Decision of the President's Chamber of the Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen of 28 January 2015 on the order for and choice of proceedings and on the determinations and rules (award rules) and on the determinations and rules for conduct of the proceedings (auction rules) to award spectrum in the 700 MHz, 900 MHz and 1800 MHz bands and additional spectrum in the 1452 to 1492 MHz band for mobile/fixed communications networks (MFCN); decision taken under section 55(4), (5) and (10), section 61(1), (2), (3), (4) and (6) and section 132(1) and (3) of the Telecommunications Act (TKG)

- Reference: BK1-11/003 -

The President's Chamber of the Bundesnetzagentur has reached a decision on the award of spectrum in the 700 MHz, 900 MHz and 1800 MHz bands and in the 1452 to 1492 MHz band (1.5 GHz band) for mobile/fixed communications networks (MFCN) (mobile broadband).

The decision makes provision for auctioning usage rights for spectrum at 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz on account of the scarcity of spectrum.

In June 2013 the Bundesnetzagentur published a draft document for consultation and a second paper – "Strategic Aspects of the Availability of Spectrum for Broadband Rollout" – which proposed that all the spectrum available for broadband be awarded early in one set of proceedings taking into account the interests of other user groups. This concerns the spectrum in the 900 MHz and 1800 MHz bands for which assignments expire on 31 December 2016 as well as spectrum in the 700 MHz and 1.5 GHz bands.

With regard to the provision of the 700 MHz spectrum, the federal government's Digital Agenda 2014 - 2017 makes provision for using spectrum in the 700 MHz band for mobile broadband rollout for the purpose of supporting the broadband strategy's target of nationwide broadband coverage by 2018.

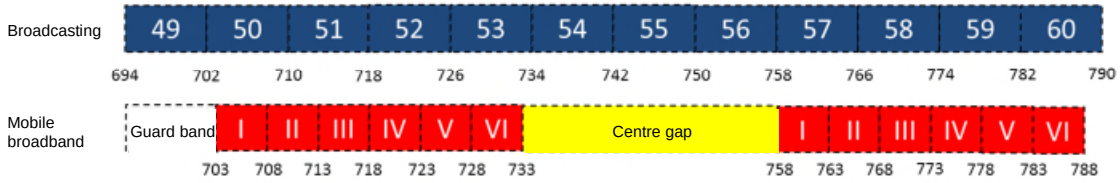
Furthermore, planning and legal certainty is to be provided in open, transparent and non-discriminatory proceedings in good time before the GSM assignments (900 MHz/1800 MHz) expire at the end of 2016.

At the same time, the approval of the merger between Telefónica and E-Plus under telecommunications legislation makes it necessary to conduct the present award proceedings as swiftly as possible, in the first half of 2015, as there is a need for short term action on account of the merger to ensure non-discriminatory broadband spectrum holdings for all mobile operators to avoid distortion of competition.

* In case of divergent interpretation of the German and English text, the German text shall prevail.

The inclusion of the 700 MHz spectrum takes place as part of a national consensus between the federal government and the federal states on using the 700 MHz spectrum for mobile broadband, which was reached at a conference of the heads of the federal states on 11 December 2014.

The following figure illustrates the different frequencies in the 700 MHz band which are currently being used for television broadcasting (DVB-T) and how the individual frequency blocks can be used in the future for mobile communications.



In 2011 the President's Chamber opened official demand identification proceedings to establish ex officio the demand for spectrum in the 900 MHz and 1800 MHz bands for MFCN as from 1 January 2017.

In view in particular of the change in the market structure as a result of the merger between Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG, the President's Chamber gave all interested undertakings the opportunity in August 2014 to notify or update their forecast requirements in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands. The responses showed that the demand for frequencies exceeds the spectrum available.

Key elements of the decision

The following spectrum will be made available for award:

Frequency band	**Spectrum volume**	**Lot**
700 MHz	2 x 30 MHz (paired)	2 x 5 MHz (paired)
900 MHz	2 x 35 MHz (paired)	2 x 5 MHz (paired)
1800 MHz	2 x 50 MHz (paired)	2 x 5 MHz (paired)
1.5 GHz	1 x 40 MHz (unpaired)	1 x 5 MHz (unpaired)
Total	270 MHz	

Since there is a shortage of spectrum, assignment will be preceded by open, transparent and non-discriminatory award proceedings in the form of an auction.

The auction design is essentially the same as for the auction in 2010. A spectrum cap of 2 x 15 MHz (paired) at 900 MHz will be set for all bidders at the pending auction. The aim of safeguarding existing mobile infrastructure, as proposed in the 2013 draft

document for consultation by means of a "frequency reserve", can be achieved with a spectrum cap as a milder means, on account of the change in the market structure. At the same time the interests of potential new entrants are safeguarded.

The minimum bids are based on the Frequency Fee Ordinance (FGebV) in force since 2013. Thus the minimum bids per lot are as follows:

Band	**Lot**	**Minimum bid**
700 MHz/900 MHz	2 x 5 MHz (paired)	€75m
1800 MHz	2 x 5 MHz (paired)	€37.5m
1.5 GHz	1 x 5 MHz (unpaired)	€18.75m

The Bundesnetzagentur, under section 61(3) second sentence para 4 TKG, determines the frequency usage conditions, including the degree of coverage with the frequency usage and the time required for this, prior to the award proceedings. In this connection, the federal states presented a broadband policy framework that was also fed into the draft decision. On the basis of the draft decision and the responses to the consultation the Chamber has laid down a coverage obligation.

Each assignee – with the exception of new entrants – must ensure nationwide broadband coverage of the population with a minimum transmission rate of 50 Mbit/s per sector, with coverage of a minimum of 98% of households nationwide, whereby a minimum of 97% must be achieved in each federal state. The aim of this requirement is to ensure the general availability of transmission rates of 10 Mbit/s and more. Full coverage must be ensured for the main transport routes (national motorways and high speed railway lines), as far as is legally and practically possible. Assignees may use their entire spectrum package to meet this target.

Concepts for other user groups

The Bundesnetzagentur has developed a concept which takes account of the interests of other user groups – most notably wireless microphone and broadcasting users – and shows how the requirements of these user groups can be satisfied:

With regard to the interests of wireless microphone users, the Chamber points out the following: Firstly, all professional users are now able to use unused spectrum in the UHF band. The Bundesnetzagentur has discontinued the previous subdivision of the 470 to 790 MHz band for wireless microphones into "broadcasting-related applications" (use by broadcasters) (470 to 710 MHz) and "other professional applications" (theatres, schools, concerts, churches etc) (710 to 790 MHz), thus enabling all professional users to use the remaining spectrum in the core band (470 to 790 MHz) flexibly and on equal terms.

Secondly, European harmonised spectrum is available for this user group, including spectrum in the duplex gaps at 800 MHz and 1800 MHz and in the newly available 1492 to 1518 MHz band.

Hence the following frequencies are available for exclusive or shared use for wireless microphones:

- 32.475 to 38.125 MHz
- 174 to 230 MHz
- 470 to 790 MHz
- 823 to 832 MHz
- 863 to 865 MHz
- 1452 to 1518 MHz
- 1785 to 1805 MHz
- 2400 to 2483.5 MHz

In total, more than 440 MHz of spectrum is available for exclusive or shared use for Programme Making and Special Events (PMSE) applications such as wireless microphones. The Bundesnetzagentur will campaign to achieve additional general assignments.

In respect of the interests of broadcasting, the President's Chamber takes due account of the significance of terrestrial television broadcasting as a means of transmission and of the need for sufficient transmission capacity for the switch from DVB-T to DVB-T2.

In the interest both of establishing DVB-T2 early and on a lasting basis and of swiftly improving broadband coverage, in particular in those regions still without coverage, the switch to DVB-T2 and broadband rollout must be realised as soon as possible and in the best possible interests of the consumers.

The Chamber is quite aware that, in the event of the 700 MHz band being cleared, suitable measures need to be taken to facilitate, in both technical and economic terms, the prompt switch to DVB-T2 and prompt clearance of the 700 MHz band by the broadcasting services.

The Bundesnetzagentur is developing a switchover plan, involving national and international frequency coordination, on the basis of a DVB-T2 requirements plan drawn up by the federal states and in close cooperation with the federal states and stakeholders. The Bundesnetzagentur has set up a national planning group (UHF AG) for this purpose, which comprises representatives from the federal states, broadcasters, PMSE services and other stakeholders. In addition to these planning

activities at national level, the Bundesnetzagentur has already consulted with the European countries concerned within various bodies and forums at international level and has already agreed bilateral memoranda of understanding or letters of intent with nearly all the neighbouring countries.

In respect of the introduction of mobile broadband in the 700 MHz band – with priority for rural areas – it is conceivable that mobile broadband rollout can begin early in some regions. The Bundesnetzagentur will therefore support the private and public service broadcasters to enable them to begin switchover work on their transmitters, if possible in April 2015, so that DVB-T2 operations can begin as planned in spring 2016. This should create the conditions whereby the spectrum can be used gradually from 2017 for mobile communications and where possible nationwide from mid-2018 for mobile broadband.

Timetable

The proceedings for qualification to take part in the auction will open with publication of the decision.

The auction is scheduled for the second quarter of 2015.

Applications to qualify to take part in the auction should be made in writing, in German, in one original and six copies, and electronically on a data storage medium in Word or PDF format, to

Bundesnetzagentur
Referat 212
Kennwort: Versteigerungsverfahren
Tulpenfeld 4
53113 Bonn

Germany

Applications to qualify to take part in the auction are to be submitted by 3 pm on 6 March 2015.

* In case of divergent interpretation of the German and English text, the German text shall prevail.

Decision of the President's Chamber of the Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen of 28 January 2015 on the order for and choice of proceedings and on the determinations and rules (award rules) and on the determinations and rules for conduct of the proceedings (auction rules) to award spectrum in the 700 MHz, 900 MHz and 1800 MHz bands and additional spectrum in the 1452 to 1492 MHz band for mobile/fixed communications networks (MFCN); decision taken under section 55(4), (5) and (10), section 61(1), (2), (3), (4) and (6) and section 132(1) and (3) of the Telecommunications Act (TKG)

- Reference: BK1-11/003 -

The Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen, through the President's Chamber, hereby issues the following decisions under section 55(10), section 61(1), (2), (3), (4) and (6), and section 132(1) and (3) of the Telecommunications Act (TKG) on the award of spectrum for mobile/fixed communication networks (MFCN) in the frequency bands at 700 MHz, 900 MHz, 1800 MHz and additional spectrum in the 1452 – 1492 MHz band and on the determinations and rules for conduct of the proceedings for the award of spectrum in consultation with the Advisory Council of the Bundesnetzagentur:

I. Order for award proceedings

It is hereby ordered under section 55(10) TKG that assignment of spectrum for MFCN in the 700 MHz, 900 MHz and 1800 MHz bands and other spectrum in the 1452 - 1492 MHz band is to be preceded by award proceedings as set out in section 61 TKG.

II. Choice of award proceedings

The proceedings referred to in section 61(1) of the TKG will be conducted in the form of an auction in accordance with section 61(2) TKG.

III. Determinations and rules

III.1 Qualification requirements, section 61(3) second sentence para 1 TKG

1. The right to take part in the auction, given the minimum specialist and other requirements within the meaning of section 61(3) second sentence para 1 TKG, is not limited.

2. Undertakings may qualify once only. This also applies in respect of consortia. Undertakings that have merged under section 37 of the German Restraints of Competition Act (GWB) are deemed to be one undertaking.

3. In their application, applicants must state how the requirements for admission to the auction as set out in section 61(3) second sentence para 1 and subsection (4) TKG are met (cf Annex 1 for details of the application requirements).

4. In their application for admission, applicants are entitled to request the minimum frequency requirements for their business model (so-called minimum essential spectrum package).

   Applicants requesting a minimum essential spectrum package but actively bidding for less during the auction will be eliminated from the entire proceedings.

   Any minimum essential spectrum package requested should be set out accordingly in the frequency usage concept.

5. The Bundesnetzagentur will state the particular bidding eligibility and the minimum essential spectrum package allowed on the qualification notice. This determination of the essential spectrum package is binding and will be reflected in the auction software for the particular bidder. The bidding eligibility will be given in lot ratings (cf subsection IV.3.8).

6. The procedure for qualification to take part in the auction opens with publication of this Decision on the Bundesnetzagentur's website.

   Applications to qualify to take part in the auction should be made in writing, in German, in one original and six- copies, and electronically on a data storage medium in Word or PDF format, to

   Bundesnetzagentur
   Referat 212
   Kennwort: Versteigerungsverfahren
   Tulpenfeld 4
   53113 Bonn

   Germany

   Applications to qualify to take part in the auction are to be submitted by 3 pm on 6 March 2015.

III.2 Determining the frequency usage for which the spectrum to be awarded may be used in compliance with the Frequency Plan (section 61(3) second sentence para 2 TKG)

1. In compliance with the Frequency Plan, the frequencies to be assigned may be used for MFCN.

2. The frequencies in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands are available for usage across the country.

III.3 Basic spectrum package and restriction of bidding rights, section 61(3) second sentence para 3 TKG, section 61(4) in conjunction with section 61(2) first sentence TKG

1. A basic spectrum package as referred to in section 61(3) second sentence para 3 TKG will not be stipulated.

2. Bidding rights in the 900 MHz band are limited to a maximum spectrum package of 2 x 15 MHz (paired) (spectrum cap).

III.4 Frequency usage conditions including the degree of coverage with the frequency usage, section 61(3) second sentence para 4 TKG

1. The spectrum for award in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands is to be used for MFCN. There are no restrictions on the technologies that may be used. Every available technology can be deployed in observance of the usage conditions.

   The spectrum is available for award as follows:

Frequency band	**Spectrum volume**	**Lot**
700 MHz	2 x 30 MHz (paired)	2 x 5 MHz (paired)
900 MHz	2 x 35 MHz (paired)	2 x 5 MHz (paired)
1800 MHz	2 x 50 MHz (paired)	2 x 5 MHz (paired)
1.5 GHz	1 x 40 MHz (unpaired)	1 x 5 MHz (unpaired)

Table 1

2. The usage conditions in this decision and in Annex 2 apply to frequency usages in the 900 MHz and 1800 MHz bands. The provisional usage conditions in this decision as well as in Annexes 3 and 4 apply to frequency usages in the 700 MHz and 1.5 GHz bands.

   Assignees may diverge from these conditions if they have made mutual arrangements to this effect and divergence is without detriment to the frequency usage rights of third parties. The Bundesnetzagentur must be informed of this in writing beforehand.

   The frequency usage conditions can be modified subsequently, particularly if this is necessary to secure efficient and interference-free use of frequencies or as a result of international harmonisation agreements. The usage conditions in Annex 3 for the 700 MHz band are a case in point, as final decisions at European and national level are still outstanding.

3. The frequency assignments will be valid until 31 December 2033.

4. Coverage obligation

   Assignees must ensure nationwide broadband coverage of the population with mobile-based transmission technologies that achieve a minimum transmission rate of 50 Mbit/s (Megabit per second) per sector.

   The imposition of a coverage obligation of 50 Mbit/s per sector on each network operator is to ensure the general availability of download transmission rates of 10 Mbit/s and more in relation to the percentage of required household coverage.

   Within three years of the award of spectrum, each assignee must achieve coverage of a minimum of 97% of households in each federal state and a minimum of 98% nationwide with the above-referred mobile-based broadband access. Full coverage must be ensured for the main transport routes (national motorways and high speed railway lines), as far as is legally and practically possible.

   Assignees may enter into cooperation agreements and lease frequencies, as long as this is permitted under the regulatory and competition law frameworks.

   An assignee that has not previously operated a nationwide mobile communications network is required in its frequency usage to cover at least 25% of the population from 1 January 2021 and at least 50% of the population from 1 January 2023.

   Assignees must provide evidence that the coverage obligation imposed on them has been met. Evidence of nationwide coverage shall be substantiated unequivocally and plausibly through appropriate simulations. The Bundesnetzagentur will check this using appropriate measurement methods. The parameters to be met under the obligation will be decided subsequently, taking account of the technology deployed.

5. From the time the spectrum is assigned, assignees must report to the Bundesnetzagentur every year on the progress of spectrum use and network build and rollout. This report should also include the degree of coverage with respect to nationwide provision, the average transmission rate actually available and the current status regarding the deployment of innovative applications and technological developments.

6. A condition subsequent will be attached to the assignment of frequencies which, at the time of the present Decisions, were the subject matter of an

administrative law dispute pending at the time of assignment, to the effect that assignment will be rescinded if the legal requirements are to be regarded as not given at the time of assignment as a result of the court's final decision. This secondary provision may be worded differently on the individual assignment notices.

7. No obligation will be imposed on assignees to offer service providers access to services on a non-discriminatory basis.

III.5 Minimum bid, section 61(4) second sentence TKG

1. The minimum bid for a frequency block of 2 x 5 MHz (paired) is set at €75 million in the 700 MHz and 900 MHz bands and at €37.5 million in the 1800 MHz band.
2. The minimum bid for a frequency block of 1 x 5 MHz (unpaired) in the 1.5 GHz band is set at €18.75 million.

IV. Auction rules

IV.1 General provisions

IV.1.1 Venue

The auction will be held in the physical presence of the bidders at the Bundesnetzagentur's Mainz office in Canisiusstrasse 21 in Mainz.

IV.1.2 Eligibility

Eligible to take part in the auction are applicants qualified under subsection IV.3.3 who have provided security for the bidding eligibility in accordance with subsection IV.1.3 and whose representatives have been authorised in accordance with subsection IV.2.2.

IV.1.3 Security

Qualified applicants shall pay a deposit no later than 14 days before the auction begins to an account to be specified by the Bundesnetzagentur. The security can also take the form of an unconditional, continuing, irrevocable, absolute bank guarantee for the amount of the security payable, issued by a domestic financial institution or a financial institution authorised as a customs and tax guarantor.

The security is €18.75 million per lot rating (cf Annex 1). The total is derived from the eligibility, expressed in lot ratings (cf subsections IV.3.8 and III.5).

IV.1.4 Lots

Frequencies in the 700 MHz band will be auctioned in five abstract frequency blocks and one specific block of 2 x 5 MHz (paired).

Frequencies in the 900 MHz band will be auctioned in six abstract frequency blocks and one specific block of 2 x 5 MHz (paired).

Frequencies in the 1800 MHz band will be auctioned in nine abstract frequency blocks and one specific block of 2 x 5 MHz (paired).

Frequencies in the 1.5 GHz band will be auctioned in eight abstract frequency blocks of 5 MHz (unpaired).

Details can be found in Annexes 5 and 6.

IV.1.5 Restriction of bidding rights

Bidding eligibility for frequency blocks in the 900 MHz band is restricted to a maximum of 2 x15 MHz (paired) per bidder (spectrum cap).

IV.2 Power of attorney and auction tutorial

IV.2.1 Power of attorney

Applicants must, by the auction tutorial date at the latest, authorise four to eight persons to take part in the tutorial and to bid at the auction on behalf of their undertaking. A written declaration of power of attorney must be provided to the Bundesnetzagentur. During the auction, at least two authorised persons per bidder who have attended the tutorial must be present in the bidder's area.

IV.2.2 Auction tutorial

The authorised agents must take part in a tutorial before the auction is held. The tutorial is to give these persons instruction in the practical conduct of the auction, in particular in the electronic bidding proceedings and the special software used.

The tutorial will be held in the Bundesnetzagentur's Mainz office. The tutorial date should be close to the auction date.

The authorised agents must provide the Bundesnetzagentur at the end of the tutorial with a written declaration stating that they have understood the auction rules and the electronic bidding method. They must also undertake to comply with the rules.

Participation in the tutorial and the declaration specified in paragraph 3 are a precondition for participation in the auction. The tutorial will be held once only.

Only the persons holding a power of attorney and who have attended the tutorial are authorised to submit bids on the bidder's behalf. On the part of the bidders, only authorised agents have access to their rooms (cf subsection IV.3.2).

IV.3 Conduct of the auction

IV.3.1 Type of auction

The auction will be held as an open ascending simultaneous multiround auction.

IV.3.2 Procedure

The auction will be held Monday to Friday. It will begin at 08:00 hours and finish as a rule at 18:00 hours.

Each bidder will be provided with a separate room within the building. Each room will be equipped with a computer for making bids, a telephone permitting connections solely to the auctioneer, and a second telephone, fax machine and internet access permitting connections solely to the decision-makers in the qualified undertaking.

Any suspension of the auction will be announced by the auctioneer, who will also inform the bidders of the time at which the auction will be resumed.

The auction results will be announced publicly.

IV.3.3 The bidder

The bidder is the undertaking that has qualified to take part in the auction. Bidders will be represented by authorised agents and those with powers of attorney.

IV.3.4 Bid submission

In each round, bidders can submit bids simultaneously and independently of one another and, subject to their eligibility, are free to choose which blocks to bid for (cf subsections IV.1.5 and III.1.5).

Bids will be submitted electronically by means of special software.

IV.3.5 Valid bids

In the first round the minimum valid bid is the minimum bid for a frequency block. In the subsequent rounds the minimum valid bid is a bid that exceeds the current highest bid for a frequency block by the current minimum bid increment. If no valid bid was made for a frequency block in the previous rounds, the minimum valid bid will count as the minimum bid. If the highest bid in a round is withdrawn (cf subsection IV.3.11) and no new valid bid for this block is submitted in that round, the new minimum valid bid will be derived from the amount of the withdrawn highest bid plus the current minimum bid increment.

In each round, the software will provide a list for each frequency block showing the valid bids from which bidders can choose their bid amount (click box bidding).

The bidder may choose a bid from the following list of bid amounts:

- the minimum valid bid,
- the minimum valid bid plus €10,000
- the minimum valid bid plus €20,000
- the minimum valid bid plus €50,000
- the minimum valid bid plus €100,000
- the minimum valid bid plus €200,000
- the minimum valid bid plus €500,000
- the minimum valid bid plus €1,000,000
- the minimum valid bid plus €2,000,000
- the minimum valid bid plus €5,000,000
- the minimum valid bid plus €10,000,000
- the minimum valid bid plus €20,000,000
- the minimum valid bid plus €50,000,000
- the minimum valid bid plus €100,000,000.

IV.3.6 Minimum bid increment

If there is a highest bid for a frequency block after a round in the auction, the auctioneer will stipulate a minimum bid increment for it for the subsequent rounds.

The minimum bid increment is a particular (not minus) sum of money by which the highest valid bid in a round must increase as a minimum.

In the first stage, the minimum bid increment is 5% of the designated highest bid. Depending on how the auction proceeds, the minimum bid increment can be lowered step by step by the auctioneer for further stages to 3% and 1% of the designated highest bid (incremental stages).

Diverging from this, the auctioneer can stipulate a specific amount for individual frequency blocks as the minimum bid increment.

The auctioneer will notify bidders at the start of a round of the level of the particular minimum bid increment, rounded to the next whole multiple of €1,000.

IV.3.7 Highest bids

At the end of every round the highest bid for each frequency block will be identified by evaluating the round. The highest bid is the highest active bid for a frequency block at the end of a round. If identical highest valid amounts are bid for a frequency block, the

* In case of divergent interpretation of the German and English text, the German text shall prevail.

bidder who submitted his bid first will be considered to have the highest bid. The current highest bid for a frequency block will be designated as such at the beginning of the next round.

IV.3.8 Lot ratings

Standardised numerical values are determined for every frequency block depending on its spectral extent (known as lot ratings).

A frequency block of 1 x 5 MHz (unpaired) is given a lot rating of 1, a block of 2 x 5 MHz (paired) is given a lot rating of 2. Details are given in Annex 6.

Bidding eligibility is given in lot ratings.

IV.3.9 Activity rules

A bidder's activity in a round is the sum of all eligibility points, in lot ratings, used for frequency blocks for which the bidder has submitted an active bid.

An active bid for a block in a round is deemed to have been given when, at the beginning of the round, either the bidder holds the highest bid for the block – and does not withdraw it in the current round as set out in subsection IV.3.11 – or submits a valid bid for a block in the current round in accordance with subsection IV.3.5.

A bidder must exercise his bidding eligibility to a certain extent if he is not to lose any (minimum level of activity), unless he makes use of a waiver as provided for in subsection IV.3.10.

The auction is divided into three consecutive activity phases:

- Activity phase 1 requires a minimum activity level of 65% of the current bidding eligibility.
- Activity phase 2 requires a minimum activity level of 80 % of the current bidding eligibility.
- Activity phase 3 requires a minimum activity level of 100 % of the current bidding eligibility.

The auctioneer will decide when to move on to the next activity phase in accordance with the progress of the auction.

The minimum activity level determines the minimum activity a bidder has to engage in. Minimum activity is derived from the product of the number of the bidder's eligibility points and the minimum activity level in the particular activity phase, rounded up to the next highest whole number.

A bidder keeps his full bidding eligibility for the next round if he has complied with or surpassed the minimum activity level in the current round.

If a bidder falls below the minimum activity level and does not use a waiver (cf subsection IV.3.10), his bidding eligibility will be determined anew for the next round:

- in activity phase 1 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/65.
- in activity phase 2 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/80.
- in activity phase 3 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/100.

A bidder not submitting a new valid bid in a round for any frequency block, not holding a highest bid and not using a waiver (active or passive) as provided for in subsection IV.3.10 , will be eliminated from the auction.

Notwithstanding this activity rule, a bidder must in any case place bids to match the extent of the minimum essential spectrum package he has specified (cf subsection III.1.5). If fewer bids are placed than the minimum essential spectrum package agreed, the bidder will lose all his bidding eligibility and will be eliminated from the auction, provided he has not used any waivers (active or passive) as specified in subsection IV.3.10.

IV.3.10 Waivers

Each bidder will be given five waivers that he can use in five different rounds. Using a waiver means that no eligibility points will be lost in the particular round (cf subsection IV.3.9).

A distinction is made between active and passive waivers.

Active use of a waiver is made by activating a command to this effect in the software (active waiver).

There are two possibilities of use:

1. A bidder can sit out a whole round, ie he does not submit a valid bid and does not withdraw a bid in the particular round. In this case he does not lose any eligibility points.
2. He can also submit valid bids and/or withdraw bids and – as long as he remains under the required minimum activity level – can avoid his eligibility being reduced by active use of the waiver.

If the bidder engages in less than the minimum activity level but places bids to match his minimum essential spectrum package, the bidder can explicitly decide to do without a waiver. In this case he will lose eligibility points (cf subsection IV.3.9).

This form of active waiver is not available to a bidder with an agreed minimum essential spectrum package unless he has placed bids to the extent of his minimum essential spectrum package.

A passive waiver, by contrast, is automatically effected by the software when the bidder allows time to elapse in a round without submitting a valid bid or withdrawing a bid and he falls below the minimum activity level even with his highest bids (cf subsection IV.3.9). A passive waiver has no effect on the termination rule (cf subsection IV.3.16).

IV.3.11 Withdrawal of highest bids

Every bidder is entitled to withdraw, in part or in full, the highest bids he holds in ten rounds of the auction. A bidder can also submit new valid bids in the same round with the entitlements that have been released.

A bidder is not permitted to withdraw a bid if this would mean falling below his agreed minimum essential spectrum package in the particular round.

Withdrawal of a bid does not have any effect on the termination rule of the auction (cf subsection IV.3.16). If a bidder withdraws one or more bids in the last activity phase and none of the bidders submits a new valid bid or uses an active waiver, the auction will end.

A bidder withdrawing a bid will be bound by his bid to pay if no new valid bid is made for the frequency block in question in the course of the first stage of the auction. In this case the bidder will be obliged to pay a sum equivalent to the bid he has withdrawn.

If the frequency block is awarded in a second stage, the price bid for the block will be deducted from the amount the withdrawing bidder has to pay.

IV.3.12 Time of a round, completion of a round, discontinuation of a round and suspension of the auction

At the beginning of the auction, the time for a round in which bids can be submitted is 60 minutes. The auctioneer may set a different time before the start of a round, after due consideration of the circumstances.

There will be an automatic reminder ten minutes before the round expires.

A round is completed after the bids from all the bidders have been received by the auctioneer or after expiry of the specified time period for the submission of bids. A round is closed after evaluation by the auctioneer.

The auctioneer may discontinue a round not yet completed if there is a technical defect in the equipment needed for conducting the auction or if other reasons jeopardise proper conduct of the auction. In this case the auction will resume with the result of the previous round.

Each bidder will be given one opportunity to request the auctioneer to suspend the auction. Upon request, it can also be suspended during a round. The request must be declared for the record with the auctioneer. The auction will then be continued at 13:00 hours on the next working day.

Bidders will be notified of the reason for and length of any suspension of the auction.

IV.3.13 Provision of information to bidders

The auctioneer will provide every bidder with the following information at the start of a round:

- the current round,
- the current activity phase (cf subsection IV.3.9),
- the duration of the round (cf subsection IV.3.12),
- the highest bid and the correspondingly highest bidder for each frequency block (cf subsection IV.3.7),
- the minimum valid bid and the minimum bid increment for each frequency block (cf subsectionsIV.3.5 and IV.3.6),
- a click box list of valid bids from which bidders can choose their bid amount (cf subsection IV.3.5),
- the extent of their current eligibility (in lot ratings) and their minimum activity level in the current round (cf subsection IV.3.9),
- the number of their waivers remaining (cf subsection IV.3.10),
- the number of their bid withdrawal opportunities remaining (cf subsection IV.3.11),
- the names of bidders eliminated or excluded.

At the close of every round the auctioneer will inform every bidder of the current highest bid for each frequency block and the active bids of all the bidders and their identity by means of special software. This information will also be provided electronically to the authorised agents in the bidder's room for further processing.

IV.3.14 Exclusion of bidders/collusion

Any bidders working together before or during the auction to influence the course or the result of the auction (colluding) may be excluded from taking part in the entire proceedings. Bidders may also be excluded from taking part as a result of irregular behaviour or as a result of holding up proper conduct of the auction.

An excluded bidder is bound by his bid to pay if, in the course of the auction, no new valid bid is submitted to take the place of the highest bid he held at the time of exclusion. In this case he must pay the amount of his highest bid. If the frequency block is awarded in the second section of the auction (cf subsection IV.3.18) to another bidder, the bid price for the block will be deducted from the amount to be paid by the excluded bidder. If the price for the particular frequency block in the second stage is higher or the same as the highest bid in the first stage of the auction, the excluded bidder is not obliged to pay.

The frequency block will not be awarded to the excluded bidder.

If collusive or irregular behaviour is only established after the auction has closed, award and/or frequency assignment will be revoked. A highest bidder shall remain bound by his bid to pay. He must also meet his payment obligation for withdrawing his bids (cf subsection IV.3.11). Payments made will not be refunded.

IV.3.15 Elimination from the auction

A bidder will be eliminated from the auction if he has no more eligibility points (cf subsection IV.3.9) or has been excluded (cf subsection IV.3.14).

IV.3.16 End of the auction (termination rule)

The auction will end if no valid bid has been made in the last activity phase for any frequency block and none of the bidders has used an active waiver. The final result of the auction will be announced by the auctioneer.

If, in an earlier activity phase of the auction, no valid bid has been submitted in a round and none of the bidders has used an active waiver and if all the eligibility points are bound by highest bids, it is up to the auctioneer to continue the auction by taking it into the next activity phase or to end it directly.

The auction can also end through discontinuation. The auctioneer may discontinue the auction if there is a technical defect in the equipment necessary for auction conduct, if bidders collude, or if other reasons jeopardise the proper conduct of the auction. In this case, the Bundesnetzagentur will set a date for a new auction.

* In case of divergent interpretation of the German and English text, the German text shall prevail.

IV.3.17 Award

The bidder holding the highest bid for a frequency block at the end of the auction will be awarded the block. Bidders with an agreed minimum essential spectrum package will be awarded the spectrum only if they have won their minimum essential package at least.

The award price will be equal to the highest bid submitted by the particular bidder. Award will be made in writing. The award notice will be presented after the auction.

A frequency award for which

a) there is no valid bid at the end of the auction,
b) no new valid bid was submitted after a bid was withdrawn,
c) award was denied, or
d) there is a bid, but the highest bidder failed to acquire his agreed minimum essential spectrum package,

will not be awarded in the auction.

IV.3.18 Second stage of the auction

If frequency blocks have not been awarded at the close of the first stage of the auction (cf subsection IV.3.17), the President's Chamber will take a decision within two working days on whether, and if so when, these blocks should be auctioned in full or in part in a second stage. Provided that it is appropriate to award the frequencies in a second stage, the following arrangements will apply as a general rule:

Eligibility will also be restricted in the second stage as a result of the cap on spectrum in the 900 MHz band. Spectrum won in the first stage will count.

The same minimum bids for the frequency blocks will apply in the second stage of the auction as in the first stage.

For the second stage of the auction, the same auction rules will apply as for the first stage, with the following exceptions:

- Only bidders that have been awarded one or more frequency blocks in the first stage will be eligible to take part.
- The maximum number of eligibility points in the second stage will be derived from the difference between the number of eligibility points established as a result of application and the eligibility successfully used in the first stage. Bidders may also submit bids for frequency blocks for which they withdrew a bid in the first stage.
- Bid withdrawal is not possible.

- A minimum essential spectrum package cannot be requested.

IV.4 Auction close

IV.4.1 Obligation to pay

The bidder awarded a frequency block at the close of the auction must pay the amount of his highest bid.

A bidder that has withdrawn a current highest bid must pay his highest bid if no new valid bid is made for the frequency block in question in the course of the first stage of the auction. If the frequency block is awarded in the second stage of the auction, the price bid for the block will be deducted from the amount the withdrawing bidder has to pay (cf subsectionIV.3.11)

The award notice will be presented together with the notice of amount payable against acknowledgement of receipt.

Payment of the award price for frequency blocks in the 900 MHz, 1800 MHz and 1.5 bands, less any security deposited as a sum of money (cf subsection IV.1.3), is due immediately after presentation of the notice of amount payable and must be paid within five banking days onto the account specified by the Bundesnetzagentur.

Payment of the award price for frequency blocks in the 700 MHz band, less any security deposited as a sum of money (cf subsection IV.1.3), is due immediately after presentation of the notice of amount payable and must be paid in three equal instalments. The first instalment is due immediately upon presentation of the notice of amount payable. The second instalment is due by 1 July 2016 and the third instalment by 1 July 2017. Payment of the first instalment must be made within five banking days of presentation of the notice of amount payable to the account specified by the Bundesnetzagentur. Payment of the second and third instalments must be made by the due dates stated above to the account specified by the Bundesnetzagentur.

Compliance with each deadline is determined by the time at which the sum is credited to the account (value date). The debtor automatically defaults if payment has not been made before the deadline expires. There is no need for a reminder. Interest will be charged during the period of default on the award price less any security deposited as a sum of money. The interest rate for the year shall be five percentage points above the base rate in accordance with section 274 of the German Civil Code (BGB).

The security will likewise be deducted if there are other payment obligations under the auction rules.

The security will not earn interest. If a bidder has not received any award and has no other payment obligations, his security deposit will be refunded without undue delay after the close of the entire auction. The surety bonds will be returned after receipt of payment or of the final instalment.

IV.4.2 Allotment of the abstract frequency blocks won

At the end of the auction the abstract frequency blocks won will be allotted to their highest bidders. The allotment proceedings are carried out in an objective, transparent and non-discriminatory manner in accordance with the following rules:

1. Successful bidders have the possibility of reaching agreement within a period of one month from the close of auction on the specific location of the blocks auctioned in the specific frequency band.
2. Insofar as no agreement is reached between all the successful bidders involved before the end of the set deadline, the Bundesnetzagentur may allot the abstract frequency blocks won taking account of current use, of contiguous spectrum and of any preferences stated.
3. If there are abstract frequency blocks that have been won and awarded but cannot be allotted in accordance with the principles under point 2 above, their allotment will be decided by lot.

V. Applications

Separate proceedings will be held to decide on the applications submitted by Telefónica Germany GmbH & Co. oHG of 8 January 2015.

Rationale

1 The following considerations and grounds have prompted the Chamber to order and choose proceedings and to lay down award rules and auction rules for the award of spectrum in the 700 MHz, 900 MHz and 1800 MHz bands and additional spectrum in the 1452 to 1492 MHz band for MFCN.

Considerations

Provision of this spectrum is based on the following considerations:

2 The spectrum available in the 900 MHz and 1800 MHz bands as from 1 January 2017 is to be provided for MFCN on a technology neutral basis. Additionally, it is already foreseeable that further spectrum at 700 MHz will become available and that this can be provided for MFCN along with the spectrum in the 900 MHz, 1800 MHz and 1.5 GHz bands, in line with the regulatory aims. The national consensus between the federal government and the federal states on using the 700 MHz spectrum for mobile broadband was reached at a conference of the heads of the federal states on 11 December 2014.

3 The spectrum is being provided in consideration of the regulatory aims set out in section 52 in conjunction with section 2(2) TKG. Hence frequency assignment is to ensure in particular efficient spectrum use. In following these aims the Bundesnetzagentur is guided by the principles laid down in section 2(3) TKG of safeguarding competition in the telecommunications sector for the benefit of the consumer and promoting infrastructure competition. It is taking particular account of the conditions in the different geographic areas of the Federal Republic of Germany by providing frequencies with different physical propagation characteristics (frequencies above and below 1 GHz). Provision of this spectrum in open, transparent and objective proceedings will ensure that the operators of existing mobile networks and new entrants are given non-discriminatory access to the spectrum above and below 1 GHz. These proceedings will also encourage efficient investment and innovation in new and improved infrastructures.

4 Optimum use has been made of the potential of the 900 MHz and 1800 MHz spectrum, notably for mobile voice communications, through GSM licensing in Germany and the introduction of GSM service offers across Europe. Economically, GSM has been a resounding success for the German mobile market with great importance for the economy as a whole. Offering consumers nationwide mobile communication for the very first time, its social benefit has been huge. Owing to its introduction across Europe the GSM success story can also be viewed in terms of economic and social integration in the European Union.

5 Meanwhile, consumers want more than just mobile voice communications and text messaging. Demand is soaring for high speed wireless access for innovative mobile data services (mobile Internet), driven especially by the following:

- new multimedia devices, eg smartphones and tablets,
- mobile broadband internet usages,
- cloud computing,
- videostreaming,
- mobile software applications (apps),
- increase in machine-to-machine, or M2M information exchange,
- multimedia social networks,
- high definition voice.

6 By lifting the restriction on GSM usage rights the Bundesnetzagentur has paved the way for use of the frequencies for broadband systems such as UMTS and LTE or LTE Advanced. In principle, the spectrum can already be used for broadband mobile data services. Their physical propagation properties make these two frequency bands well suited to satisfy rising consumer demand for new, innovative data services, both in rural and in urban areas. Doing so allows the potential of the 900 MHz and 1800 MHz spectrum to be exploited to the full, in future too, by the offer of mobile voice services and, in particular, by high speed mobile data services.

7 The federal government's broadband strategy of 2009 set ambitious goals for deploying broadband:

> *"A total of 75 percent of households should have high speed broadband access with transmission rates of at least 50 MB/sec by 2014. The government's goal is to deliver nationwide access with this high-speed broadband as soon as possible."* (The Federal Government's Broadband Strategy, page 5, downloadable at www.bmwi.de)

8 The federal government stated the following regarding the provision of all households with broadband access (Digital Agenda 2014 - 2017, I.2.):

> *"Mobile broadband is helping to accelerate the provision of universal broadband access. As a result of the early allocation of radio frequencies to mobile communications in the 700 MHz range – a frequency range that enables wireless*

connections in rural areas in particular thanks to the development of digital terrestrial television (switch to DVB-T2) – we can ensure that certain peripheral areas are quickly gaining speedy access to high-speed networks through the use of frequency resources."

9 The Bundesnetzagentur's proposal to include in the proceedings further spectrum in the 700 MHz band in particular is designed as an added incentive to invest efficiently in order to speed up the rollout of broadband wireless networks. This spectrum has good propagation characteristics for the cost-efficient coverage of rural communities and hence – in light of the digital agenda, too – can contribute significantly to achieving the target of 50 Mbit/s internet access by 2018 for consumers in sparsely populated areas as well.

10 The Chamber is thus opening the proceedings for award of the 700 MHz spectrum and spectrum in the 900 MHz, 1800 MHz and 1.5 GHz bands so as to ensure use of the spectrum for consumers in timely manner in 2017/2018.

11 In awarding the spectrum it is also important to set investment incentives and to encourage innovation and sustainable competition for the benefit of the consumer as effective support for the federal government's goals.

12 At EU level, too, mobile broadband is an important spectrum management topic. The first European Radio Spectrum Policy Programme (RSPP) (Decision No 243/2012/EU of the European Parliament and of the Council of 14 March 2012) lays down in Article 3 that the Member States cooperate to support and achieve the following policy objectives:

"seek to allocate sufficient and appropriate spectrum in a timely manner to support Union policy objectives and to best meet the increasing demand for wireless data traffic, thereby allowing the development of commercial and public services, while taking into account important general interest objectives such as cultural diversity and media pluralism; to that end, every effort should be made to identify, based on the inventory established pursuant to Article 9, at least 1 200 MHz of suitable spectrum by 2015. That figure includes spectrum already in use;" (Article 3 point (b));

*"bridge the digital divide and contribute to the objectives of the Digital Agenda for Europe, fostering access to broadband at a speed of not less than 30 Mbps by 2020 for all Union citizens and making it possible for the Union to have the highest possible broadband speed and capacity;" (*Article 3 point (c)).

13 At EU level 1025 MHz of spectrum has been harmonised for MFCN (cf Radio Spectrum Policy Group, RSPG – 12-408, Annex 1).

14 Awarding spectrum in the 800 MHz, 1.8 GHz, 2 GHz and 2.6 GHz bands in 2010 on the basis of the President's Chamber decision of 12 October 2009 (BK1a-09/002), the Bundesnetzagentur has paved the way for overcoming the digital divide and hence for rapid rollout to provide the population, rural communities in particular, with mobile internet access. This marked a first contributory step to achieving the aims of the European Commission and the federal government's broadband strategy, in light also of the digital agenda, to provide the population with high speed broadband connections.

15 Provision of this spectrum has enabled broadband networks to be rolled out using the new LTE technology. The coverage obligations imposed with assignment of the 800 MHz spectrum have been met but there are still gaps in coverage, particularly in rural areas, in which there is neither wired nor wireless broadband access. Mindful of the aims of the broadband strategy, that is to say high speed connections for consumers everywhere in the country, the provision of further spectrum below 1 GHz for MFCN will give fresh momentum to filling these gaps also.

16 The broadband policy prepared by the SPD's parliamentary party, entitled "Ensuring comprehensive broadband coverage and accelerating dynamic development", dated 10 September 2012, sets out the following objectives:

> *"[…] rollout of high speed networks which allow significantly higher bandwidths of 50 Mbit/s and more and will also meet the demands placed in the future on a modern broadband infrastructure. The great challenge involved in this is to create, or improve, the relevant conditions for the more thinly populated regions, so that they can be linked up with a top-grade broadband infrastructure in spite of the heavy costs involved."*

17 The coalition's working group "A future for rural areas – Securing and extending regional diversity" requested the following in the Bundestag on 27 November 2012 (BT printed paper 17/11654 of 27 November 2012, page 2):

> *"1. Modern transport, communications and energy infrastructure network*
>
> *a) Telecommunications*
>
> *The primary task is to improve the local conditions of the rural areas by ensuring that both urban and rural regions have fully comprehensive access of the same standard to the high speed internet, thus preventing a digital divide inside Germany. To achieve the federal government's rollout objectives the focus must be on:*
>
> *[…]*
>
> *- Provision of further spectrum (eg 700 MHz band) for mobile broadband use […];".*

18 The federal government, with a view to provision of the 700 MHz spectrum, had the following declaration included in the minutes of the Bundesrat meeting in February 2012 (cf BR minutes of plenary proceedings 892, page 4ff):

> *"In connection with the award of the spectrum hitherto allocated to broadcasting services – in particular by way of auction – the federal government undertakes to achieve a settlement based on mutual agreement with the federal states covering the distribution of proceeds as between the federal and state governments. This will be done before the Frequency Ordinance is passed to the Bundesrat for its mandatory approval. The federal government is aware that the federal states assume the proceeds will be split fifty-fifty after deduction of the costs resulting from the changes."*

19 In its Special Report 61 issued in 2011 the Monopolies Commission pronounced itself in favour of a "Digital Dividend II" (page 17, para 23):

> *"In the long term it would seem necessary, given the anticipated growth in the volume of mobile data, to provide further spectrum for mobile communications below 1 GHz by 2018/2020 at the latest. The Monopolies Commission pronounces itself in favour of harvesting this spectrum from a Digital Dividend II by making further spectrum below 790 MHz, previously used for terrestrial broadcasting, available for mobile communications. The Monopolies Commission does not deny that the further spectrum requirements of terrestrial broadcasting cannot be accurately predicted today. Yet in view of the growing share of broadcasting via satellite, cable and IPTV the importance of terrestrial transmission is likely to decrease, rather than increase."*

20 With reference to this Special Report the Bundesrat provided the following clarification in respect of the divergent interests (BR printed paper 531/12 of 2 November 2012):

> *"The Bundesrat wishes to clarify that the UHF spectrum from 470 MHz to 790 MHz that remains after release of the digital dividend will continue to be*

required for broadcasting. It must likewise be possible for production broadcasts, outside broadcasts and events technology – namely for more demanding microphone systems (theatre, opera) – to continue to use the spectrum from 470 MHz to 790 MHz on account of the necessary stability and the low costs."

21 The Chamber shares the view that social and cultural aspects such as the requirements cited by the Bundesrat should also be taken into consideration in providing the spectrum. This is particularly true in light of the social importance of broadcasting and PMSE. The Chamber is looking at all the different interests relative to the spectrum requirements of broadcasting, mobile communications and wireless microphones that have to be balanced. The Bundesnetzagentur has drawn up a concept on this, setting out its ideas on the short, medium and long term availability of spectrum resources for broadband rollout in Germany ("Strategic Aspects of the Availability of Spectrum for Broadband Rollout in Germany", cf Communication No 170/2013, Bundesnetzagentur Official Gazette No 12/2013 of 3 July 2013, page 1846ff). In its considerations on reconciling the different interests the Bundesnetzagentur is not assuming a priori that spectrum requirements are decreasing.

22 The Second Monitoring Report on the broadband strategy has the following to say on the spectrum requirements for further nationwide broadband rollout (downloadable from www.bmwi.de, page 25):

"The potential of the use of further spectrum from the digital dividend is not yet sufficiently anchored in the industry players' perception, as the auction was held only recently and use of the first frequencies from the digital dividend (790 to 862 MHz) has only just begun."

23 The German Bundestag has also highlighted the particular importance of mobile broadband, calling upon the government to

"… strive for a national consensus on broadband rollout by the end of the third quarter of 2014 to ensure the award of spectrum, including that in the 700 MHz band, at the beginning of 2015. […] In reaching a political compromise the two overriding objectives – nationwide broadband coverage (50 Mbit/s by 2018) with mobile broadband use beginning in 2017 and the swift switch to DVB-T2 – are to be kept in mind."
("Modern networks for a modern country – fast internet for all", page 15f, presented by the coalition parliamentary groups in the Bundestag on 2 July 2014).

24 With a view to improving broadband coverage and eliminating the digital divide the Bundesnetzagentur is looking at all possible ways of accelerating proceedings so as to make the 700 MHz spectrum that is well suited for rolling out high speed telecommunications networks across the country available at an early stage, after this spectrum was already identified internationally at WRC-12 for the mobile service.

25 The Chamber expects this band to have great social and economic potential for broadband rollout in Germany. The 700 MHz band is already harmonised globally to the greatest possible extent, providing economies of scale in respect of the cost-efficient provision of technical systems and terminal equipment. In Asia, South America and Africa this spectrum will either be made available shortly or is already being used for broadband. Thus the 700 MHz band can be expected to become a valuable resource for broadband services internationally. The Chamber is hence working on the assumption that in Germany, too, favourably priced technical systems and terminal equipment will be available at an early stage and hence stimulate cost-efficient, nationwide coverage of consumers with mobile broadband services as envisaged in the broadband strategy. Further, maximum global harmonisation gives consumers the best possible deal as regards international roaming.

26 The provision by the Bundesnetzagentur at the earliest possible opportunity of spectrum in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands for MFCN can inject new impetus into the process of achieving the aims of the broadband strategy to provide the population with high speed connections of at least 50 Mbit/s in a further step after the award of spectrum in 2010. Even though LTE rollout has begun, the Bundesnetzagentur is increasingly being contacted by consumers regretting that the speeds and data volumes of the services currently offered in the market do not always match their needs. In assigning further spectrum for MFCN the Chamber must take proper account of the diverse conditions in connection with competition and the consumer that prevail in the different geographical areas of Germany. Doing so will contribute to ensuring the availability of adequate and appropriate telecommunications services throughout the federal territory, as envisaged in Article 87f of the Basic Law, or constitution, and to securing coverage of those regions in which levels are still below average.

27 The frequencies will be assigned for a particular purpose in accordance with the Frequency Plan and in non-discriminatory manner, on the basis of clear and objective procedures. If frequencies are not available for assignment in sufficient numbers, the law makes provision in section 55(10) TKG for an auction to be held. A departure from this method of proceeding is possible only in exceptional cases in consideration of the regulatory aims of section 2(2) TKG.

28 The aim of the provision of the 900 MHz and 1800 MHz spectrum and additional spectrum in Germany is to promote efficient investment and innovation in the field of new and improved infrastructures, at the same time ensuring that competition in the market and the principle of non-discrimination are safeguarded. Accordingly, to be encouraged are frequency usages that heighten the intensity of competition, especially through the deployment of new technologies that can enhance product quality and diversity in terms of both offer and price for the consumer. This does not rule out the continued use of existing infrastructures, however. Yet if existing infrastructures continue to be used entirely unchanged – as for instance in the case of extending all the current frequency assignments in the case of spectrum shortage – competition and market structures will basically remain unchanged as well and there will be no incentive to innovate or to heighten the intensity of competition. This cannot be the measure for a regulatory decision oriented by the promotion of new, improved infrastructures, efficient investment and non-discriminatory access to spectrum in the event of scarce resources. This is why usage rights are typically granted for a limited period only. Consequently, as a general rule there can be no such thing as a legitimate interest in the continued existence of these rights. Such an interest can exist only exceptionally if this is necessary in light of the regulatory aims of section 2(2) TKG. Otherwise, non-discriminatory access to the spectrum would be virtually impossible, particularly for new entrants.

29 Account must be taken on the other hand of the interest of the consumers in continuing to enjoy the benefits in terms of choice, price and quality of the mobile services that the services and infrastructure competition of the four current mobile operators have delivered. Currently available to consumers are several competitively independent mobile infrastructures, each with an almost 100% degree of coverage.

30 The Bundesnetzagentur, in making spectrum in the 700 MHz, 900 MHz and 1800 MHz bands and further spectrum available, aims to secure fair competition and to promote telecommunications markets with sustainable competition in services and networks and in associated facilities and services, in rural areas as well.

31 Fair competition can be secured in particular by taking account, in equal measure, of the opportunities of all parties requesting assignment. Making available the spectrum required for the business models of each interested party in objective, transparent and non-discriminatory proceedings will be a way of doing so.

32 The Bundesnetzagentur is providing all the spectrum available in a foreseeable period in one set of proceedings. In taking this approach it is following the principle of avoiding regulation-induced scarcity. Providing all available spectrum in one set of proceedings will make it possible for interested companies to factor in value and usage interdependencies between the frequencies to the greatest possible extent and to choose accordingly. The volume of spectrum provided, the award of spectrum above and below 1 GHz and the attendant possible choices may affect the price level in award proceedings. Providing the largest possible amount of spectrum enables all potential interested parties to acquire adequate spectrum for their business models in order to be able to compete successfully. This creates maximum planning and investment certainty for the interested undertakings. This was last confirmed in the auction in 2010 in which every participant, taking into account the value and usage interdependencies between the frequency bands, was able to obtain sufficient spectrum for their business model as a result of the diverse choices resulting from the provision of spectrum above and below 1 GHz and the large volume of spectrum.

33 The joint award of spectrum from the 900 MHz and 1800 MHz bands and from the 700 MHz band as well as the 1.5 GHz band is based on the principle of simple, appropriate and prompt administrative proceedings. This approach avoids having to carry out a number of time-consuming award proceedings, each requiring many separate steps from opening proceedings right up to assignments for the individual frequency bands.

34 To use every possible way of streamlining and accelerating proceedings the Bundesnetzagentur is adopting a parallel approach in providing the 700 MHz and 1.5 GHz spectrum, aiming to carry out the legal steps concurrently with the necessary changes to the frequency planning framework. This presupposes that the federal government and the federal states are of one mind in drawing up the Frequency Ordinance and the Frequency Plan. Only early initiation of the steps needed to provide this spectrum will ensure that the federal government's declared aim of nationwide coverage of at least 50 Mbit/s for the population as a whole by 2018 at the latest is achieved, and is indeed a prerequisite for this.

35 On 11 December 2014 the federal government and the federal states adopted "Key elements to secure terrestrial television coverage through DVB-T2 and on the future use of digital dividend II spectrum for broadband rollout" as the product of the discussions between the Federal Chancellor and the heads of the federal states, providing a national consensus on including the 700 MHz spectrum in the award proceedings.

36 The spectrum will be assigned in line with the Frequency Ordinance and the Frequency Plan on a technology and service neutral basis. This means that it can be used for all the applications consumers want. Under international harmonisation and technological neutrality requirements provision of the spectrum for broadband systems will need channel bandwidths of 5 MHz or a multiple of this. Provision and assignment will be in contiguous blocks, as far as possible, to facilitate the efficient use of broadband wireless systems.

37 In providing spectrum in the 700 MHz, 900 MHz and 1800 MHz bands and further spectrum in the 1.5 GHz band the Bundesnetzagentur is also promoting high speed next generation public telecommunications networks. Consumers' strongly growing demand for high speed data services calls for the provision of suitable bands that can be used flexibly. At the same time, flexible use will provide scope for technology change by allowing the current technologies to continue in use as required while having spectrum available for the successive use of new technologies as required by the network operators' business models and demand in the market, in pursuance of the aim of efficient spectrum use.

Explanatory statement

Starting point

38 Spectrum in the 900 MHz and 1800 MHz bands will be available from 1 January 2017 for nationwide use for MFCN.

39 The following spectrum in the 900 MHz and 1800 MHz bands has been assigned for a limited period expiring on 31 December 2016 by virtue of the GSM licences awarded to the network operators E-Plus Mobilfunk GmbH & Co. KG (E1 licence), Telefónica Germany GmbH & Co. OHG (E2 licence), Telekom Deutschland GmbH (D1 licence) and Vodafone GmbH (D2 licence) (as published in Administrative Order No 259/1994, Federal Ministry of Posts and Telecommunications Official Gazette No 23/1994, page 866): 880.1 to 914.9 MHz (lower band) and 925.1 to 959.9 MHz (upper band); 1725.0 to 1730.0 MHz, 1735.1 to 1752.5 MHz, 1752.7 to 1758.1 MHz, 1763.1 to 1780.5 MHz (lower band); and 1820.0 to 1825 MHz, 1830.1 to 1847.5 MHz, 1847.7 to 1853.1 MHz, 1858.1 to 1875.5 MHz (upper band). Accordingly, these bands, providing in total some 160 MHz, will be available for frequency assignment again as from 1 January 2017.

40 The GSM licences were awarded in Germany in the 1990s. The 900 MHz and 1800 MHz bands provided for this licensing were reserved for Europe-wide mobile communications services operating to the GSM standard as a result of European harmonisation. A unique opportunity was therefore provided to introduce mobile communications across Europe. GSM licensing in Germany and the Europe-wide introduction of GSM mobile services enabled optimum use to be made of the potential of the 900 MHz and 1800 MHz bands for both services and infrastructure competition. Economically, GSM has been a resounding success for the German mobile market with great importance for the economy as a whole. It also delivered great social benefit for consumers who, for the very first time, were offered nationwide mobile communications by the four operators in the market. Owing to its introduction across Europe the GSM success story can also be viewed in terms of economic and social integration in the European Union.

41 The historically different terms of the GSM licences have now been aligned to the same expiry date – 31 December 2016 – (cf "GSM concept" 2005, Administrative Order No 88/2005, RegTP Official Gazette No 23/2005, page 1852ff, Communication No 951/2007, Bundesnetzagentur Official Gazette No 23/2007, page 4673ff and Communication No 168/2012, Bundesnetzagentur Official Gazette No 3/2012, page 361ff). This alignment was necessary in order that the regulatory framework conditions were the same for all the operators, as the licences would have ended at different times as a result of licence grant in stages. The different terms of the GSM licences would have made reallocation processes or spectrum re-award more difficult if, successively, only parts of all the GSM bands had been available.

42 This created a regulatory environment allowing decisions on use of all the spectrum after 2016 to be taken at the same time, suitably ahead of expiry of the time limit.

43 The technical restrictions on the GSM system have now been lifted in the wake of the flexibilisation process. The 900 MHz and 1800 MHz bands can be used on a technology neutral basis and thus also for broadband systems such as UMTS and LTE or LTE Advanced.

44 On 4 July 2014 the President's Chamber published its decision regarding frequency regulation aspects of the proposed merger between Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG and laid down the conditions under which the merged company may use the spectrum held by both mobile operators (BK1-13/002, Administrative Order No 38/2014, Bundesnetzagentur Official

Gazette No 13/2014 of 23 July 2014, page 1645 ff). The President's Chamber ruled as follows:

> *"1. Ruling Chamber 1 authorises Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG to use the frequencies held by both companies after the acquisition of E-Plus Mobilfunk GmbH & Co. KG by Telefónica Deutschland Holding AG in accordance with the following provisions.*
>
> *2. Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG are required to return by 31 December 2015 the frequencies in the 900 MHz and 1800 MHz bands whose current assignment term does not run beyond 2016 (return of 900 MHz/1800 MHz spectrum before expiry).*
>
> *3. Any other existing rights and obligations of the two companies, in particular the rollout and coverage obligation and the obligation to provide offers for service providers, are not affected by the arrangements.*
>
> *4. The Bundesnetzagentur, taking an overall view, will investigate the need for action in respect of the post-merger spectrum holdings in particular at 2 GHz in light of the future spectrum holdings in the 900 MHz and 1800 MHz bands (investigation into spectrum distribution). [...]"*

45 The European Commission has since cleared the merger under competition law following fulfilment of the conditions attached to its approval. The merger brings down the number of competitively independent mobile operators in Germany – and thus the number of competitively independent infrastructures – from four to three.

46 To guarantee objective, transparent and non-discriminatory proceedings the Chamber in December 2011 opened formal demand identification proceedings for the 900 MHz and 1800 MHz bands in order to take decisions in timely manner before the frequency assignments expired (cf President's Chamber decision BK1a-09/001).

47 In the 700 MHz band 2 x 30 MHz (paired) is available for future assignment for MFCN.

48 The 470 to 790 MHz band is currently allocated in Germany to the broadcasting service on a primary basis and designated to television broadcasting within the meaning of telecommunications law.

49 It was decided at WRC-12 to allocate the 694 to 790 MHz band to the mobile service on a co-primary basis with the broadcasting service and to identify it for IMT-2000 applications. WRC-12, in RESOLUTION 232 (Use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service in Region 1 and related studies), laid down the following key elements:

> *"resolves*
>
> *1 to allocate the frequency band 694-790 MHz in Region 1 to the mobile, except aeronautical mobile, service on a co-primary basis with other services to which this band is allocated on a primary basis and to identify it for IMT;*
>
> *2 that the allocation in resolves 1 is effective immediately after WRC-15; […]*
>
> *4 that the lower edge of the allocation is subject to refinement at WRC 15, taking into account the ITU-R studies referred to in invites ITU-R below and the needs of countries in Region 1, in particular developing countries;[...]."*

50 Accordingly, allocation will become effective in the Radio Regulations directly after WRC-15. In the meantime the main technical parameters of use will be drawn up, due account being taken of the interests of broadcasting, but also of PMR (eg wireless microphones), public safety agencies and the federal armed forces, or *Bundeswehr* (cf Strategic Aspects, loc cit). This approach is consistent with Recommendation 10

of the Third Monitoring Report on the federal government's broadband strategy (page 60, www.bmwi.de):

> *"It is necessary that the legal and regulatory framework conditions for the possible uses of further spectrum for mobile communications (Digital Dividend II) be clarified before the next World Radio Conference (WRC) in 2015. The interests of all the stakeholders (most notably the federal states, broadcasters, cable operators, wireless microphone businesses, the Federal Armed Forces, or Bundeswehr) must all be taken into account to the best possible extent and a solution sought early on that reconciles the different interests."*

51 The national consensus now reached between the federal government and the federal states on awarding the 700 MHz spectrum provides a firm basis enabling the spectrum to be allocated to the mobile service in the Frequency Ordinance, taking due account of the interests of other stakeholders in Germany. The Bundesnetzagentur will amend the Frequency Plan on the basis of the Frequency Ordinance such that the frequencies required for broadband rollout can be assigned in line with demand.

52 Frequencies have been assigned regionally for DVB-T for public and private broadcasting in the whole of the 470 to 790 MHz band. Most of the assignments run until 2025. The Bundesnetzagentur has drawn up a concept to make the 700 MHz spectrum available for MFCN at an early point in time not just regionally but nationwide and to properly consider the interests of other stakeholders (cf Strategic Aspects, loc cit, 4.1.1).

53 Available in the 1452 to 1492 MHz band is 1 x 40 MHz (unpaired). This band is allocated wholly or in part to the fixed service, the mobile service, the broadcasting service and the broadcasting-satellite service. There is currently a national allocation for the broadcasting-satellite service until the end of 2018. As the band is widely unused, it will be designated for MFCN (cf Strategic Aspects, loc cit, 4.2).

54 A national consensus on allocating and awarding the 700 MHz spectrum for MFCN was reached on 11-12 December 2014.

55 The decision in respect of section 61(3) paras 2 and 4 TKG has been taken in consultation with the Advisory Council of the Bundesnetzagentur as required by section 132 TKG.

Steps

Key elements for demand identification proceedings

56 To ensure objective, transparent and non-discriminatory proceedings the Bundesnetzagentur on 6 July 2011 published in a first step a key elements paper to identify demand for 900 MHz and 1800 MHz spectrum after 1 January 2017 in its Official Gazette (Bundesnetzagentur Official Gazette No 13/2011, Communication No 365, page 3446ff) and on its website and invited responses to this paper. By publishing these key elements for demand identification proceedings the Bundesnetzagentur provided an overview of the procedural steps and the framework conditions for any later decisions required by law. At the same time all interested parties were given the opportunity to prepare for participation at an early stage.

57 Most of those responding to the key elements paper welcomed the planned early identification of future requirements in the 900 MHz and 1800 MHz bands in open, transparent proceedings with input from parties concerned. This would help to create planning and investment certainty, they said. Most of the respondents also wanted qualified notified requirements to be a precondition for consideration in the

proceedings, as companies must not be able to claim requirements while in reality following different interests (cf on the individual responses: Order No 79/2011, Bundesnetzagentur Official Gazette No 23/2011, page 4138ff).

Formal demand identification proceedings

58 The next step was the opening on 21 November 2011 by the Chamber of formal demand identification proceedings for the 900 MHz and 1800 MHz bands in order to identify requirements ex officio for spectrum for MFCN from 1 January 2017 (Order No 79/2011, Bundesnetzagentur Official Gazette No 23/2011, page 4138ff).

59 This was the stage at which interested parties were called upon to set out their anticipated requirements for spectrum as from 2017. Six companies did so.

Analysis Paper

60 In a further step the interested public were asked their views on foreseeable market, technological and international developments and suitable spectrum package factors (Analysis Paper, Bundesnetzagentur Official Gazette No 08/2012 of 2 May 2012, Communication No 275/2012, page 1150ff).

61 The inclusion of further market developments and demand for broadband wireless applications in the investigation of requirements for spectrum for MFCN in the 900 MHz and 1800 MHz bands as from 2017 was welcomed by the majority of those responding to the Analysis Paper. It was necessary, they believed, to look at the bigger picture, encompassing the different bands and all the available and suitable frequencies in the bands 450 MHz to 3.8 GHz. Furthermore, it was not appropriate to hold a number of award or assignment proceedings in quick succession in light of the successive expiry dates of the frequency assignments (2016 (GSM), 2020 (UMTS), 2021 (BWA), 2025 (the 2010 auction)) and further spectrum available in the future. The exponential growth of mobile data as a result of the increasing use of mobile broadband services required spectrum policy that was drawn up for the long term, they said. In the short term, however, market players in particular wanted an extension and flexibilisation of the 900 MHz and 1800 MHz spectrum as soon as possible for an appropriate period, irrespective of the scarcity issue.

Scenarios Paper

62 Working on the basis of telecommunications law requirements and declared interest the Bundesnetzagentur drew up various scenarios for provision of the 900 MHz and 1800 MHz spectrum, to which it invited responses (Scenarios Paper, Bundesnetzagentur Official Gazette No 22/2012 of 21 November 2012, Communication No 958/2012, page 3960ff). On this it said the following:

> *"With a view most notably to safeguarding consumer interest the scenarios must be looked at in terms of consumer interest in nationwide mobile coverage (voice telephony in particular) and the growing demand for mobile broadband services. The aim of accelerating the rollout of high speed telecommunications networks, the declared aim of the federal government's broadband strategy too, calls for proactive spectrum management. Hence the resources must be made available in open, transparent and non-discriminatory proceedings and efficient spectrum usage ensured, not just to promote competition. Due account must also be taken of broadcasting interests but also those of PMR (eg wireless microphones) and public safety agencies with a view to further spectrum.*

In the interest of predictable regulation it is necessary to provide suitable proceedings for assigning the frequencies, reconciling the interests in delivering planning certainty as soon as possible regarding assignment of the frequencies expiring shortly in the band 900/1800 MHz and the call to look at the different bands as a whole and/or include all the spectrum that is available and suitable for broadband wireless access to cover rural areas and expand capacity."

63 Four detailed scenarios were presented:

64 *Scenario 1* (extension) addresses an extension of the current assignments at 900 MHz and 1800 MHz.

65 *Scenario 2* (award proceedings for 900/1800 MHz) describes proceedings solely for the expiring assignments at 900 MHz and 1800 MHz.

66 *Scenario 3* (award proceedings for 900/1800 MHz plus) includes further available spectrum in the proceedings. It sets out the possibility of the 900 MHz and 1800 MHz spectrum being provided together with the 2 GHz and 3.5 GHz spectrum and also with new bands such as 700 MHz and 1.5 GHz.

67 *Scenario 4* (total award in 2025) sets out an approach in which the assignments expiring in 2016 are included in one set of award proceedings. Accordingly, all the spectrum for MFCN could, in essence, be provided at the same time in one set of proceedings

68 A public information event was held on 9 November 2012 to provide the background to frequency requirements and the regulatory options resulting from them (cf Bundesnetzagentur Official Gazette of 5 September 2012, Communication No 614/2012). The Scenarios Paper was published in Bundesnetzagentur Official Gazette No 22/2012 of 21 November 2012, Communication No 958/2012, page 3960ff and responses invited.

69 A total of 23 responses to the consultation were received, most notably from network operators, equipment and systems manufacturers, industry associations and broadcasters.

70 Basically, the following was said.

Some of the respondents were in favour of early extension of the 900/1800 MHz spectrum usage rights, pointing to a lack of scarcity, as extension would quickly provide planning and legal certainty for the mobile operators. Some wanted at least a short term extension (approx four years), while others favoured a longer period. Extension should, they believed, retain at least some of the current conditions (eg fragmentation, coverage obligation, service provider obligation). It was also claimed that a newcomer would find it difficult in Germany to enter the market on account of the existing competition situation. If the current usage rights were not extended, consolidation would be a more likely outcome.

71 Some of the respondents were in favour of extending the spectrum usage rights and lifting the restriction to GSM. Yet GSM was not likely to be phased out before 2020/2025, given the heavy demand in the market. By contrast, other respondents declared that an extension of GSM had to be ruled out because the availability of standards such as UMTS, HSPA, LTE and LTE Advanced meant that the spectrum could be used more efficiently; hence extension was not reconcilable with the requirement of efficient spectrum use.

72 With a view to the regulatory aims, extension was necessary in the respondents' view, so that even if scarcity was assumed the current usage rights should be extended by four years to the end of 2020. Extension of the 900/1800 MHz spectrum keeping the existing rights and obligations was appropriate; possible interest on the part of new entrants would have to take second place to nationwide coverage. Continuance of coverage across Germany with voice and narrowband data services

via GSM served consumer interest to a great extent and delivered considerable added value for the economy as a whole. In rural areas in particular, the GSM network was sometimes still the only form of mobile service, and would be under threat if there was no extension. The federal infrastructure obligation, too, called for provision of the spectrum for these services after 2016, and could not be interpreted solely in terms of broadband coverage. At the same time it followed from the federal infrastructure obligation, specifically from the federal government's broadband strategy, that award proceedings should not, through the conduct of an auction, unnecessarily deprive the market of financial resources that could otherwise be invested in broadband rollout.

73 On the other hand, attention was drawn to the unlawfulness of extension, scarcity having already been established with regard to the 900/1800 MHz spectrum. The preconditions for extension which regulatory aims could call for in a particular, exceptional, case were not given. In other respects, extension in the case of scarcity was only possible, according to a ruling of the Federal Administrative Court of 26 January 2011 (6 C 2.10), if comparable spectrum was made available to the competitors.

74 Many of the respondents were against a separate auction for the 900/1800 MHz spectrum usage rights, pointing out the threat of distortions of competition from, amongst other things, regulatory-induced scarcity; nor was there any serious market entrant in sight. This also held good in light of the incumbents' interest in the continued existence of the GSM usage rights. For the rest, a number of award proceedings in rapid succession should be avoided, they said.

75 One respondent noted that only Scenario 2 offered the necessary planning and investment certainty and complied with the legal requirements where demand was found to exceed supply. For new entrants in particular, access to this rural area spectrum was important in order to provide basic service.

76 It was pointed out that the Monopolies Commission believed spectrum should be auctioned only when demand exceeded supply and at least one serious potential new entrant had submitted proper notification of requirements. However, there was no sign of a serious new entrant looking to enter the German market. One respondent feared that the Bundesnetzagentur was under political pressure to conduct an auction.

77 Scenario 3 was welcomed by a large number of respondents, the majority of whom favoured a combination with an interim extension as per Scenario 1. The Bundesnetzagentur should implement Scenario 1 first, however, they believed. With a view to avoiding multiple proceedings in quick succession Scenario 3, awarding spectrum from different bands, was generally endorsed.

78 Some respondents welcomed the inclusion of the 2 GHz and 3.5 GHz spectrum in award proceedings for the 900/1800 MHz spectrum, as it made it possible for common value interdependencies with the 2 GHz and 3.5 GHz spectrum to be taken into account. Two respondents, however, were not in favour of this inclusion. It was not possible, they said, to value the spectrum in a way that would make efficient distribution in the auction possible if proceedings took place more than three years before the spectrum became available.

79 Some of the respondents, while basically in favour of including the 700 MHz band and the 1.5 GHz band, were not in favour of doing so at the present time. The inclusion of further spectrum must not be allowed to delay the decision on the award of spectrum actually available, they said. Mixing the 2012 notified requirements for the 900/1800 MHz spectrum with forecasts of future requirements for frequency bands that were not yet available was not permitted. It was pointed out that the spectrum was required for broadcasting at least until 2022. It was proposed that the 2 GHz and 3.5 GHz spectrum be extended until 2025 and awarded together with the

spectrum auctioned in 2010 for use from 2026. Further, with a view to a possible interim extension, the inclusion of the 2 GHz and 3.5 GHz spectrum at a later date was taken into consideration by some.

80 It was said that new demand identification proceedings would be necessary if the 900/1800 MHz spectrum were to be provided together with further bands. Without formally identifying demand it would not be possible, respondents believed, to establish surplus demand for the frequencies for allocation under Scenarios 3 and 4. The surplus demand established within the meaning of section 55(10) first sentence, first alternative TKG related to a particular frequency band. If this point of reference were to be changed in Scenarios 3 and 4 it would be necessary to carry out new demand identification proceedings.

81 If further spectrum was included, the interests of all the different users of the UHF band would have to be taken suitably into account, it was said. Another respondent called for cable to be taken into consideration from the outset in preparing for future award proceedings.

82 While some of the respondents were in favour of total award 2025 (Scenario 4) particularly for economic reasons, this scenario was rejected by a larger number of respondents who favoured providing spectrum at appropriate intervals. The reason for this was the enormous financial requirements for obtaining the total package an operator would need. New spectrum coming onto the market would possibly lie idle in the run-up to total award or would be awarded for very short periods only. Attention was also drawn to the need for interim solutions, not yet defined, to align the current assignment terms.

83 Further, some of the respondents to the consultation on the Scenarios Paper declared, with reference to the demand identification proceedings, that there was no scarcity. In light of this, a right to extension (from short term up to 15 to 20 years) by way of individual assignment existed. Inadmissible or ineligible notified requirements must not be included in the proceedings. Nor should submissions from parties not admitted to earlier proceedings or notified requirements not included in the designation of the frequencies be considered, just as little as mere declarations of intent. The eligible notifications would represent the requirements ceiling in the scarcity test as it was not clear in particular why companies should notify lower requirements than they needed on the basis of their business model. Moreover, in addition to demand exceeding supply, there had to be at least one qualified notification from a serious potential new entrant, they declared.

Draft consultation document of 3 July 2013

84 The next step was the drafting by the President's Chamber of a consultation document to encourage a transparent discussion promoting the objectives of the broadband strategy (Communication No 169/2013, Bundesnetzagentur Official Gazette No 12/2013 of 3 July 2013, page 1787ff). The draft proposed that the spectrum in the 900 MHz and 1800 MHz bands currently used for GSM be provided for mobile broadband in one set of award proceedings together with other available spectrum – in particular in the 700 MHz band – in line with demand and as quickly as possible.

85 The Bundesnetzagentur published a second paper – "Strategic Aspects of the Availability of Spectrum for Broadband Rollout in Germany" – together with the consultation document, setting out its strategic considerations on the short, medium and long term availability of spectrum resources for broadband rollout in Germany (Communication No 170/2013, Bundesnetzagentur Official Gazette No 12/2013 of 3 July 2013, page 1846ff). The main objective was to create planning and investment

certainty for all user groups concerned, including broadcasting services and wireless microphone users.

86 Interested parties were invited to respond to the draft by 4 October 2013. The responses received – as far as they were not confidential – were posted on the Bundesnetzagentur's website (www.bundesnetzagentur.de/mobilesbreitband). Essentially, the respondents said the following.

87 Some of the respondents welcomed the aim to assign the 700 MHz spectrum in good time before 2018. Mobile broadband could then contribute to providing 50 Mbit/s broadband access cost effectively, they said. It would also boost the rollout of fibre across the country as a result of the expansion of backhaul links to LTE Advanced base stations.

88 Should the 700 MHz spectrum not be available in the short term, the auction should be postponed, respondents said. This would then be a reason for extending the existing 900 MHz and 1800 MHz usage rights.

89 If the 700 MHz spectrum was to be awarded early, the companies acquiring the spectrum would need to invest in 2014/2015 in the spectrum that would not be available until 2017/2018 at the earliest. The capital invested would then not be free for expanding or optimising existing networks.

90 It was said that the interests of the broadcasting services first needed to be clarified. The switch from DVB-T to DVB-T2 would involve simultaneous transmissions for a period of at least two years. At the same time the requirements of all the other user groups – in particular public safety agencies, the federal armed forces and PMSE users – would need to be assessed. This should not be done until the joint federal government/federal state working group had presented its findings. As regards the interests of wireless microphone users, respondents said that no comprehensive strategy had as yet been set out for the future operation of PMSE services at different events. Some respondents were not in favour of opening the downlink bands at 700 MHz, 800 MHz and in the L Band for wireless microphones because of the considerable interference potential for mobile terminal equipment.

91 The proposal to include the 1.5 GHz spectrum was generally endorsed.

92 It was suggested that further spectrum at 1800 MHz (DECT guardband) could be included in the proceedings. There was no relevant interference potential that would justify not making this spectrum available.

93 Some respondents said that to protect GSM-R in the adjacent 900 MHz band broadband technologies such as UMTS and LTE should not be allowed. The diverse results of the measurements carried out by the ECC's GSM-R Correspondence Group should be taken into account initially by the regulator.

94 Some respondents were in favour of dividing the spectrum into blocks of 5 MHz as this would enable the efficient use of WCDMA/HSPA and LTE with carrier bandwidths of 5 MHz and multiples of this as well as efficient operation with 25 GSM 200 kHz carrier frequencies. Other respondents said it was absolutely necessary to divide the 900 MHz spectrum into blocks of 2.5 MHz because the same amount of spectrum would be required for GSM into the medium term.

95 It was suggested that for the 900 MHz band a spectrum cap should be considered for each assignment holder instead of a frequency reserve of 2 x 5 MHz for each existing network operator. Limiting the bidding rights in this way could secure fair competition provided that established operators no longer had an incentive to factor in the costs of potential future losses in market shares when bidding for spectrum. There would be no such incentive if, in the interests of competition, a minimum amount of spectrum was to be reserved for new entrants.

96 It was said that new entrants would only be able to enter the market if they were guaranteed access to spectrum in the 900 MHz band. Fair competition in infrastructure and services depended on new entrants being as equally capable as established operators of offering voice telephony and high speed data services to consumers. This in turn depended on new entrants having access to the 900 MHz spectrum.

97 As regards the frequency usage provisions for the 700 MHz band, it was said that it would not be possible to use the spectrum for mobile services unless usage was harmonised in the neighbouring countries. The band could not be used for mobile services until it was cleared in these countries. In addition, a transitional period should be allowed for equipment already in the market.

98 Some respondents welcomed the President's Chamber's considerations on imposing a service provider obligation. This was vital in terms of competition.

99 The obligation period should take into account the availability and market penetration of suitable terminal equipment.

100 It was absolutely necessary, respondents said, to lay down coverage requirements for network operators that assigned priority to coverage for rural areas and in particular any remaining not-spots in those areas.

101 Respondents emphasised, however, that it would not be productive to lay down a 100% population coverage requirement for use of the 700 MHz band. Previous experience of rolling out and operating mobile networks had shown that the input required to provide coverage for the last 1-2% of a country's population was neither economically nor technically reasonable, they said. Requiring 100% coverage of the population might mean that no companies would be willing to acquire the 700 MHz spectrum.

Updating the spectrum requirements

102 As part of the process to identify the demand for spectrum in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands and in view in particular of the change in the market structure as a result of the merger between Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG the President's Chamber gave all interested companies the opportunity in August 2014 to notify or update their forecast requirements (Administrative Order No 43/2014, Bundesnetzagentur Official Gazette No 14/2014).

103 Several companies notified their qualified demand. Expressions of interest concerning in particular the interests of broadcasting, PMSE and public safety agencies were also submitted.

104 The responses showed that the demand for mobile broadband exceeds the spectrum available.

105 Essentially, the other user groups said the following:

106 Attention was drawn to the fact that the 700 MHz band was currently being used intensively for broadcasting and would therefore not be available for mobile broadband until after the switch from DVB-T to DVB-T2 from mid-2019 onwards. Furthermore, a national political consensus between the federal government and the federal states, a decision on the question of reimbursing costs, a strategy to create long term planning certainty for broadcasting and solutions to possible interference to broadcasting from mobile services were still needed before the 700 MHz spectrum could be included in the award proceedings.

107 It would only be possible to speed up the switch to DVB-T2, respondents said, if the broadcasting services were guaranteed use of the 700 MHz band until the switch was completed, reimbursement of the costs involved and long term access to the remaining UHF spectrum (until at least 2030).

108 Respondents also doubted the possibility of using the 700 MHz spectrum earlier in individual regions.

109 Respondents stressed that alternative spectrum would be needed for professional PMSE users should the 700 MHz spectrum be awarded for mobile services. The 700 MHz spectrum was needed to meet the PMSE spectrum requirements as proven in studies as well. As far as they could see, there was no alternative spectrum available that was comparable in terms of quality and quantity with the 700 MHz spectrum.

110 The responses received – as far as they are not confidential – have been posted on the Bundesnetzagentur's website at www.bundesnetzagentur.de/mobilesbreitband.

Draft decision of 22 October 2014

111 In October 2014 the President's Chamber of the Bundesnetzagentur invited responses to its draft decision on the award of spectrum in the 700 MHz, 900 MHz and 1800 MHz bands and in the 1.5 GHz band for MFCN. Comments could be submitted by 26 November 2014.

112 The responses received – as far as they are not confidential – have been posted on the Bundesnetzagentur's website at www.bundesnetzagentur.de/mobilesbreitband.

Telefónica's applications

113 With reference in particular to its comments dated 26 November 2014 Telefónica Germany GmbH & Co. OHG submitted the following applications in its letter dated 8 January 2015:

1. *The upper block of 5 MHz in the 1800 MHz band between 1780–1785 MHz and 1875–1880 MHz should be included in the proceedings.*
2. *[Confidential information]*
3. *A frequency reserve of 2 x 10 MHz in the 900 MHz and/or 1800 MHz band(s) should be provided for each established mobile operator. This frequency reserve should be able to be used in conjunction with each operator's existing frequency usage rights in the 900 MHz and/or 1800 MHz band(s) and should be claimed in the operator's application to qualify to take part in the auction.*
4. *[Confidential information]*
5. *The award price should generally be payable in equal instalments on 1 January of each year from 2016 to 2030. The award price should, however, not be payable until the spectrum acquired can actually be used. The instalments for the award prices for the 700 MHz spectrum should only be payable pro rata for those regions in which the spectrum can actually be used.*
6. *Any coverage obligation for the 700 MHz spectrum should not include a minimum transmission rate. Any period within which coverage obligations for the 700 MHz spectrum are to be met should begin as from the date on which the spectrum assigned can actually be used nationwide.*

* In case of divergent interpretation of the German and English text, the German text shall prevail.

7. *The minimum bid increments in the first stage of the auction should not exceed 5%. The maximum price increment should be set at €100,000. The maximum permissible increments should be limited to 10%.*

8. *The award prices payable by Telefónica Deutschland's competitors should be increased by 1/15 each in the 900 MHz/1800 MHz band if the award results in the 900 MHz/1800 MHz spectrum currently held by the Telefónica Deutschland group being reduced with effect from 31 December 2015 and the spectrum being made available to a competitor with effect from 1 January 2016 (increased award price). The difference between the award price and the increased award price should be reimbursed to Telefónica Deutschland.*

Public hearing of 9 January 2015

114 To guarantee continuity of open and transparent proceedings for all stakeholders and parties involved, the President's Chamber held public oral proceedings on 9 January 2015.

115 The interested parties essentially reaffirmed their positions as set out in their written responses to the consultation.

Re I Order for award proceedings

116 The order for award proceedings is made under sections 55(10) and 61 TKG, section 55(4) and (5) TKG and Article 87f of the Basic Law and section 2(2) and (3) TKG in such a way that the assignment of spectrum for MFCN in the 700 MHz, 900 MHz and 1800 MHz bands and further spectrum in the 1452 to 1492 MHz band must be preceded by award proceedings.

117 Under section 55(10) first sentence TKG it may be ordered, without prejudice to section 55(5) TKG, that the assignment of spectrum be preceded by award proceedings based on conditions according to section 61 TKG as determined by the Bundesnetzagentur. Award proceedings can be ordered if insufficient spectrum is available for assignment or if several applications are made for specific frequencies. This order as per section 55(10) TKG is made at the discretion of the Bundesnetzagentur.

118 The amount of spectrum available for assignment for MFCN in the 700 MHz, 900 MHz and 1800 MHz bands as well as in the 1.5 GHz band is insufficient.

Timing of the order

The following comments were made:

119 Respondents welcomed the Bundesnetzagentur's consistent approach in connection with the forthcoming award proceedings. In particular the competitively distortive spectrum holding resulting from the merger between Telefónica and E-Plus and the expiry of the usage rights in the 900 MHz and 1800 MHz bands meant that award proceedings should start early.

120 Including the 700 MHz and 1.5 GHz bands – in addition to the 900 MHz and 1800 MHz bands – was essentially seen as a key contribution to achieving the objectives of the broadband strategy.

121 Since spectrum in the 700 MHz band was expected to be available for mobile services, the spectrum should be awarded in one set of proceedings together with the 900 MHz and 1800 MHz spectrum with a view to supporting the federal government's broadband strategy. Given the tight time schedule it was correct to launch the consultation procedure at such an early stage. The intention to auction the 700 MHz

spectrum and make it available for mobile communications as soon as possible was welcomed.

122 Respondents particularly endorsed the President's Chamber's view that postponing the award of the 900 MHz/1800 MHz spectrum was not an option to be considered since it was necessary to give companies sufficient time to accommodate the changes in spectrum usage and create planning and investment certainty.

123 On the other hand, it was said that the 900 MHz/1800 MHz spectrum should, if anything, not be auctioned until the 700 MHz spectrum could be used. It might be appropriate to auction the spectrum in joint proceedings together with the 2 GHz spectrum in 2020.

In respect of the interests of other user groups, the following comments were made:

124 The user groups affected by the clearance of the 700 MHz band said that it was too early to include the band in the award proceedings.

125 The draft decision did not show how the requirements of other user groups could be satisfied should the 700 MHz band be cleared. Instead, the draft referred to a strategy paper drawn up in 2013 which was very much behind the present state of knowledge and planning and which was based on the assumption that RTL would cease terrestrial television broadcasting.

126 The 700 MHz spectrum should therefore be excluded from the planned proceedings and should be awarded at a later point in time when it was certain that broadcasting requirements could be satisfied with spectrum below 700 MHz (470 to 694 MHz). The broadband objectives could still be achieved even if the 700 MHz spectrum was auctioned at a later date.

127 The technical framework for use of the 700 MHz band would not be finalised until WRC-15 in late 2015 and would not become binding until at least 2016 if it were to be implemented in national law.

128 It would not be possible to begin clearing the 700 MHz band before binding agreements had been concluded with the neighbouring countries to regulate clearance of the band in their territories. Only then would it be known which channels below 700 MHz could be used for television broadcasting. Relocation in several countries would not be completed until after 2020 at the earliest.

129 The European decisions were based on use of the 700 MHz band from between 2020 and 2022.

130 Furthermore, some 150 broadcasting applications needed to be relocated. The state media authorities had yet to agree on a procedure for relocation. If only one television broadcaster refused to relocate and took legal action should the usage right be revoked, no coordinated spectrum planning would be possible for a long time.

131 Attention was drawn to the fact that there was no further scope for mobile broadband below the 700 MHz band (Digital Dividend III).

132 As regards PMSE, respondents said that the Bundesnetzagentur had yet to present a concept showing how PMSE users' requirements could be satisfied in future. An appropriate concept therefore needed to be drawn up first and the spectrum in the 700 MHz band awarded separately from the 900 MHz and 1800 MHz spectrum.

133 The changes in the 700 MHz band had a direct effect on the use of PMSE equipment, respondents said. PMSE users needed a sound basis for planning in order to be able to make the necessary investment decisions and technical modifications. Wireless microphone users should be able to continue using the remaining PMSE spectrum in the long term. The spectrum could be provided as one block or as five blocks of 20 MHz. It was essential that the spectrum be allocated on a primary basis.

134 Other respondents said that the majority of the bands specified were not suitable for professional use, putting such media productions and in particular large scale events at stake. In any event, a maximum of 190 MHz and not 440 MHz, as described, would be available for use. The comment "not including optional resources in the 700 MHz band" was misleading since the list of available spectrum actually included the whole of the 700 MHz band. The frequencies that could be used varied, depending on the spectrum actually free locally or at the site of the event, its physical properties and its suitability for PMSE.

135 The 32.475 to 38.125 MHz and 174 to 230 MHz bands were potentially subject to considerable interference owing to man-made noise, respondents said. If the 800 MHz and 700 MHz bands were cleared, all the terrestrial television broadcasting transmitters operating in Germany and other countries in the 470 to 694 MHz band would need to be relocated. In addition, the wireless microphones and in-ear monitors currently using the 700 MHz band would also need to move to the 470 to 694 MHz band. This would, it was said, lead to a considerable reduction in the spectrum resources available for wireless microphones and in-ear monitors. Furthermore, account needed to be taken of capacity for public safety agencies. Joint use of the 700 MHz duplex gap by wireless microphones and public safety agencies would not be possible or would at least first need appropriate technical conditions to be laid down and tested for feasibility, which had not yet been done.

136 Nor could the duplex gaps at 800 MHz and 1800 MHz be used by professional users since the risk of uncontrolled interference was highest at these frequencies. The spectrum could only be used if mobile phones did not cause any interference or were switched off. This, however, was not a realistic basis for PMSE spectrum usage. In addition, discontinuing the subdivision of the spectrum for wireless microphones did not mean that more spectrum was available but just that users could use different spectrum. Since only the Bundesnetzagentur had information on the professional users, spectrum planning was only possible with the participation of the Bundesnetzagentur.

137 The draft decision discussed the possibility of wireless microphones using the MFCN downlink bands (700 MHz/800 MHz/1.5 GHz). These bands were reserved for MFCN in the relevant CEPT Reports. Use of these bands by wireless microphones in the vicinity of mobile terminal equipment would lead to extensive interference to mobile reception, it was said, which is why the current general assignment at 800 MHz should not be extended.

138 Other respondents said that this form of shared use was out of the question and had never been considered in connection with clearing the 800 MHz band. It was not clear how indoor and outdoor operation of wireless microphones in the 700 MHz and 800 MHz bands could be feasible with a minimum separation distance of 300 m from mobile base stations. In the 758 to 788 MHz, 832 to 862 MHz and 1452 to 1492 MHz bands, even indoor operation of wireless microphones would require minimum distances of at least one kilometre, while outdoor operation would require minimum distances from base stations of ten or more kilometres. Based on typical LTE cell radiuses, use of the spectrum for PMSE would no longer be possible even given only partial MFCN deployment.

139 There was a similar situation in the L Band (1452 to 1518 MHz): the whole band could supposedly be used for wireless microphones but at the same time was to be auctioned for mobile services. If the band were to be awarded for mobile services, it was said, any investments made in developing appropriate technology – and development had in fact largely been completed – would be lost.

140 The spectrum in the 2.4 GHz band could only be used at limited, small scale events at well shielded locations and without additional WLAN usage and was therefore not

an adequate alternative to the 700 MHz spectrum, which had proved very well suited to PMSE, respondents said.

141 As regards quantifying requirements, the draft decision had referred to studies undertaken by Hanover University in 2008 and by the German Commission for Electrical, Electronic and Information Technologies of DIN and VDE (DKE) in 2014. Some respondents feared that it would no longer be possible to hold large scale events such as church congresses or the Eurovision Song Contest. Furthermore, technical aspects such as intermodulation products and protection ratios also needed to be taken into account when determining the demand for spectrum, they said.

142 It was said that the study conducted in 2008 and referred to by the Bundesnetzagentur did not include all the potential spectrum users. There had been a steady increase in the use of PMSE equipment since then, and it could be assumed that current daily spectrum requirements were considerably higher than those determined in the study in 2008. CEPT and ITU-R had both made comprehensive studies on the spectrum requirements for events production, and according to the European Commission an additional 59 MHz of spectrum would be needed to meet daily requirements just to compensate for the spectrum no longer available in the 800 MHz band.

143 Some respondents stated that a total of 100 MHz would be needed to meet the daily requirements for wireless microphones in theatres and concert halls, etc. It was not clear from the draft decision whether or not the spectrum required would actually be available everywhere.

144 Some of the respondents called for adequate compensation arrangements for PMSE users in the 700 MHz band. The compensation scheme provided for users of the 800 MHz band was not satisfactory, they said, and this should not happen to the 700 MHz band users.

145 Some respondents said that it was too early and therefore not appropriate to include the spectrum now available in the 1500 MHz band in the forthcoming award proceedings. Efforts were in progress at international level to identify further spectrum for mobile services and included looking at the option of extending the mobile band at 1500 MHz. If the spectrum were to be awarded in the forthcoming proceedings, Germany would unnecessarily be restricting itself to the subband in advance, they said. It would also take at least three years to bring the relevant technology onto the market. To avoid separate proceedings, the 1500 MHz spectrum could be awarded together with the 2.1 GHz spectrum – for which usage rights were due to expire at the end of 2020 – in 2018 for instance.

The Chamber has ruled as follows:

146 The Chamber considers it appropriate to order award proceedings for the spectrum in the 700 MHz, 900 MHz and 1800 MHz bands as well as in the 1.5 GHz band at an early stage.

147 In its earlier decision (BK1a-09/001 of 12 October 2009, Administrative Order No 58, Bundesnetzagentur Official Gazette No 20/2009 of 21 October 2009, page 3575ff) the Chamber announced that the decision concerning provision of the GSM spectrum would be made well in advance, ie around three years before the GSM assignments expire, so as to give market participants the necessary planning and investment certainty. This is particularly relevant in light of the need for short term action in the 900 MHz and 1800 MHz bands as identified by the Chamber on account of the merger between Telefónica and E-Plus (cf BK1-13/002, Administrative Order No 38/2014, Bundesnetzagentur Official Gazette No 13/2014 of 23 July 2014, page 1645ff).

148 To ensure that spectrum is provided in good time, award proceedings are to be ordered so as to give both the existing network operators and new market entrants

equal access to the spectrum available and also to conclude the assignment proceedings within a reasonable period of time.

149 The award proceedings will include all the spectrum which the Chamber considers will be available for MFCN in the foreseeable future, in addition to the 900 MHz and 1800 MHz spectrum, to enable the parties requesting assignment to acquire adequately competitive spectrum packages. This includes the spectrum anticipated to be available for later assignment for MFCN but for which the usage rights have not yet expired at the time the award proceedings are ordered. This comprises not only spectrum which will become available upon expiry of the usage rights but also spectrum which is highly likely to become available for re-award for other reasons such as future migration. If the Chamber were not to open award proceedings for such spectrum until its availability within the meaning of section 55(5) para 2 TKG, this would be contrary to the principle of efficient spectrum use because it would inevitably mean that the spectrum might remain unused during the considerable period of time required for award proceedings under section 61 TKG.

150 The following spectrum is available for MFCN:

Frequency band	Spectrum	Availability
450 MHz	451.075 - 455.575 MHz / 461.075 - 465.575 MHz	01.01.2021
800 MHz	791 - 821 MHz / 832 - 862 MHz	01.01.2026
900 MHz	880 - 915 MHz / 925 - 960 MHz	01.01.2017
1800 MHz	1710.0 - 1725.0 MHz / 1805.0 - 1820.0 MHz	01.01.2026
	1725.0 - 1730.0 MHz / 1820.0 - 1825.0 MHz	01.01.2017
	1730.1 - 1735.1 MHz / 1825.1 - 1830.1 MHz	01.01.2026
	1735.1 - 1758.1 MHz / 1830.1 - 1853.1 MHz	01.01.2017
	1758.1 - 1763.1 MHz / 1853.1 - 1858.1 MHz	01.01.2026
	1763.1 - 1780.5 MHz / 1858.1 - 1875.5 MHz	01.01.2017
2 GHz	1900.1 - 1905.1 MHz	01.01.2026
	1905.1 - 1920.1 MHz	01.01.2021
	2010.5 - 2024.7 MHz	01.01.2026
	1920.3 - 1930.2 MHz and 2110.3 - 2120.2 MHz	01.01.2021
	1930.2 - 1940.1 MHz and 2120.2 - 2130.1 MHz	01.01.2026
	1940.1 - 1950.0 MHz and 2130.1 - 2140.0 MHz	01.01.2021
	1950.0 - 1959.9 MHz and 2140.0 - 2149.9 MHz	01.01.2026
	1959.9 - 1979.7 MHz and 2149.9 - 2169.7 MHz	01.01.2021
2.6 GHz	2500 - 2690 MHz	01.01.2026
3.5 GHz	3410 - 3473 MHz and 3510 - 3573 MHz	01.01.2022
	3473 - 3494 MHz and 3573 - 3594 MHz, smaller frequency blocks assigned regionally or locally	01.01.2023
3.7 GHz	3600 - 3800 MHz; smaller frequency blocks assigned regionally or locally	01.01.2023

Table 2

151 Other spectrum available for MFCN:

Frequency band	Spectrum	Availability
700 MHz	703 - 733 MHz / 758 - 788 MHz	Successively as from 2017
1.5 GHz	1452 - 1492 MHz	2015
1800 MHz	1780 - 1785 MHz / 1875 - 1880 MHz	2015

Table 3

152 In the short term spectrum in the 900 MHz and 1800 MHz bands will be available as from 1 January 2017, and possibly as early as 1 January 2016 (cf BK1-13/002, loc cit). In addition, further spectrum in the 700 MHz, 1800 MHz and 1.5 GHz bands will be available or made available in the short term which can be used for MFCN together with the spectrum in the 900 MHz and 1800 MHz bands (cf Annex 5).

153 The Chamber's objective in including further spectrum in the 700 MHz, 1800 MHz and 1.5 GHz bands is to make full use of the potential for accelerating proceedings so as to make this spectrum available for broadband rollout in Germany as envisaged in the broadband strategy. It is not necessary for all the measures changing the frequency planning conditions and thus enabling subsequent assignment of the spectrum to be in place at the time the decision on awarding the spectrum is made. These measures need only be clearly foreseeable and the conditions transparent for the parties requesting assignment. The Chamber assumes that the necessary frequency planning conditions for spectrum assignment will be in place in good time (section 55(5) first sentence para 1 TKG). The spectrum can only be assigned if it has been allocated and designated for the mobile service in the Frequency Ordinance and the Frequency Plan. In the Chamber's view, a stable basis for allocating and designating this spectrum – in the form of the national consensus reached between the federal government and the federal states on 11 December 2014 – constitutes stability in terms of the preconditions for spectrum assignment.

154 The Chamber is thus adopting a parallel approach by carrying out the legal steps concurrently with the necessary changes to the frequency planning framework. The Chamber's previous regulatory concepts also provided for spectrum anticipated to become free to be made available to the market at an early stage. Most recently, for example, spectrum was included in the 2010 auction proceedings without all the frequency planning and/or usage conditions in place.

155 In this context, the Chamber wishes to draws attention to the fact that the spectrum will not be assigned until after the award proceedings and hence will not be able to be used until then. In light of this, spectrum can be included in award proceedings without all the frequency planning (Frequency Ordinance and Frequency Plan) and/or frequency usage conditions being in place. The award proceedings precede the assignment proceedings and serve to resolve cases where sufficient spectrum is not available as provided for by the TKG.

156 Ultimately the Chamber takes the view that it is possible to already include the 700 MHz spectrum in the proceedings for the award of the spectrum at 900 MHz and 1800 MHz and further spectrum without either the frequency planning conditions or all the necessary technical parameters for subsequent spectrum use being in place. The Chamber believes that it is necessary and also sufficient that the spectrum resources to be awarded can be reliably valued before the award proceedings are conducted.

157 At the same time this approach enables proceedings to be organised as efficiently as possible. Awarding the spectrum anticipated to become available in one set of proceedings together with the 900 MHz and 1800 MHz spectrum avoids having to carry out a number of time-consuming award proceedings, each requiring many separate steps from opening proceedings right up to assignments for the individual frequency bands.

158 The Chamber wishes to draw attention to the following in response to the view put forward that the auction should be postponed and the usage rights for the 900 MHz and 1800 MHz spectrum be extended should the 700 MHz spectrum not be available in the short term. In the Chamber's view, award of the 900 MHz and 1800 MHz spectrum cannot be postponed. Firstly, early award of the spectrum is essential to give existing mobile operators the necessary planning and investment certainty. Secondly, the decision following the telecommunications law assessment of the merger between Telefónica and E-Plus (cf BK1-13/002, loc cit) ruled that it was necessary to reassign the spectrum in the 900 MHz and 1800 MHz bands in open, transparent and non-discriminatory proceedings close in time to the merger. Hence the award proceedings cannot be postponed.

159 In respect of the call to exclude the 700 MHz spectrum from the forthcoming proceedings and to first ensure that the broadcasting requirements can be satisfied

with spectrum below 700 MHz, the Chamber draws attention to the following. A national consensus on including the 700 MHz spectrum in the award proceedings was reached between the federal government and the federal states at the conference of the heads of the federal states on 11 December 2014. The national consensus also set out how due account is to be taken of the interests of broadcasting.

160 The order providing for the 700 MHz spectrum to be included in the forthcoming award proceedings does not conflict with the fact that the next world radiocommunication conference will not be held until the end of 2015 (WRC-15). The basic decision to allocate the 700 MHz band to the mobile service was taken at WRC-12, and the technical conditions have already been set (cf Annex 3). The Chamber is, however, aware that the spectrum cannot be used until it has been allocated and designated accordingly in the Frequency Ordinance and the Frequency Plan.

161 Nor is the order undermined by the fact that broadcasting applications in Germany need to be relocated, requiring coordination with neighbouring countries. Awarding the spectrum at an early stage will help to create the necessary conditions for nationwide use of the spectrum for mobile services as soon as possible. The Bundesnetzagentur has already initiated appropriate steps and made initial agreements with neighbouring countries.

162 Nor does the decision to include the 700 MHz spectrum in early proceedings conflict with any European decisions or recommendations, as claimed by one respondent.

163 In including the 700 MHz spectrum in early award proceedings, the Chamber is also mindful both of the social and cultural importance of broadcasting and PMSE and of public safety. This does not, however, mean that – as called for by respondents – proceedings cannot be conducted until all the steps concerning broadcasting interests and other user groups have been completed. The Chamber's decisions take into account the resulting different interests to be reconciled (cf also Strategic Aspects, loc cit). The Bundesnetzagentur has developed a concept showing how the requirements of other user groups in the 700 MHz band – such as broadcasting, wireless microphones, public safety agencies and the Federal Ministry of Defence (BMVg) – can be satisfied.

164 As regards the requirements of wireless microphone users, the Chamber wishes to draw attention to a study conducted by Hanover University in 2008 according to which the daily spectrum requirements for wireless microphones total around 96 MHz. This conclusion has since been confirmed in a more recent study undertaken in 2014 by the German Commission for Electrical, Electronic and Information Technologies of DIN and VDE (DKE), involving measurements at various large scale events such as state elections. The Bundesnetzagentur has already taken the following measures aimed at meeting the requirements of wireless microphone users:

- discontinuation of the subdivision of the 470 to 790 MHz band;
- provision of spectrum in the L Band (1452 to 1518 MHz); and
- provision of further bands (including 823 to 832 MHz and 1785 to 1805 MHz).

The Bundesnetzagentur has discontinued the previous subdivision of the 470 to 790 MHz band for wireless microphones into "broadcasting-related applications" (use by broadcasters) (470 to 710 MHz) and "other professional applications" (theatres, schools, concerts, churches, etc) (710 to 790 MHz), thus enabling all professional users to use the remaining spectrum in the core band (470 to 790 MHz) flexibly and on equal terms.

165 The following frequencies are available for exclusive or shared use for wireless microphones:

- 32.475 to 38.125 MHz,
- 174 to 230 MHz,
- 470 to 790 MHz,
- 823 to 832 MHz,
- 863 to 865 MHz,
- 1452 to 1518 MHz,
- 1785 to 1805 MHz,
- 2400 to 2483.5 MHz.

In total, more than 440 MHz of spectrum is available for exclusive or shared use for wireless microphones (not including optional resources in the 700 MHz band, for instance). In the Chamber's view, sufficient spectrum will therefore still be available for PMSE users should 700 MHz spectrum be awarded.

Specifically, the Chamber wishes to draw attention to the concept on setting the regulatory framework for wireless microphones (cf also Strategic Aspects, loc cit, 4.1.3):

166 An international CEPT project team was established to analyse the spectrum requirements for PMSE and recommend possible solutions. On the basis of the CEPT project team's work, the European Commission harmonised the use of the MFCN duplex gaps at 800 MHz and 1800 MHz for PMSE on a binding basis with a view to ensuring sufficient spectrum resources for PMSE; this is expected to provide economies of scale with a positive effect on the availability and price of relevant equipment. The technical parameters for the general assignments already in place in Germany for the duplex gaps at 800 MHz and 1800 MHz will be amended in line with the harmonised regulations. The provision of the 800 MHz band for MFCN involved the identification in the national Frequency Plan of the 1452 to 1477.5 MHz band as alternative spectrum for wireless microphones. In the course of international studies on the harmonisation of the 1452 to 1492 MHz band for new applications, attention was drawn to the fact that – in spite of a preference for supplemental downlink (SDL) applications for MFCN – additional applications could be accommodated in this band at national level. A study was therefore made to identify the conditions under which downlink bands for MFCN could also be used by wireless microphones.

In the case of indoor operation (indoor reception), it is assumed that interference-free operation of wireless microphones is possible given the following minimum distances from base stations: up to 150 m in the 700 MHz and 800 MHz bands and up to 60 m in the 1.5 GHz band. In the case of outdoor operation (outdoor reception) the minimum separation distances required between LTE base stations and wireless microphones to ensure wireless microphone operation with a tolerable interference level of -100 dBm/MHz are larger: 300 metres in the 700 MHz and 800 MHz bands and 100 metres in the 1.5 GHz band.

167 It is therefore planned to make the 800 MHz and 700 MHz downlink bands universally available for use for wireless microphones. The 1452 to 1492 MHz band can already be assigned upon application for shared use by professional wireless microphone users.

With a view to continuing to provide additional resources for wireless microphones in a band with propagation conditions comparable to those of the 1452 to 1477.5 MHz band, the ECC has harmonised the use of the 1492 to 1518 MHz band (which is

* In case of divergent interpretation of the German and English text, the German text shall prevail.

similar in size) at European level for indoor wireless microphones, on Germany's initiative. International compatibility studies are still in progress to establish whether or not the band can be extended up to 1525 MHz. The Bundesnetzagentur will take an active part in these studies.

168 Furthermore, additional spectrum is available for PMSE use. The 174 to 230 MHz band can also be used on a secondary basis for wireless microphones subject to individual assignment. In addition the following bands have been awarded by general assignment: 32.475 to 34.325 MHz, 36.610 to 38.125 MHz, 823 to 832 MHz, 863 to 865 MHz and 1785 to 1805 MHz. The general assignment for the 790 to 814 MHz and 838 to 862 MHz bands officially expires on 31 December 2015; however, use of this spectrum, and in particular the 838 to 862 MHz band, for professional PMSE is already restricted because of increasing use for MFCN.

169 To meet the high demands of professional users in the alternative bands below 470 MHz, new equipment might need to be developed to deliver comparable audio quality in spite of the different physical conditions compared to the 470 to 790 MHz band. In the alternative bands above 790 MHz, and in particular in the 1785 to 1805 MHz band, such technology is becoming increasingly available.

170 In respect of comments to the effect that no concept on future PMSE use had been drawn up, the Chamber wishes to point out that both the draft decision and the Strategic Aspects (loc cit, 4.1.3) showed in detail how full account would be taken of the interests of PMSE users. The Bundesnetzagentur has already implemented the following measures on this basis:

171 The subdivision of the 470 to 790 MHz band has been discontinued, and spectrum in the L Band (1452 to 1518 MHz) and other bands has been provided. Discontinuing the subdivision alone means that professional, non-broadcasting PMSE users now have considerably more spectrum to choose from because of the additional spectrum available in the 470 to 694 MHz band, despite no longer being able to use some of the 48 MHz originally assigned in the 800 MHz band (General Assignment, Administrative Order No 91/2005). Overall, taking into account all the measures, the award of the 700 MHz band and the requirements identified in the studies, the Chamber believes that sufficient spectrum is available for PMSE users.

172 Some respondents stated that a total of 100 MHz would be needed to meet daily requirements and considerably more given large scale events; one reason was that owing to intermodulation effects the spectrum required for each link increased exponentially with the number of links. According to a study conducted by Hanover University in 2008, and referred to by respondents, the daily spectrum requirements for wireless microphones in Berlin amount to some 96 MHz. Some respondents stated that there had been an increase in PMSE use and hence requirements; this might well be true, but the fact must also be taken into account that current equipment is now considerably more immune to intermodulation. This increases overall spectrum efficiency, enabling more links to be operated using the same amount of spectrum.

173 A more recent study undertaken in 2014 by the German Commission for Electrical, Electronic and Information Technologies of DIN and VDE (DKE) – referred to by and managed by or involving some respondents – also took account of measurements at various large scale events such as state elections and produced findings similar to those in Hanover University's study. The study uses a simplified method to calculate spectrum requirements, by multiplying the number of links by 600 kHz. This linear approach does not take account of intermodulation products or similar effects that may increase the amount of spectrum actually required, depending on the equipment. However, in view of the increased availability of equipment that is more immune to intermodulation for professional users in particular, the Chamber considers the method applied in the study to be justified for many applications.

174 One of the respondents confirmed that spectrum efficiency could be considerably improved by using highly linear components. Wireless microphones with such components were used at the Eurovision Song Contest in 2013, for example, enabling more efficient use of the spectrum than at the Contest in 2011 mentioned by respondents. It is important to remember that the method used in the DKE study does not take into account the fact that it may be possible to reuse frequencies at certain locations and times, which – depending on the scenario – could reduce the amount of spectrum required. The study gives a cumulative representation of all the links identified in the measurement period; it is in particular therefore not clear how long a frequency was used by a PMSE application and whether a coordinated time schedule for frequency usage would have resulted in the spectrum being used more efficiently and fewer resources being needed. The calculated spectrum requirements are much higher than the actual requirements because the total number of links measured is multiplied by 600 kHz, which works on the assumption that all the links are using the spectrum at the same time. Furthermore, it is possible for intermodulation products or similar emissions to be wrongly counted as PMSE links – as they may display similar characteristics in a spectrum recording – and consequently for the number of links to be overestimated.

175 The spectrum in the list of bands can be used to meet the requirements identified in the studies. Overall, the Chamber therefore believes that the amount of spectrum available for PMSE use, including large scale events, is sufficient.

176 The Chamber would like to point out the following in respect of its statement that over 440 MHz of spectrum would be available for PMSE applications: In purely numerical terms, the spectrum in the bands listed amounts to 562.15 MHz. If the list included the 790 to 823 MHz band (which is does not) the total amount of spectrum available would be even higher at 595.15 MHz. The amount of 440 MHz already takes account of the fact that shared use of the MFCN downlink bands (totalling 100 MHz) provides only additional, optional capacity that would not be available everywhere. Furthermore, it includes neither the 30 MHz of spectrum in the uplink band at 700 MHz nor the 25 MHz of spectrum in the duplex gap at 700 MHz, whose use has yet to be fully clarified. This capacity was therefore, from the very beginning, seen as not being essential to meet the requirements and not included in calculating the total amount of spectrum.

177 In respect of comments to the effect that the spectrum listed was not fully available because the bands could not be used or could only be used to a limited extent for PMSE, the Chamber would like to draw attention to the phrase "exclusive or shared use" which it consciously chose because, to a large extent, the bands are indeed not available for exclusive use by PMSE. Both the decision and the Strategic Aspects paper (4.1.3) therefore draw specific attention to the nature and conditions of sharing the individual bands. These restrictions were taken into account in the overall assessment, ensuring the provision of a sufficient amount of spectrum in the appropriate bands. Exclusive use of large bands of spectrum on a primary basis by PMSE, as called for by some respondents, would be contrary to the principle of efficient spectrum use since PMSE spectrum requirements are both local and temporary. Use on a secondary basis enables PMSE to use generally different subbands which, for technical and operational reasons, are not used by the primary applications. Since the subbands, which vary from region to region, are generally used by PMSE only, such use on a secondary basis is not seen as a significant restriction; this is reflected by the large amount of interest from PMSE users in the 470 to 790 MHz band, which is (only) available for PMSE use on a secondary basis.

178 The 470 to 790 MHz band is currently used by up to nine TV channels each with an 8 MHz bandwidth for DVB-T coverage in one region; the number of channels using the band is, however, usually lower. Other weaker signals from TV channels in adjacent regions or neighbouring countries may also occupy the band. The

measurements made in Frankfurt and Munich – two metropolitan areas that are particularly affected – by one respondent identified up to 14 TV channels with varying signal strength in the 470 to 790 MHz band. Even if these 14 TV channels (amounting to 112 MHz) and the radio astronomy band from 608 to 614 MHz (6 MHz) were totally excluded from the spectrum available for wireless microphone users, 106 MHz of the 224 MHz in the 470 to 694 MHz band would still be available for PMSE use. This amount of spectrum alone is sufficient to satisfy the requirements identified in the studies. The graphic submitted by one respondent shows that, using solely high quality equipment with a fixed channel arrangement, 170 links could be operated in parallel at one location with this spectrum. Furthermore, experience shows that channels used by DVB-T with signals that are too weak for indoor broadcasting reception can be used for PMSE in particular for indoor operation. Such channels may also be able to be used for outdoor PMSE operation, depending on local conditions. The amount of spectrum usually available for PMSE is therefore considerably more than that specified above. In addition, depending on the local conditions and the type of event, it is often possible to reuse frequencies at certain locations and times and thereby again enable considerably more links to be operated in the available spectrum. Not to be forgotten is the wide range of spectrum available for use in the other bands.

179 As in the UHF band, and contrary to some comments, a large amount of spectrum in various subbands in the 174 to 230 MHz band will be able to be used for PMSE even given intensive use of the band for DAB+; the subbands available will vary from region to region.

180 In respect of respondents' claims of potential interference owing to man-made noise in the 32.475 to 38.125 MHz and 174 to 230 MHz bands, the Chamber would like to point out with regards to the suitability of this spectrum that the bands are actually used intensively for PMSE; this is reflected by the several thousands of current individual assignments in each of these bands.

181 The duplex gaps at 823 to 832 MHz and 1785 to 1805 MHz, which were the subject of several comments, were harmonised on a binding basis by the European Commission in Commission Implementing Decision 2014/641/EU of 1 September 2014. The aim of the Implementing Decision is to make available on a harmonised basis a baseline of 59 MHz of spectrum – comprising the duplex gaps at 800 MHz and 1800 MHz and an additional amount of 30 MHz – for PMSE use across the Union. Contrary to some comments, this is only indirectly related to the provision of the 800 MHz band for MFCN: in Germany the 710 to 790 MHz band, in particular, was made available to PMSE users as an alternative to the 800 MHz band.

182 The statement made by some respondents to the effect that the 823 to 832 MHz duplex gap cannot be used for professional applications is not correct. Here, the Chamber would like to draw attention to various large scale events, such as the 2014 DFB Cup Final, where the duplex gap frequencies were coordinated by the Bundesnetzagentur for use by professional production companies. Although a certain amount of interference may actually be possible at the edges of the duplex gaps given very short separation distances between a transmitting LTE terminal and a PMSE receiver, CEPT Report 50 and its Annex describe how such interference can be avoided. The use of the 800 MHz duplex gap by professional users shows that in practice many users see the risk of interference as manageable.

183 The same applies to the 1800 MHz duplex gap where – in terms of the overall size of the spectrum – the risk of potential interference at the edges is smaller than in the 800 MHz duplex gap. Contrary to some comments, there are currently no plans in Germany to award the 1492 to 1518 MHz band for mobile broadband. The German administration most recently reiterated its critical position towards the possible future identification of this band for IMT (this and the 1452 to 1492 MHz band were allocated to the mobile service more than ten years ago) in a statement reserving its position in

the CPG meeting minutes dated 22 October 2014. The Chamber would also like to point out that there would be no obligation to nationally implement any IMT identification made at WRC-15.

184 The 2400 to 2483.5 MHz band is also already being used by wireless microphones on the basis of a general assignment; this is reflected by the wide range of equipment from various manufacturers available in the market. Although the band is also used for various other applications, including other SRDs and WLAN, it can still be used for PMSE under certain conditions.

185 In respect of the interference to PMSE equipment at the Berlin Marathon in 2014 referred to by respondents, the Chamber would like to point out that the PMSE equipment changes made by one broadcaster were related not to the event itself but to a change in the individually assigned frequencies. The Bundesnetzagentur requested operation of TV channel 42 with DVB-T2 to be postponed because spectrum planning for the event had been under way for months and frequencies in the – previously unused – channel had already been allocated for use at the marathon. It would, however, have been possible to replan and recoordinate these frequencies. Overall, there was sufficient spectrum available for PMSE at the event.

186 Discontinuing the subdivision of the 470 to 790 MHz band will enable PMSE users to use the spectrum more efficiently overall. Even though the measure does not provide additional spectrum, it enables the frequencies to be assigned more flexibly and thus the whole band to be used efficiently by all user groups. In respect of comments to the effect that discontinuing the subdivision of the 470 to 790 MHz band had not resulted in more spectrum being available but in the spectrum being reorganised, involving more coordination, the Chamber would like to point out that although location-bound applications had been able to use spectrum in the whole of the band, the subdivision had meant that non-location-bound, non-broadcasting applications had not been able to use the 470 to 710 MHz band. The Bundesnetzagentur's figures for assignments before the subdivision was discontinued show a large proportion of users in the upper subband (690 to 790 MHz). In 2013, for example, there were about 10,000 assignments in the whole of the 470 to 790 MHz band. In the upper subband 690 to 790 MHz, which is considerably smaller and principally used for non-location-bound, non-broadcasting applications, there are, however, currently more than 5,000 assignments. This means that a large number of users can now use considerably more spectrum than before, especially considering the fact that up to 2010 these users could only use 48 MHz of spectrum in the 800 MHz band. As in the past, on-site frequency coordination is the responsibility of the users; frequency usage at smaller scale events can, for instance, be coordinated by the organiser. Discontinuing the subdivision of the band makes it possible to assign bands of spectrum instead of individual frequencies to all user groups, which had only been possible before for broadcasting-related applications; this in turn enables more flexible frequency coordination. Experience in the 710 to 790 MHz band shows that coordination between various user groups at small and medium scale events is possible without the Bundesnetzagentur's participation. The Bundesnetzagentur will continue to be responsible for frequency coordination at large scale events.

187 In respect of respondents' concerns about mutual interference between wireless microphones and mobile services sharing the downlink bands at 700 MHz, 800 MHz and 1500 MHz, the Chamber would like to point out that interference to wireless microphones in these bands – seen as additional, optional capacity – can only be ruled out given sufficient separation distances between the wireless microphones and MFCN base stations. Conversely, in situations where it is possible for mobile terminal equipment to receive a radio signal from a base station, the audio signal from wireless microphones is usually dominated by the mobile signal so much that PMSE operation on the frequency is not feasible and hence no interference is caused to the mobile service. Overall, the Chamber considers the risk of interference from mobile

transmissions to be very low and hence use of the downlink bands by wireless microphones on a secondary basis to be possible.

188 The Chamber maintains its view that use of the downlink bands for PMSE is generally possible given sufficient separation distances between the PMSE equipment and MFCN base stations. This view is confirmed by experience with the current general assignment for wireless microphones in the 800 MHz band (Administrative Order No 91/2005): the Chamber is aware of a number of cases where it has been possible to continue operating PMSE equipment without interference despite a well developed mobile network. There are also numerous cases where it has not been possible continue operating PMSE equipment, but these cases concern firstly equipment using the uplink band for MFCN, part of which is covered by the general assignment for wireless microphones, and secondly equipment using the downlink band without sufficient separation distances. Experience with the existing general assignment in the 800 MHz band also shows that there has been no significant interference from mobile services despite the large number of PMSE equipment in use. One reason for this is that in situations where it is possible for mobile terminal equipment to receive a radio signal from a base station, the audio signal from wireless microphones is usually dominated by the mobile signal so much that microphone operation at the location is not feasible.

189 In respect of the separation distances given in the draft decision, the Chamber would like to point out that the distances calculated in a model can vary depending on the data assumed. These distances should therefore been seen not as a regulatory requirement but as a guideline showing that use of the downlink bands is possible, but is subject to restrictions. Overall, the downlink bands represent additional, optional capacity that can be used as required and where possible depending on the local conditions. The Chamber would also like to point out that the bands may be used by professional users only who are assumed to have the appropriate knowledge to correctly assess the compatibility situation and ensure that no interference is caused to primary users. Furthermore, users are required to cease PMSE operation immediately should interference occur. Overall the Chamber, also taking into account experience in the 800 MHz band, considers the risk of interference from mobile transmissions to be very low.

190 In light of these considerations, the Chamber maintains its view that the downlink bands at 700 MHz, 800 MHz and 1500 MHz may also be used by wireless microphones under the conditions set out above.

191 To sum up, the Chamber is unable to accept the argument that it is too early to include the band in the award proceedings because there is no concept showing how PMSE users' spectrum requirements can be satisfied. Rather, the Chamber believes to have taken full account in every respect of the significance of this user group's applications for broadcasting and the cultural and creative industries in its considerations by making sufficient spectrum available.

192 The spectrum available in the 1.5 GHz band will be included in the proceedings. The spectrum is also to be designated for MFCN. CEPT has adopted ECC Decision (13)03 of 8 November 2013 ("The harmonised use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)") which sets out the technical conditions for use of the band for SDL.

193 Joint award of all the spectrum, including the 1.5 GHz spectrum, at the present time reflects the Chamber's practice of awarding all the available spectrum, as far as possible, in one set of proceedings (consistency requirement). Furthermore, prompt use is to be made of the potential of the 1.5 GHz spectrum with a view to promoting broadband rollout in Germany in line with the aims of the broadband strategy. In light of this, the Chamber does not agree that the 1.5 GHz band should be awarded at a later date.

194 Inclusion of this spectrum is also suited to promoting the regulatory aims of the TKG. The spectrum is well suited alongside the paired bands to be awarded in these proceedings for rolling out mobile broadband in urban and rural areas in the interest of consumers within the meaning of section 2(2) para 1 TKG. By including this spectrum in the proceedings, the Chamber is providing for the award of all the spectrum available for MFCN to the parties requesting assignment. These parties will then be in a position to provide the higher downlink capacity usually required in high speed mobile data networks in line with demand and in pursuance of the aim of section 2(2) para 5 TKG. Provision of this complementary spectrum together with the paired bands also ensures efficient spectrum use as laid down in section 2(2) para 7 TKG. The parties requesting assignment will be in a position to obtain and make efficient use of an optimum spectrum package in line with their business models, depending on their acquisition of paired spectrum. Only by providing the spectrum in one set of proceedings can maximum account be taken of potential value and usage interdependencies between the various frequency bands.

195 There was also a call from respondents to avoid carrying out a number of award proceedings in rapid succession.

196 The Chamber is convinced that the 700 MHz spectrum should be included in the forthcoming award proceedings.

197 The inclusion of the 700 MHz spectrum in the proceedings is designed so as to make the spectrum that is particularly well suited for nationwide network rollout available as early as possible for efficient use in rolling out broadband networks in Germany. This will help to meet the federal government's target date for achieving nationwide coverage, promote the dynamic development of the broadband market in Germany and satisfy consumers' growing demand for nationwide mobile broadband services.

198 It is not appropriate to postpone awarding the 700 MHz spectrum until the technology and terminal equipment are available. Timing spectrum award in line with the actual availability of radio systems might not be consistent with the regulatory aim of efficient spectrum use as laid down in section 2(2) para 7 TKG because use of the spectrum could be delayed by the length of the proceedings. Opening the proceedings at an early stage does not necessarily mean that the spectrum will actually be assigned immediately. As in earlier proceedings, temporary usage conditions will be needed, depending on the progress of international studies. Only then will the spectrum be specifically assigned for use.

199 Likewise, it is not appropriate to postpone awarding the 700 MHz spectrum until the switch from DVB-T to DVB-T2 has been completed. The Chamber is aware that this switch may involve a period of simultaneous DVB-T and DVB-T2 transmissions, but it assumes that the spectrum will be available for use for broadband rollout as soon as possible, albeit in individual regions only.

200 Attention should be drawn here to the fact that this band is already harmonised globally to the greatest possible extent, providing economies of scale in respect of the cost-efficient provision of technical systems and terminal equipment. In Asia, South America and Africa this spectrum has already been assigned for broadband or will be made available shortly. The 700 MHz band can be expected to become a valuable resource for broadband services internationally in the next few years. The Chamber – unlike some of the respondents – is hence working on the assumption that in Germany, too, favourably priced technical systems and terminal equipment will be available at an early stage and hence stimulate cost-efficient, nationwide coverage of consumers with mobile broadband services as envisaged in the broadband strategy.

201 Moreover, the early development of suitable radio systems and the time a new frequency band is made available are interrelated. Opening spectrum award proceedings at an early stage can add further impetus to speed up the process of defining harmonised frequency usage conditions and thus stable framework

conditions for the development of radio systems. Likewise, technological development will be accelerated early on by specific demands from network operators and consumers.

202 In this context, the Chamber wishes to draw attention to the fact that – as in the case of the UMTS core band and most recently the 800 MHz band – the relevant technologies and terminal equipment are still being developed when the newly identified bands are made available.

203 However, the Chamber includes in its decisions only those bands which have already been identified internationally and for which the harmonisation process has already begun.

204 In including the spectrum anticipated to become available in the 700 MHz and 1.5 GHz bands the Chamber is following the principle of avoiding regulation-induced scarcity. In particular, by including the 700 MHz spectrum it can more or less double the amount of spectrum below 1 GHz for award in these proceedings. This can make an important contribution to overcoming the digital divide as an objective of the broadband strategy in promoting the rollout of broadband networks in rural areas. The spectrum in the 900 MHz and 700 MHz bands comprising 2 x 65 MHz (paired) is particularly well suited for rolling out networks in rural areas as well as for providing high speed mobile broadband services with up to 50 Mbit/s across the country – and therefore also basically for improving coverage throughout a cell.

205 Attention was drawn to this by representatives of industry at the 2012 National IT Summit (cf documentation of the results of working group 2's broadband sub-working group at the National IT Summit in Essen on 13 November 2012 and BITKOM's statement on the technical potential of LTE mobile communications and VDSL vectoring of 25 May 2012):

> *"(…) there are limits to the extent to which technological development can contribute to higher spectral efficiency on the margins of the service area given that tight physical limits are set by thermal noise and very low receiving levels. Improvements can be achieved through the use by subscribers of certain antennas, although these would have to be directive external or rooftop antennas.*
>
> *On the other hand, the provision of additional spectrum – in particular further spectrum in the UHF band with a range comparable to the 800 MHz band – can also achieve a more or less linear improvement in mobile communications system performance. In this context, WRC-2012 resolved to allocate the so-called 700 MHz band (694 to 790 MHz) in ITU Region 1 to the mobile service for IMT on a co-primary basis, with effect immediately after WRC-2015. The time between the conferences will be used for the required co-existence studies, one of the tasks being to define the exact lower band edge. Adopting an FDD band plan with 2 x 30 MHz in the 700 MHz band would double the amount of spectrum available for rural mobile broadband services. Increasing the current downlink bandwidth of 10 MHz to 20 MHz across both bands for one or more network operators would enable the operators to provide at least twice the current speeds right up to the cell edge using LTE Advanced carrier aggregation. (…)*
>
> *This shows the importance of further UHF spectrum in achieving the broadband objectives using LTE Advanced:*
>
> *an operator with twice as much UHF bandwidth as today can provide the average subscriber with the target transmission rate of 50 Mbit/s. (...)*
>
> *Manufacturers are convinced that LTE Advanced can provide a key contribution in good time to achieving the broadband objectives of providing all households in Germany with high speed connections of at least 50 Mbit/s by 2018.*

This is essentially dependent on

- *allocation of additional radio frequency spectrum in the 700 MHz band to the mobile service through confirmation of the WRC-2012 resolution at WRC-2015;*
- *prompt national implementation and allocation of the band prior to 2018; and*
- *early provision of clearly defined framework conditions for implementation."*

206 Within this context, the Chamber has taken into account the fact that the provision of higher data rates to meet demand can also be achieved by optimising existing network infrastructures, in particular by increasing network density using smaller cell structures and by deploying more efficient technologies such as LTE Advanced. There are limits, however, to the extent to which an increase in mobile network capacity is feasible or makes economic sense if the objective of providing nationwide mobile broadband coverage is to be met cost effectively. Picocell base stations have already been developed which are both compact and simple to install and which can consequently be deployed cost effectively. While their use can bring about a substantial increase in capacity in localised areas, such measures are generally not an economic way of meeting the rising demand for broadband data services in rural areas as well. Extensive coverage using microcells would not be feasible owing to the costs involved in particular for links to the core network.

207 In addition, considerable bottlenecks would, in practice, be likely with regard to the sites required to increase capacity. Resistance in the population to additional antenna sites and increasing building and environmental regulations would likely make it more difficult to acquire new sites.

208 Demand-oriented provision of higher data rates can also be supported by using additional frequencies assigned for use by the general public ("offloading"). However, since such spectrum is assigned for general use, it is not available for exclusive use by mobile operators. Moreover, this would achieve an increase in capacity in localised areas only and would not provide a solution to the demand for increased capacity on a national scale.

209 Nonetheless, the Chamber takes the view that the provision of further suitable spectrum resources is necessary in addition to these measures. The provision of additional spectrum below 1 GHz enables capacity to be increased nationwide at reasonable cost. Current mobile operators in particular will be able to make cost-effective use of the 700 MHz spectrum in their network infrastructures and thus achieve a substantial increase in network capacity at national level. New entrants would also be able to establish a mobile network swiftly and cost effectively with this spectrum.

210 This was highlighted by representatives of network operators and industry in a joint position paper presented on 5 February 2013 (page 8):

> *"Developments such as LTE Advanced, which from 2015 will enable ten times higher data rates than today's LTE allows, require additional spectrum for mobile communications. The low frequency range below 1 GHz will be especially important – and in particular the 700 MHz band (digital dividend II) which has already been allocated by the World Radio Conference (WRC-12) to the mobile service on a co-primary basis with effect from 2015.*
>
> *The use of this frequency band would not only make broadband coverage in rural areas affordable, it would also ensure that the cost of chipsets and thus also of terminal equipment would fall, since it is anticipated that the 700 MHz band will be in use in large parts of the world. The 700 MHz spectrum is also needed to*

make full use of the advantages of LTE Advanced. Germany took a key leading role in Europe in respect of the 800 MHz band by awarding spectrum and establishing rollout rules at an early stage. The aim now must be to maintain and build on this position in the 700 MHz band."

211 Including the 700 MHz band will also make it possible for the parties requesting assignment to factor in value and usage interdependencies between the available frequencies – in particular below 1 GHz – and to choose accordingly. This will create maximum planning and investment certainty for the mobile operators in particular in respect of broadband rollout. This was last confirmed in the auction in 2010 in which every participant, taking into account the value and usage interdependencies between the frequency bands, was able to obtain sufficient spectrum usage rights for their business model as a result of the diverse choices resulting from the provision of spectrum above and below 1 GHz and the large volume of spectrum.

212 In the medium term further spectrum will be available for MFCN from 2021 onwards.

213 The spectrum available from 2021 in the 2 GHz band (the "UMTS spectrum") and the spectrum available from 2022 onwards in the 3.5 GHz band (the "BWA spectrum") will not be included in these award proceedings, but will be made available for renewed use in good time before expiry of the frequency usage rights.

214 Including the spectrum in these bands would mean that considerably more spectrum (totalling around 500 MHz, Scenario 3, Scenarios Paper, 9 November 2012, loc cit) could be provided in one set of proceedings. However, the Chamber is aware that market and technical developments in the dynamic broadband market are too far in the future for reliable forecasts to be made of business models and frequency requirements for these frequency usage rights which will not become available again until 2021. Respondents commenting on the Scenarios Paper have explicitly pointed this out and stated that any forecasts made at this stage would be too inaccurate.

215 As regards the spectrum in the 450 to 470 MHz band which will also be available for MFCN in the medium term and which is currently assigned regionally until 31 December 2021, the Chamber wishes to draw attention to the following. Divergent interests for this band have been voiced by both public and non-public users, including public safety agencies (cf also Strategic Aspects, loc cit, 3.1). These first need to be given full consideration to achieve a balance between the diverging interests of the various stakeholders.

216 In the long term the spectrum in the 800 MHz, 1800 MHz, 2 GHz and 2.6 GHz bands awarded at the 2010 auction will become available again from 2026 onwards. It is also planned to make this spectrum (totalling approximately 360 MHz) available to the market at the same time and well in advance. Awarding all the spectrum available in the short, medium and long term in joint proceedings (cf Scenario 4, Scenarios Paper, 9 November 2012, loc cit) would not give the companies sufficient planning and investment certainty for the frequency usage rights to be assigned prior to 2026. These rights would need to be time limited to 31 December 2025, giving companies a relatively short period of time to recoup investments.

217 The spectrum available in the short term for MFCN is to be provided as soon as possible in open, transparent and non-discriminatory proceedings, with the time limits giving both existing mobile operators and new entrants a reasonable period to recoup their investments. It is, however, not possible to ensure a reasonable and non-discriminatory payback period for spectrum available in the medium term. As regards the aims of the federal government's broadband strategy to promote nationwide mobile broadband rollout, the relevant spectrum should be made available to the market now to create maximum planning and investment certainty, hence it is not appropriate to base the current proceedings on a "Total award 2025" scenario (cf Scenarios Paper, loc cit).

Availability

The following comments were made:

218 Respondents welcomed the Chamber's intention to provide all the available spectrum efficiently, in line with requirements and in good time to accommodate the ever-increasing demand for mobile spectrum. Making further bands available would trigger investment, promote competition and generally guarantee the availability of improved services, respondents said.

219 The following comments were made about the availability of the 700 MHz spectrum:

220 The 700 MHz band was particularly interesting as it had already been standardised by 3GPP as Band 28 and would be the band most widely harmonised with almost worldwide implementation. Worldwide harmonisation to such a degree would offer incomparable advantages in terms of the availability of terminal equipment and roaming.

221 Respondents welcomed the planned implementation of the band plan in CEPT Report 53, which provides for 2 x 30 MHz (703 to 733 MHz and 758 to 788 MHz) in the 700 MHz band for public cellular mobile communications.

222 It was extremely important for a final decision on including the spectrum in the award proceedings to be made as soon as possible in particular with a view to supporting the federal government's broadband objectives, respondents said.

223 Attention was drawn to the fact that the potential benefits of the band would be lessened if the 700 MHz spectrum were to be used for broadcasting in Germany's neighbouring countries beyond 2020 since mobile services would then not be able to use the band in the border areas.

224 Both current and future users required planning and investment certainty and more reliable information about the (nationwide) availability of the 700 MHz band, it was said. It was essential to know when, where and under which conditions the 700 MHz spectrum could be used in future network planning.

225 One respondent pointed out that the switch from DVB-T to DVB-T2 was to begin in urban and not rural areas, which made sense. The 700 MHz band could not be used by the mobile service until the switch to DVB-T2 in the rural areas had been completed. A switchover period lasting from the beginning of 2017 until mid-2019 was seen to be realistic and sensible in terms of spectrum efficiency. In addition, channels in the 700 MHz band would still be needed during both the simulcast period and the later DVB-T2 switchover stages. It was illusory to believe that the mobile service would be able to use the 700 MHz band as from 1 January 2017. Specifically, there was a call for the 700 MHz band to remain available for use by the broadcasting service until 2019.

226 Another respondent said that according to a draft timetable for use of the 700 MHz spectrum for mobile broadband, broadcasting spectrum relocation and the switch to DVB-T2 was scheduled to begin in April 2015 while mobile broadband rollout was to begin early in expansive regions such as Bavaria and Schleswig-Holstein. This approach fundamentally conflicted with the migration concept which was drawn up by the national planning group (UHF AG) on the basis of the DVB-T2 requirements concept and according to which switchover would begin in city and urban areas. According to the draft, the 700 MHz band was expected to be available in 2017; although at best a few frequencies in the band would be free by that date, it would not be technically possible for future assignees to use them, it was said. The 700 MHz band would not be fully available for use by future assignees until the switch to DVB-T2 had been completed; full availability also depended firstly on the relevant frequency planning conditions in the European neighbouring countries and secondly on clearance of the band by all broadcasting applications.

227 One respondent pointed out that, as was well known, the 700 MHz could not be used simultaneously for DVB-T2 and the mobile service. The draft decision passed over this fact by assuming that the 700 MHz spectrum could be made available early for mobile use in individual regions once the switch to DVB-T2 had been completed. Even if it was assumed that the switch would not be abrupt but would involve a simulcast period, it was obvious that there would be technical problems if the spectrum were used in certain regions for broadcasting and the mobile service at the same time. Cells for TV broadcasting were considerably larger than mobile cells, it was said, and terrestrial TV reception did not end at federal state borders.

228 Several other respondents said that the planned auction should not be held until all the 700 MHz spectrum was available for use by the mobile service.

229 Various respondents pointed out that no firm information had been given about the availability of the mobile bands at 700 MHz and no specific date when the 700 MHz spectrum would be available nationwide; this created significant planning and assessment uncertainty for the market players. Network rollout depended on complex planning and factors which could not be based on the successive availability of the spectrum. It was essential to know when, where and with which conditions (or restrictions) the 700 MHz spectrum could be included in future network planning so as to accurately assess the options for use of the spectrum in advance of an auction. This was necessary to develop a sound assessment and bidding strategy for the 700 MHz spectrum. A binding timetable should therefore be drawn up before the auction showing where and when the spectrum would be available for use. Rollout in selected regions only was not feasible on account of the national planning required, nor did it offer any advantages.

230 One respondent stated in connection with this that, because mobile services were marketed nationally and not regionally, it was not relevant to know when the first frequencies would be available in the first regions but rather when the whole DVB-T/DVB-T2 switchover process would be completed and the whole of the spectrum available nationwide.

231 Other respondents expect the mobile bands at 700 MHz to be available nationwide before 2019 and at the latest at the beginning of 2018. If the 700 MHz spectrum could not be used immediately after the auction and – as forecast by the Bundesnetzagentur – not until at least 2017, and initially only in certain regions, assignments would effectively run for a maximum of 13 years and even less in rural areas. If network operators were then required to meet the coverage obligations by the end of 2018, they would have much less than two years to comply with the obligations.

232 Several respondents said that the award proceedings for the 700 MHz band should not be conducted until it was certain that all the aspects of the federal states' DVB-T2 requirements concept for the spectrum below 700 MHz (470 to 694 MHz) – recently updated and submitted to the Bundesnetzagentur in the form of a switchover plan involving national and international frequency coordination – could be applied.

233 Two respondents stated that binding information was needed from the Bundesnetzagentur on the use of specific broadcasting channels at individual sites before the switch could be planned, commissioned and implemented (coordinated frequency plan). The parameters (including the channel numbers) for the transmitters in the regions where DVB-T2 was to be introduced first were needed in April 2015 to ensure introduction in 2016.

234 One respondent said that the spectrum should not be awarded until it was certain that a temporary simulcast period with simultaneous DVB-T and DVB-T2 transmissions was possible in line with the federal states' requirements concept and switchover timetable. More spectrum would be required during the simulcast period, and this

would need to be taken into account by the Bundesnetzagentur in national and international frequency coordination.

235 Several respondents criticised the fact that the 700 MHz centre gap would be able to be used for DVB-T, albeit only temporarily. This scenario was not covered by CEPT Report 53 and detailed investigations were needed before such use could be approved, they said.

236 One respondent added that use of the centre gap for DVB-T would not be sensible even in exceptional cases because it was expected to lead to extensive interference. According to CEPT Report 53 Annex 6, even given a guardband of 9 MHz an additional isolation of 40 dB (depending on the scenario) would be necessary to improve the LTE base station receiver blocking level and avoid interference from DVB-T signals. Apart from the fact that the centre gap would not be large enough for such a scenario (2 x 9 MHz guardband + 8 MHz DVB-T channel = 26 MHz), there would be a serious isolation problem, it was said. If the spectrum below the LTE uplink were to be used for DVB-T, LTE base stations would need to be fitted or retrofitted with a filter providing an additional isolation of 40 dB; if the centre gap (the spectrum above the LTE uplink and below the LTE downlink) were to be used for DVB-T, LTE mobile stations would also need appropriate protection. Since it would not be possible to retrofit mobile stations, they would all need to be manufactured with such a filter. This was not only unrealistic but also infeasible because the mobile stations were too small to accommodate such a high quality filter.

237 One respondent welcomed the fact that in view of the tight time schedule the consultation process had been opened even before a political consensus had been reached.

238 Another respondent said that the Bundesnetzagentur had referred in no 180 of the consultation document to a joint announcement by all the parties concerned about the gradual introduction of DVB-T2 in Germany. In the respondent's view, the market players took this to mean a switchover scenario that was acceptable to viewers and the terrestrial TV platform but in no way rushed. This conflicts with the statement in no 185 that the temporary simulcast period – as planned in the interest of the consumers – would block spectrum resources. This showed that the Bundesnetzagentur accepted the fact that to achieve the aim of mobile broadband rollout as soon as possible, as referred to for example in no 183, the terrestrial broadcasting platform could be permanently damaged or destroyed.

239 One respondent said that to protect the consumers a period of two years should be allowed for simultaneous transmissions during the switch from DVB-T to DVB-T2. A period of less than six months was to be seen as negligent.

240 Several respondents mentioned issues relating to the availability of DVB-T2 receivers with HEVC. Such receivers would not be available in the market in large numbers until at least the end of 2016, in other words not until after the planned introduction of DVB-T2 in June 2016.

241 Launching the switch in April 2015, as planned by the Bundesnetzagentur, might result in gaps in coverage because the appropriate receivers would not be available. Another respondent pointed out that the terrestrial broadcasting platform might even be totally destroyed; this conflicted in any case with the coalition agreement, which required that the necessary framework for the switch to DVB-T2 be maintained. One respondent pointed out that account needed to be taken both of the provisions of the constitution and of the interests of broadcasting as protected by the Teleommunications Act.

242 Another respondent commented on nos 138 and 139 of the draft decision where the Bundesnetzagentur stated that it would be appropriate neither to postpone awarding the 700 MHz band until the technology and terminal equipment were available

because it would not be consistent with the regulatory aim of efficient spectrum use nor to postpone awarding the spectrum until the switch from DVB-T to DVB-T2 had been completed. It was not necessary to wait until implementation of DVB-T2 had been completed, the respondent said, but until it was certain that all the future broadcasting requirements could be met.

243 Consumers needed to be able to buy low or at least reasonably priced equipment. A transitional period of at least 12 months should be allowed for each region to ensure that consumers were not forced to buy initially overpriced equipment. Customers buying new receivers had not been told that a new codec would be introduced very soon and that they would then no longer be able to use receivers with the old codec.

244 One respondent criticised the need to buy new receivers, saying that it presented an additional financial burden for consumers as well as a burden on resources and the environment.

245 The following comments were made about the availability of the 1.5 GHz spectrum:

The 1.5 GHz band was harmonised at European level. Several European countries (including Great Britain, Ireland and Italy) planned to auction the band or expected the band to become available for mobile broadband in the near future. The band had already been standardised by 3GPP as Band 32. Appropriate equipment was expected to be available at the beginning of 2015.

246 The band was of particular significance in light of the aim set in the broadband strategy of providing the population with connections of 50 Mbit/s by 2018, it was said. Terminal equipment could easily be designed so as to combine this band with bands above and below 1 GHz – as specified by 3GPP – to improve transmission rates for the benefit of the consumers.

247 Some respondents said that the expected availability date of 2015 given for the 1500 MHz band had an uncertainty of at least 12 months. A firm date should be given to create planning certainty.

248 The following comments were made about the availability of the 1800 MHz spectrum:

The majority of the respondents said that the upper 1800 MHz block, which had already been harmonised for the mobile service, should be included in the award proceedings.

249 Reference was made to the European Commission's Report on the Radio Spectrum Inventory, which calls for the necessary steps to be taken to make available and assign the spectrum that has already been harmonised before additional spectrum is harmonised. Attention was also drawn to the fact that the 1800 MHz band is the most valuable and most easily accessible band in the short term.

250 The planned guardband (1875.5 to 1880 MHz) had already been awarded to mobile operators in full or without any restrictions in a large number of European countries (currently 29 countries, including in particular Germany's neighbouring countries, cf ECO Report 03). It was therefore not clear, it was said, why the situation in Germany would be significantly different from that in similar countries. It would be inefficient not to include the upper 2 x 5 MHz, especially considering the added value in combination with the existing networks and wide support through mobile equipment.

251 There had been no reports of interference to DECT operation, above all in countries with a similarly high proportion of DECT equipment in the market as Germany. DECT equipment was capable of detecting emissions on the frequency used and switching channel. Although fewer channels might be available in certain situations, this would neither impair the DECT network nor cause costs for DECT users.

252 Attention was drawn in this connection to the fact that fixed telephony penetration was not significantly higher than in other countries where the band had been assigned to the mobile service without any restrictions. In addition, residential buildings in Germany had fewer households than in other countries where the band had been assigned, hence there was a lower risk of congestion.

253 According to the draft decision, DECT systems in Germany have a smaller range than in other European countries, increasing the probability of a free DECT channel being available.

254 One respondent said that both ECC Decision (06)13 of 21 June 2013 and Commission Decision 2011/251/EU designated the whole 1805 to 1880 MHz band for LTE without excluding the upper 5 MHz block as a guardband.

255 There was no reason for the parameters for coexistence between DECT and public mobile networks as drawn up by CEPT (and set out in particular in CEPT Report 041) not to apply in Germany, it was said.

256 According to several respondents, another reason why the DECT guardband should be included in the award proceedings was that the latest compatibility studies made at European level to investigate potential interference between LTE1800 and DECT (CEPT Report 41) had concluded that no guardband between LTE1800 and DECT was required since it was generally possible for both systems to operate without mutual interference even in the 1875.5 to 1880 MHz band and that there was, at the most, a potential risk of marginal, local interference to DECT systems or of interference where pico-cellular LTE 1800 base stations and DECT are operated within the same building which, however, could be alleviated using mitigation techniques to the disadvantage of the mobile applications.

257 As regards coexistence with GSM, ERC Report 100 concluded that a guardband was not required but that specific restrictions should apply to the 1878 to 1880 MHz subband, including a maximum EIRP limit of 33 dBm on GSM carriers in the 1878 to 1880 MHz band. If the frequency block were not to be included without restrictions in the award proceedings, additional mitigation techniques could be included in the usage conditions.

258 Several respondents also argued that not including the DECT guardband in the mobile spectrum award proceedings would prevent valuable spectrum resources in the 1800 MHz band from being used and thus prevent the spectrum from being used efficiently.

259 A regulation-induced shortage could be avoided by providing additional spectrum, hence it seemed inappropriate not to include the upper block from 1875 to 1880 MHz in the award proceedings.

260 Another respondent believed that not including the DECT guardband in the award proceedings conflicted with the interests of the German consumers and placed them at a disadvantage compared to their European counterparts.

261 One respondent said that if the Bundesnetzagentur had concerns about including the whole of the 1875.5 to 1880 MHz DECT guardband in the proceedings, then at least the lower part of the frequency block, namely 1875 to 1878 MHz, should be included in the award.

262 The following comments were made about the merger between Telefónica and E-Plus:

263 The procedure for the return of spectrum in the 900 MHz and 1800 MHz bands by Telefónica Deutschland/E-Plus ahead of schedule and at the latest by 31 December 2015 was not clear. The draft decision did not make it clear what would happen with the returned spectrum between 1 January 2016 and 31 December 2016.

264 Some respondents said that all the blocks in the 900 MHz and 1800 MHz bands should be made available as from 1 January 2017. This was the only way to enable interested parties to make a sound assessment of the spectrum concerned before the auction and to ensure that all the spectrum to be awarded as abstract blocks was equal in value, thereby avoiding a considerably more complex auction. This meant in particular in respect of the 1800 MHz band that the twelve months in 2016 could be used to prepare for the reshuffling to take effect on 1 January 2017. Any reshuffling measures taken earlier would jeopardise investments made on the basis of the spectrum usage rights in place until the end of 2016. Requiring Telefónica Deutschland/E-Plus to return any spectrum that it does not intend to buy at auction also prevented the company from misusing the spectrum, in keeping with the aims of decision BK1-13/002.

265 Other respondents said it should be made clear that any 900 MHz and 1800 MHz spectrum not rebought by Telefónica/E-Plus itself would be made available to the purchasing company on 1 January 2016.

The Chamber has ruled as follows:

266 Spectrum in the 900 MHz and 1800 MHz bands will be available for assignment for MFCN from 1 January 2017. Further spectrum in the 700 MHz and 1.5 GHz bands will also become available during the same period of time.

267 Specifically:

Frequency band	**Spectrum**	**Volume**
700 MHz	703 - 733 MHz / 758 - 788 MHz	2 x 30 MHz (paired)
900 MHz	880 - 915 MHz / 925 - 960 MHz	2 x 35 MHz (paired)
1800 MHz	1725 - 1780 MHz / 1820 - 1880 MHz	2 x 50 MHz (paired)
1.5 GHz	1452 - 1492 MHz	1 x 40 MHz (unpaired)

Table 4

268 Spectrum is available if it is not already being used for other purposes and if the additional assignment criteria stipulated in section 55(5) TKG are met.

269 The spectrum usage rights in the 900 MHz and 1800 MHz bands will expire on 31 December 2016 and this spectrum will therefore in principle become available from 1 January 2017. In this respect the Chamber points out once more that Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG are required to return the spectrum in the 900 MHz and 1800 MHz bands – ahead of schedule and at the latest by 31 December 2015 – that they will not buy in the auction (early return of 900 MHz/1800 MHz spectrum; cf BK1-13/002 loc cit).

270 In respect of the call for any 900 MHz and 1800 MHz spectrum not rebought by Telefónica/E-Plus to be made available for use on 1 January 2016 (BK1-13/002), the Chamber wishes to draw attention to the following.

271 Telefónica Deutschland Holding AG and its affiliated companies are required under point 2 of the President's Chamber decision on the merger between Telefónica and E-Plus (BK1-13/002) to "… *return by 31 December 2015 the frequencies in the 900 MHz and 1800 MHz bands whose current assignment term does not run beyond 2016 (return of 900 MHz/1800 MHz spectrum before expiry).*" The early return of 900 MHz/1800 MHz spectrum is necessary so that the spectrum can be used to provide non-discriminatory spectrum holdings for all competitors. In light of this, leaving spectrum unused for one year – as called for by one respondent – would

be inappropriate and would be contrary in particular to the principle of efficient spectrum use as set out in section 52 and section 2(2) para 7 TKG.

272 Here, the Chamber would like to point out that Telefónica is only required to return spectrum in a band ahead of schedule if it buys less spectrum at the auction than it was previously assigned (for details cf President's Chamber decision BK1-13/002, re point 2). This means, for instance, that if Telefónica buys at least two abstract 900 MHz blocks, a competitor buying the first specific 900 MHz block will not be able to use the block until 1 January 2017.

273 Insofar as demands have been made that no broadband radio technology such as UMTS and LTE be permitted in the 900 MHz band to protect GSM-R, these demands cannot be met as spectrum must be assigned on a technology neutral basis according to the Frequency Plan designation (cf specifically the frequency usage conditions, Annex 2 and III.4.2).

274 The Chamber agrees with the call from respondents to include the 1780 to 1785 MHz and 1875 to 1880 MHz spectrum in the award proceedings as no relevant interference potential exists to justify not making this spectrum available. The Chamber would, however, also like to draw attention to the following.

275 The 1880 to 1900 MHz band is allocated to DECT cordless telecommunications systems and assigned for general use by Administrative Order No 54/2008 with a maximum EIRP of 250 mW. In addition to this, professional users can operate in the band with a maximum EIRP of 4 W on the basis of individual assignments. DECT equipment is used by private households and businesses throughout Germany.

276 The general assignment is worded as follows:

Administrative Order No 54/2008

General assignment of frequencies for public use for DECT cordless telecommunications systems

By virtue of section 55 of the Telecommunications Act (TKG) the frequency band specified below is hereby assigned for public use for DECT cordless telecommunications systems.

Administrative Order No 66/2003 "General assignment of frequencies for public use for DECT telecommunications systems", published in RegTP Official Gazette No 25/2003 (page 1360) of 17 December 2003 is hereby repealed.

1. Frequency usage parameters

The following table lists the maximum permitted equivalent isotropically radiated power (EIRP), the channel arrangement and the modulation.

Frequency band 1880 MHz – 1900 MHz	
Maximum EIRP	*250 mW*
Channel arrangement	*1.728 MHz*
Channel bandwidth	*1.728 MHz*
Modulation	*As specified in ETSI EN 301 406*

2. Provisions to avoid interference to radio equipment operated within the frequency band specified above

Cordless telecommunications systems may only be operated if they comply with the relevant provisions for the intended purpose of use and are marked accordingly.

Radio applications designed so as to permanently occupy frequencies or individual frequency channels are not covered by the general assignment.

3. Time limit

This general assignment is valid until 31 December 2020.

Notes:

1. Equipment operated under this frequency assignment is subject to the provisions of the Radio Equipment and Telecommunications Terminal Equipment Act (FTEG) and the Electromagnetic Compatibility Act (EMVG).

2. This frequency assignment does not affect any of the legal provisions arising for frequency users from other provisions under public law, including telecommunications legislation, or obligations under private law. This applies in particular to reservations relating to permits or authorisations (eg under building or environmental legislation).

3. The frequency user is responsible for compliance with the assignment provisions and for the consequences of any violations, eg remedial action and administrative offences.

4. The frequency user is subject to the applicable provisions for the protection of persons exposed to electromagnetic fields arising through the operation of radio equipment.

5. Attention is drawn to the fact that the emissions from cordless telecommunications systems may, under certain circumstances, also be received by other radio equipment.

6. Representatives of the Bundesnetzagentur are to be granted access for inspection purposes to property and premises where radio equipment and installations are located, in accordance with the EMVG provisions.

7. In the event of interference and in technical tests the parameters set out in ETSI EN 300 175 and ETSI EN 301 406 are to apply. Details of measurement specifications and test methods to be observed when verifying the above parameters are also to be taken from these standards."

277 Here, the Chamber would like to point out that it is planned in 2015 to bring the existing general assignment into line with the European regulations for Class 1 radio equipment with a maximum permitted effective radiated power of 250 mW.

278 Furthermore, Article 2 of Council Directive 91/287/ECC of 3 June 1991 states the following:

"Member States shall, in accordance with CEPT Recommendation T/R 22-02 of the European Conference of Postal and Telecommunications Administrations, designate the frequency band 1880-1900 MHz for digital European cordless telecommunications (DECT) by 1 January 1992.

In accordance with the CEPT Recommendation, DECT shall have priority over other services in the same band, and be protected in the designated band."

279 Incompatibility between frequency usages, which – according to section 55(5) first sentence para 3 – would prevent frequency assignment, does not exist where there is a mere potential for interference between the usages but where in practice such interference cannot be avoided through mutual consideration and without having to accept unreasonable disadvantages or cannot be reduced to a tolerable level.

280 Given the tight balance between efficient use and interference-free use, compatibility within the meaning of section 55(5) first sentence para 3 TKG is to be assumed not only where no interference whatsoever occurs but also where interference occurs which is, however, acceptable.

281 Cologne Administrative Court said the following (21 K 8149/09, 14 September 2011):

"The legal requirement imposed on the Bundesnetzagentur to ensure efficient and interference-free spectrum use (section 2(2) para 7, section 52(1), section 53(2), section 55(5) first sentence para 4, and section 60(1) and (2) TKG) presents an objective involving a conflict of interests between efficiency and freedom from interference; this conflict is to be resolved not by maximising one interest at the expense of the other but by balancing the two in line with demand. The requirement of efficient and interference-free spectrum use therefore does not oblige the Bundesnetzagentur to ensure maximum freedom from interference but to reduce radio interference to an acceptable level in terms of creating maximum possible freedom from interference together with maximum efficiency in spectrum use. Where the requirement to ensure efficient and interference-free spectrum use is also imposed on the spectrum user (section 55(5) first sentence para 4 and section 60(1) and (2) TKG), it comprises on the one hand the right and duty to use the assigned frequencies efficiently and on the other hand the duty not to cause interference to other frequency usages. Even if it is assumed that the latter duty corresponds to a defensive claim to be asserted by the frequency users affected by interference vis-à-vis the Bundesnetzagentur, it does not include absolute protection from interference "at any price" but merely the right to defence against unacceptable degradation as a result of the balancing of interests referred to above, irrespective of which frequency usage was in operation first and which came into operation later.[…]"

282 The Chamber, acknowledging the above-mentioned general assignment and the European Directive and in light of Cologne Administrative Court's opinion, is including the 1780 to 1785 MHz and 1875 to 1880 MHz spectrum in the award proceedings. In doing so, the Chamber is also taking account of respondents' calls.

283 In light of Cologne Administrative Court's deliberations on the interrelationship between interference-free and efficient spectrum use, a guardband at 1875.5 to 1880 MHz is no longer required to protect DECT (1880 to 1900 MHz). Neither ECC Decision (06)13 of 21 June 2013 nor Commission Implementing Decision 2011/251/EU of 18 April 2011 answer the question as to whether a guardband to protect DECT should be in place at national level or whether other appropriate, necessary and reasonable measures should be taken to protect DECT.

284 In any case, spectrum management issues (section 52ff TKG) are, in accordance with the principle of subsidiarity, the responsibility of each individual Member State. The above-mentioned European provisions apply to usage conditions to be harmonised at European level for radio applications operating in bands that have already been harmonised. However, the necessity for a guardband or other protective measures needs to be assessed at national level with a view to ensuring efficient and interference-free spectrum use with compatibility between frequency usages in accordance with the TKG provisions (cf section 55(5) first sentence paras 3 and 4 TKG).

285 The Chamber would like to draw attention to the following possible measures to provide protection for DECT without the need to implement a guardband that could not be used by the mobile service.

286 Given the inclusion of the 1780 to 1785 MHz and 1875 to 1880 MHz spectrum in the award proceedings, there are several measures that can be taken to protect DECT applications; these include additional limits on the mobile service base station radiated power, the use of additional external filters in the mobile service base stations, and space separation between the DECT and mobile service base stations.

287 No additional requirements other than the frequency usage conditions set out in Annex 2 are to apply to the use of the 1780 to 1785 MHz band.

288 In respect of the 1875 to 1880 MHz band, it must be ensured that on the one hand the mobile service is able to use the band efficiently and on the other hand the

legitimate rights to protection for DECT and thus use of the band for DECT applications are safeguarded.

289 The spectrum in the 1875 to 1880 MHz band is available for MFCN.

290 The following conditions would need to apply to provide full protection for all DECT channels if the band were also used for GSM 1800:

291 In the 1878 to 1879.8 MHz band, the maximum GSM base station radiated power (EIRP) may not exceed 30 dBm given a minimum separation distance of 70 m between the GSM base station and the nearest DECT base station. The maximum GSM base station power (EIRP) may not exceed 33 dBm for a minimum separation distance of 100 m, 36 dBm for a minimum separation distance of 200 m, and 54 dBm for a minimum separation distance of 250 m. If the separation distance between the GSM base station and the nearest DECT base station is less than 70 m, additional filtering between the transmitter output and the antenna input of the GSM base station is required in addition to a maximum EIRP of 30 dBm to prevent DECT carriers F9 to F7 from being blocked by out-of-band emissions. The GSM operator is responsible for demonstrating that adequate filtering has been implemented so as not to restrict the use of these DECT channels. In cases where use of the DECT carriers F9 to F7 is prevented by receiver blocking, the GSM base station may not be operated or a minimum separation distance of 70 m must be guaranteed.

292 The requirement of efficient and interference-free spectrum use does not, however, oblige the Bundesnetzagentur to ensure maximum freedom from interference but to reduce radio interference to an acceptable level in terms of creating maximum possible freedom from interference together with maximum efficiency in spectrum use. Where the requirement to ensure efficient and interference-free spectrum use is also imposed on the spectrum user (section 55(5) first sentence para 4 and section 60(1) and (2) TKG), it comprises on the one hand the right and duty to use the assigned frequencies efficiently and on the other hand the duty not to cause interference to other frequency usages. Even if it is assumed that the latter duty corresponds to a defensive claim to be asserted by the frequency users affected by interference vis-à-vis the Bundesnetzagentur, it does not include absolute protection from interference "at any price" but merely the right to defence against unacceptable degradation as a result of the balancing of interests referred to above, irrespective of which frequency usage was in operation first and which came into operation later.

293 This means that the restrictions set out above apply only where it is necessary to fully prevent DECT carriers F9 to F7 from being blocked by GSM out-of-band emissions or receiver blocking. The Chamber believes, however, that it is sufficient and appropriate to ensure that users can actually continue to use the 1880 to 1900 MHz band for DECT applications without unacceptable degradation. This does not mean that each DECT channel needs to be available at any time and at any place, as would be the case given the measures restricting GSM use set out above.

294 The following requirements have been specified at international level to minimise interference to DECT users (cf CEPT Report 41):

> *"8.4 Conclusions for DECT*
>
> *The LTE and WiMAX Base Station masks for the 1800 MHz bands are aligned with the UMTS1800 mask for all the LTE channelisation bandwidth available. In previous studies [4] and [5], blocking of DECT has been the dominating interference mechanism. In these Reports it has also been assumed that DECT by its DCS provision is able to detect possible harmful interference on carriers close to the band edge and escape to a less interfered carrier. For LTE/WiMAX interferers, blocking of DECT also dominates except for three DECT carriers F7-F5, where the unwanted interference (iRSS unwanted) created by the out-of-band emissions is somewhat (2 dB) higher than the blocking response (iRSS*

blocking). Since only 3 out of 10 carriers are interfered somewhat more than given by the blocking response, and since DECT provides DCS, the LTE/WiMAX case will be very similar to a case where the blocking mechanism dominates on all carries. Therefore results from previous coexistence Reports can be applied as follows:

• The conclusion is the same as for the previous studies [4] and [5], that no guard band is required between LTE1800 and DECT allocations, provided that DECT is able to properly detect GSM interference on closest DECT carriers F9-F7 and escape to more distant carriers F6-F0. How to detect GSM interference is described in ETSI EN 300 175-3, clause 11.4.5, "Handover criteria due to Interference".

• Therefore, LTE/WiMAX1800 macro-cells can be deployed in the same geographical area in co-existence with DECT which is deployed inside of the buildings, as the interference between DECT RFP and PP and macro-cellular LTE/WiMAX1800 BS and UE is not a problem;

• When pico-cellular LTE/WiMAX1800 BS is deployed inside of the building in co-existence with DECT RFP and PP deployed in the same building indoor area, some potential interference is likely to exist from indoor pico-cellular LTE/WiMAX1800 BS to DECT if they are placed too close and they are operating in the adjacent channel at 1880 MHz;

• The following interference mitigation techniques could be used to address the potential interference from indoor pico-cellular LTE/WiMAX1800 to indoor DECT RFP and PP when they are operating at the adjacent frequency point of 1880 MHz (ECC Report 096):

a) Space separation between indoor pico-cell LTE/WiMAX1800 BS and DECT RFP or PP of 65 m or more;

b) External filter on indoor pico-cellular LTE/WiMAX1800 BS;

c) Avoiding the adjacent frequencies of 1880 MHz for indoor pico-cellular LTE/WiMAX1800 BS and DECT or operate with reduced transmitting power if necessary.

In terms of interference analysis, the DECT system has the DCA (Dynamic Channel Allocation) mechanism which allows it to avoid efficiently an interfered channel, except if both systems are deployed indoors."

295 Furthermore, ERC Report 100 states the following:

"7 CONCLUSIONS

This Report identifies and investigates the critical scenarios where interference can occur between DECT and GSM 1800 systems.

The problem of compatibility in adjacent bands between DECT and GSM 1800 is alleviated by properties inherent in these systems: DCS algorithm for DECT and intra-cell hand-over for GSM 1800 which both enable in most cases to avoid local/temporary interference by moving to an other carrier when interference has been detected. However, it has to be ensured that this escape process is possible, i.e. that the interfered system is capable of detecting the interfering signal and provide a successful handover.

• DECT has very low probability to cause harmful interference to GSM 1800 systems.

• A guard band is not required to protect DECT from GSM 1800 interference, but measures are proposed to facilitate the coexistence when the GSM sub-band 1878-1880 MHz is used.

It is very important to note that the different means provided to facilitate sharing could be constraining for the system they are applied to. Due to the high complexity of a radio network engineering, even little constrains on the way an operator should use its frequencies can be impracticable, especially if it is an existing network.

As the potential interference problems will appear in specific situations, it would not be economically justifiable to prevent potential harmful interference for these few cases by implementing general measures to a whole network. Therefore, the application of constraints should only be taken at a national level, in the very specific cases where it is relevant. Such an approach will not unduly constrain either operator and would facilitate efficient use of the spectrum.

7.1.1 Position of the GSM BCCH control channel

The GSM 1800 BCCH control channel should not operate within the band 1878 – 1880 MHz for outdoor GSM BTSs.

7.1.2 GSM escape from DECT interference by intra-cell handover

GSM can escape temporary interference close to the DECT band edge by intra-cell handover, if this escape is made to another carrier more distant from the DECT band. This provision is of importance mainly for systems with GSM systems outdoor BTSs. GSM outdoor macro cells systems normally have at least 2 carriers per sector. At least one of these carriers should be below the frequency band 1878 – 1880 MHz.

7.2 Interference from GSM 1800 to DECT

The important scenarios for the recommendations are when DECT and GSM operate in the same local environment. There are two relevant cases:

GSM and DECT systems operate both in the same residence, office or exhibition hall.

Above rooftop DECT WLL systems and GSM macro cell systems operate in the same outdoor environment.

For both these cases, the potential interference comes from GSM base stations interfering with the DECT base stations and DECT subscriber stations (mobiles and CTAs for WLL).

Whenever needed, it is important to apply proper system planning, co-ordination and site engineering to ensure that potential local interference to all DECT carriers is avoided. See proposed feasible recommendations in section 7.2.1 for DECT WLL applications.

For the indoor case, the typical short cell radius will provide a relevant margin for self-protection, and does not need further recommendations. See section 4.4.7.

7.2.1 Above roof-top DECT WLL systems and GSM 1800 macro cell systems in the same local area

The critical case occurs when the BTSs and subscriber units (CTAs) are in proximity of a GSM BTS and the antennas are in alignment.

Blocking is the main cause of interference to DECT from GSM 1800 BTS. DECT WLL applications would suffer less potential risk of range reduction, if installed DECT WLL equipment have blocking performance above minimum specification.

Site co-ordination and system planning has to be done properly. Above roof-top DECT WLL base stations and above roof-top GSM 1800 base stations should be geographically separated as much as possible. Wherever possible, the GSM BTS sites should occur at the intersection of DECT WLL cells. This is important to

minimize interference probability for the DECT BTS and for the DECT WLL subscriber units (which have a directional antenna).

A guard band is not required, but where the possibility exists not to allocate in the same local area the upper part of the GSM 1800 band (1878 – 1880 MHz), this would simplify the coexistence, especially in areas where high traffic densities DECT above roof-top WLL systems already are installed. This would also reduce the probability for harmful non-detectable interference (at GSM low traffic hours) to DECT, if GSM frequency hopping were used (see section 4.4.1.5).

There may be cases where separation distances between DECT and GSM BTS down to 100 m have to be accepted. These cases mainly occur in urban areas where high traffic is expected for both systems. This corresponds typically to about 20 dB improved interference protection requirement. Depending on the configuration and the eventual precedence of one or the other system, some of the precautions listed below may need to be taken:

• Using DECT equipment that exceeds the minimum blocking requirement.

Note: Performance of installed equipment is expected to typically exceed the DECT minimum blocking requirement by about 10 dB.

• Planning the DECT system with an adequate installation margin N added to the minimum operational wanted signal level.

• Local site engineering and system planing, e.g. local change/removal of carriers, local external filtering and local change of antenna configuration including height differentiation and proper tilting.

• The GSM operator could avoid using the upper part of the band (1878-1880 MHz) especially with power > 33 dBm on its macro-cell sites (this means using these channels for indoor or micro cells),

7.3

Requirements to detect asynchronous interference from a single GSM connection DECT should be able to detect and escape via intra-cell handover interference from a single GSM bearer, which implies that:

• DECT should be able to process a successful handover when the up-link or the down-link is interfered as seldom as every 6th frame.

This requirement is of prime importance for DECT WLL systems.

It is recommended that ETSI Project DECT make a study on the possibility to properly define the provisions for DECT to detect the interference and to process handover when interfered by a single GSM bearer.

Specific requirements on GSM to facilitate DECT detection of GSM is discussed in section 4.4.1.5."

296 It is up to each operator to decide how to ensure protection for DECT applications in the users' interests (eg deploying only macro-cells outside buildings, transmitting no pilot channels in the upper 2 MHz, using only part of the frequency block, limiting the radiated power). Future network operators may also need to take appropriate measures to limit interference to DECT applications to a reasonable level in the interests of the users.

297 Future assignees will therefore need to demonstrate how they will ensure protection for DECT applications and will, for example, need to specify which measures they will take in each case when they submit their site-related frequency usage parameters.

298 Here, the Chamber would like to point out that assignees are required to cease operation immediately should they cause unacceptable degradation to DECT applications (sections 65 and 126 TKG).

299 The Chamber is aware that the options for use of the band by the mobile service may change in the future, for instance as a result of further studies providing reliable conclusions on radio compatibility with DECT.

Pursuant to section 55(5) first sentence para 2 TKG, a condition of frequency assignment in the 700 MHz band is the availability of the frequencies for mobile broadband. Frequency assignments in the 700 MHz band for broadcasting services expire at the end of 2025. These involve about 150 frequency assignments for terrestrial television (DVB-T).

300 From the Chamber's point of view, the situation as regards the notified requirements and the requirements of broadcasting as established by the federal states is as follows:

301 The 700 MHz band is primarily used for terrestrial digital video broadcasting (DVB-T). To be able to use the spectrum throughout Germany for mobile broadband, the band needs to be cleared by the broadcasting service. This requires a thorough weighing up of the interests of the former and future user groups affected.

302 As a consequence of the necessary clearance of the 700 MHz band, there will be a decrease in frequency resources for digital terrestrial television broadcasting in the future. In order to meet the federal states' requirement to maintain programme diversity, from a broadcasting perspective there is a need to migrate to the new transmission standard of DVB-2 and to implement the new compression processing method H.265 (High Efficiency Video Coding, HEVC).

303 ARD, ZDF, RTL, ProSiebenSat.1, VPRT (the association of private broadcasters and telemedia), Media Broadcast and media organisations have jointly announced that they will gradually introduce DVB-T2 with HEVC from mid-2016.

304 As far as the Chamber is aware, for technical reasons the public and private broadcasters currently plan to implement the switch from DVB-T to DVB-T2 in a phased process. The switchover will be staggered over a certain period and DVB-T2 will be introduced across Germany region by region, depending on population density. For the Chamber, this means clearance of the 700 MHz band as swiftly as possible by the broadcasting service to make way for mobile broadband. At present, ARD/ZDF and Media Broadcast GmbH plan to begin introducing DVB-T2 in Germany in good time for UEFA EURO 2016. While public and private broadcasters will continue DVB-T transmissions on the current frequencies (multiplexes), at least one other multiplex (frequency) will be used to transmit both public and private (main) programmes on a DVB-T2 platform operated by Media Broadcast.

305 Annex 7 Part I lists the broadcast transmitters now in operation in the 700 MHz band, based on current information from the national UHF planning group comprising federal state representatives, broadcasters, PMSE users and other stakeholders. Annex 7 Part II lists the broadcast transmitters expected to be in operation in the 700 MHz band beyond May 2016, based on the planning group's information. Mobile operators can use this information to assess the possibility of interference to the various mobile frequency blocks in each region and thus plan with greater certainty.

306 According to current plans, the first switchover phase will take place in March 2017 and will involve around 70 transmitter sites in city and urban areas and a full switchover of all the multiplexes (both public and private – on average six) in these areas.

307 It will not be possible at this stage for the broadcasters to clear all the spectrum in the 700 MHz band in all the regions; this is due firstly to frequency engineering issues

and secondly to the fact that the broadcasters depend on the supply industry for the new transmitter equipment (with tendering at European level and a very limited number of highly specialised staff to install the equipment). The 700 MHz spectrum can only be cleared on a regional or local basis.

308 The Chamber believes that it will therefore be possible to introduce mobile broadband in selected regions as early as April 2017.

309 Annex 7 Part III lists the broadcast transmitters expected to be in operation in the 700 MHz band beyond April 2017, based on the UHF planning group's information. Mobile operators can use this information to assess the possibility of interference to the various mobile frequency blocks in each region and thus plan with greater certainty.

310 The second switchover phase is to take place in regions with a medium population density (lower than in the city and urban areas) and will involve primarily public broadcasters and only a few individual private transmissions (multiplexes).

311 This phase will take place in two stages in October 2017 and March 2018, with clearance of the 700 MHz band expected in most cases.

312 Annex 7 Part IV lists the broadcast transmitters expected to be in operation in the 700 MHz band beyond November 2017, based on current information. Annex 7 Part V lists the broadcast transmitters expected to be in operation in the 700 MHz band beyond March 2018, based on current information.

313 The last switchover phase is due to begin at the end of 2018 and will involve around 60 transmitter sites in rural areas (regions across Germany with the lowest population density) operated by the public broadcasters.

314 Annex 7 Part VI lists the broadcast transmitters expected to be in operation in the 700 MHz band beyond the beginning of 2019 and up to July 2019 at the latest, based on the UHF planning group's information.

315 According to the timetable, switchover at all the transmitter sites in Germany will be completed and the 700 MHz band fully cleared by early to mid 2019.

316 The Bundesnetzagentur will provide an update on which DVB-T/DVB-T2 applications in Germany are to be taken into account until which dates in good time before the auction. The Bundesnetzagentur will also provide the future assignees with updates on the overall situation (national frequency coordination) after the auction.

317 It would not be possible for the broadcasting service to clear the 700 MHz band without the implementation of DVB-T2 using HEVC. Current broadcasters also assume that the use of this modern technology will enable sufficient capacity to be generated in the 470 to 694 MHz band to meet future broadcasting requirements.

318 The Chamber is aware that, for economic reasons and reasons of public acceptance, the switch in Germany will begin in city and urban areas. Switchover in rural areas must then follow as soon as possible.

319 Technical work at the transmitter sites will need to begin up to one year before switchover at the sites takes place, and it would be best to know by the time work begins which DVB-T2 frequencies are to be used. This is why the Bundesnetzagentur has been working hard to find suitable frequencies for coordination at national and international level. As is known, the aim is to begin DVB-T2 transmissions in good time before UEFA EURO 2016. Binding agreements with neighbouring countries providing for the initial switchover stages will be in place by spring 2015, enabling technical work to begin in about April 2015. This, however, must not be confused with actual transmitter operation.

320 The UHF planning group has more or less finalised the parameters, including the channel numbers, for the transmitter sites in those regions where DVB-T2 is to be introduced first in 2016.

321 The Bundesnetzagentur is therefore taking maximum account of the plans of those involved in the switchover process (including state media authorities, public and private programme providers and nationwide operators) and is also ensuring through its frequency coordination that the necessary framework for the switch to DVB-T2 is in place. This reflects the call from respondents to take due account of the provisions of the constitution and hence the interests of broadcasting as protected by the Telecommunications Act in terms of supporting the terrestrial broadcasting platform and avoiding gaps in coverage.

322 The Bundesnetzagentur will ensure at each switchover stage through national and international frequency coordination that the spectrum requirements for broadcasting can be met.

323 The Chamber believes that the regulatory aim of efficient spectrum use can best be achieved by creating legal and planning certainty for all parties involved as early as possible. This is why – as stated above – it has ordered that the 700 MHz spectrum be included in the forthcoming mobile broadband auction. Postponing the award of the spectrum until after the switchover process has been completed is therefore not a viable option.

324 On the basis of the switchover timetable, there is no reason in terms of frequency engineering why the 700 MHz band cannot be used for mobile broadband as early as possible in those regions where the band has largely been cleared by the broadcasting service and where there is no interference from DVB-T/DVB-T2 applications in other countries. This applies at least to the use of individual mobile frequency blocks provided that there is no interference from any remaining broadcasting applications (use of selected blocks).

325 The Chamber is aware that frequencies in the 700 MHz band will be used for broadcasting for a limited period after the initial launch in city and urban areas should no other solution have been found to meet the spectrum requirements.

326 The following figure shows the overlap in the use of the 700 MHz band for broadcasting and mobile broadband:

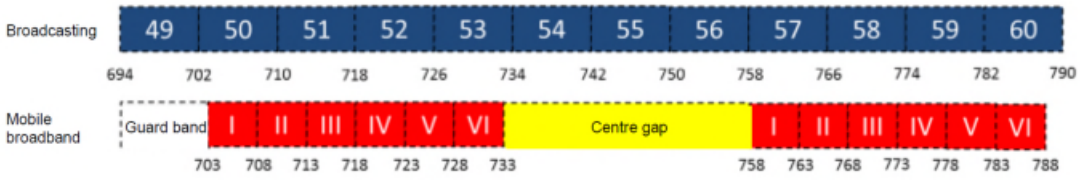


Figure 1: Band plan showing current (DVB-T) and future (LTE) use of the 700 MHz band

327 The Chamber, taking account of the Digital Agenda 2014 - 2017 and the federal government's broadband strategy, is adopting an approach enabling mobile broadband to be introduced as early as possible in at least those regions where the level of interference from broadcasting is sufficiently low so as not to impede mobile operations.

328 The Bundesnetzagentur is tasked in particular with ensuring efficient and interference-free spectrum use, taking due account of all the regulatory aims. Instead of making an assessment of the situation as a whole, the Bundesnetzagentur looks carefully at the availability of individual channels and contiguous frequency blocks in terms of where and when they can be used for broadcasting and the mobile service.

329 The timetable for the switch from DVB-T to DVB-T2 is based on a concept setting out which frequencies could be used to meet the spectrum requirements notified by the

federal states. This spectrum planning at national level is secured by the Bundesnetzagentur through usage rights planning at European level.

330 The frequency plans and timetables, including simulcast periods, are drawn up jointly by ARD, ZDF, Media Broadcast GmbH, media organisations and federal state representatives within the UHF planning group, for instance, together with the Bundesnetzagentur.

331 These schedules are based on the DVB-T2 spectrum requirements notified by the federal states. The UHF group's planning process is designed to accommodate these requirements.

332 The broadcasters are informed of the frequencies to be used as early as possible through their involvement in the planning group and in individual coordination talks.

333 According to the switchover timetable, many regions will have a transitional simulcast period when the same content will be transmitted across more than one medium – DVB-T and DVB-T2 – at exactly the same time within the same region.

334 The Chamber believes that DVB-T2 can only become firmly established if the switchover process works well for the consumers.

335 In light of the positive experience with the switch from analogue to digital TV broadcasting, there are doubts as to whether a simulcast period of two years is necessary for a successful switch from DVB-T to DVB-T2. On the contrary, it can be assumed that following a successful switchover in city and urban areas, the transition in rural areas can be made without such a simulcast period. This assumption is confirmed by the proposed timetable drawn up by ARD/ZDF and Media Broadcast GmbH, in particular for the switchover in rural areas. This and economic reasons show that the concern voiced by one respondent about the risk of damage to the terrestrial broadcasting platform is unfounded.

336 Moreover, it is the task of the federal states to determine how long DVB-T/DVB-T2 simulcasts should last on the basis of broadcasting regulations and identified requirements. The Chamber believes it would be sufficient for the federal states to adopt a draft concept drawn up by the UHF planning group as a broadcasting regulation, constituting the consensus required in section 57(1) TKG.

337 Furthermore, the Chamber would like to draw attention to the following in particular with respect to the temporary use of the centre gap (733 to 758 MHz) by the broadcasting service.

338 The whole of the 700 MHz band (channels 49 to 60) is currently being used for DVB-T. It is not possible for the same or overlapping channels to be used for both DVB-T/DVB-T2 and the mobile service in the same, adjacent or nearby areas. Sufficient frequency and/or space separation can be used to isolate broadcasting and mobile signals.

339 Optimum frequency and/or space separation will therefore be needed if frequencies in the 700 MHz band are to be used for broadcasting during the switch from DVB-T to DVB-T2. In this respect, the most suitable channels in the 700 MHz band are those in the centre gap. For this reason and for spectrum efficiency reasons, the Chamber does not rule out the option of the centre gap being used.

340 In response to the comments on the availability of DVB-T2 receivers with HEVC, the Chamber would like to point out the following.

A test platform using DVB-T2 and HEVC has been in operation in Berlin since October 2014; one of the purposes of the platform is to aid manufacturers in developing equipment. According to the operator, the platform provides a practical test environment for terminal equipment manufacturers designing the new receivers.

341 DVB-T2 with HEVC is also being tested in the Munich area, and other test platforms are due to take up operation in 2015. These pilot projects will provide manufacturers with a practical environment to develop and test the new terminal equipment.

342 Typical production cycles for receivers of any form largely depend on the availability of the required chipsets. USB DVB-T2 receivers are already available for use with computers with very high speed CPUs and with the relevant software to process DVB-T2/HEVC test signals. HEVC is also already being used in integrated tuners in top of the range TV equipment; here, however, HEVC is used to decode the satellite signal.

343 Since DVB-T2 and HEVC are standards which have already been defined and tested in practice, the prompt availability of terminal equipment essentially depends on the companies concerned being given a firm basis to make the necessary decisions in good time before operations begin. Only then can the companies make any commitments to the manufacturers on the receivers to be produced, which they need to do as early as possible or at least around 12 months before DVB-T2 is introduced. These commitments in turn depend on those involved – and in particular the private broadcasting platform operators – being given investment certainty through the allocation of transmission capacity by the state media authorities.

344 Companies will therefore need to choose a platform operator at least one year or so before DVB-T2 is introduced to secure a basic supply of receivers in the initial phases. Following this, a significant market for receivers is not expected to be established until the end of 2016 or later. Attention should, however, be drawn to the fact that appropriate measures first need to be taken before such a market can become established. This is the only way to support, on a lasting basis, the consumers' interest in being able to purchase receivers at the lowest possible cost.

345 This consumer interest is to be seen in particular in light of the risk taken by the companies concerned and the future added value, for instance in terms of the video resolution in HD broadcasts. There are doubts as to whether longer switchover periods would drive consumer interest. Rather, lengthy switchover processes might result in consumers delaying their purchasing decisions.

346 Introducing DVB-T2 and HEVC at the same time is preferable as consumers then only need to switch and buy a new receiver once. It avoids switching first from DVB-T to DVB-T2 with MPEG-4 and then from DVB-T2 with MPEG-4 to DVB-T2 with HEVC, as has happened in other countries.

347 Under section 55(5) first sentence para 1 TKG the frequencies in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands can only be assigned if they are designated for the planned usage in the Frequency Plan. The 900 MHz and 1800 MHz bands are allocated to the mobile service on a primary basis and are designated for MFCN. There is already an allocation to the mobile service with respect to the 1.5 GHz band under the Frequency Ordinance. The spectrum will be designated for MFCN in the Frequency Plan as required in the course of this year. Both the Frequency Ordinance and the Frequency Plan need to be amended in respect of the 700 MHz band. The spectrum in the 700 MHz band cannot be assigned until it has been allocated to the mobile service and designated for MFCN.

348 In view of the national consensus on the usage of the 700 MHz spectrum for broadband rollout reached between the federal government and the federal states at the conference of the heads of the federal states on 11 December 2014, the Chamber assumes that the 700 MHz spectrum will be allocated and designated accordingly by the time the award proceedings take place (by the start of the auction) or at least in good time before assignment. The essential technical terms of use, in particular the channelling arrangement, are also available, allowing the assets to be adequately determined for an auction (cf Annex 3).

349 Under section 53(1) TKG the federal government is responsible for stipulating the national allocation of spectrum and other relevant determinations. This gives rise to the authorisation for the allocation of spectrum, for the implementation of the relevant WRC results in a legal instrument and then for amending this instrument as required, as well as for the implementation of European and national frameworks. Under section 53(1) second sentence TKG the Frequency Ordinance requires the approval of the Bundesrat. Under section 53(1) third sentence TKG the parties affected by the allocation must be involved in the preparation of such ordinance.

350 Key elements of the allocation of the 700 MHz frequency band for mobile services on a co-primary basis have already been defined at WRC-12 in Resolution 232 (WRC-12). Accordingly, allocation will become effective in the Radio Regulations directly after WRC-15.

351 Given the stable international basis, the Chamber is confident that it will be possible to create the national preconditions alongside the international decisions to such an extent that the spectrum can be made available for broadband communication at the present time to implement the federal government's broadband strategy.

> *"If all parties involved take joint decisive action, it may even be possible to combine low and high frequency ranges during the next award proceedings. This improves the prospects of the resources with the best propagation properties from the digital dividend actually being used to close gaps in coverage." (The Federal Government's Broadband Strategy, page 15.)*

352 The frequencies can only be awarded as quickly as possible if work is undertaken in parallel to create the required planning framework, in particular work on reaching mutual agreement on changes to the Frequency Ordinance and Frequency Plan. As regards the 700 MHz and 1.5 GHz bands, due account is to be taken of the interests of broadcasting, but also of PMR (eg wireless microphones), public safety agencies and the federal armed forces, or *Bundeswehr* (cf also Strategic Aspects, loc cit).

353 Insofar as it has been suggested to consider awarding the 2300 to 2400 MHz band, in view of the CEPT's current harmonisation efforts that would provide for the introduction of the licensed shared access concept, the Chamber draws attention to the following. The 2300 to 2400 MHz band is used by wireless cameras (including those of authorities and organisations concerned with public safety), for undertakings, eg in industrial production, and for applications in the field of aeronautical telemetry. In Germany it is the core band for broadcasting and other programme producers as it enables the basic demand for spectrum for wireless cameras to be met at any place and time, independently of short-term assignments. Given this objective, this spectrum is currently not available for award.

354 Moreover, the Chamber draws attention to the fact that the TKG requires available frequencies to be made available. Any litigation relating to the frequencies does not prevent their availability (cf also the rationale re IV.1.4).

Scarcity

The following comments were made:

355 Some respondents questioned whether or not spectrum was actually scarce, stating in particular that the merger between Telefónica and E-Plus should in fact have led to a reduction in spectrum requirements.

356 Furthermore, the factual basis on which scarcity was identified was incorrect:

357 The Bundesnetzagentur had repeatedly emphasised the fact that the aim of awarding the 700 MHz spectrum was to achieve the federal government's broadband objectives, namely to provide all households in Germany with high speed connections

of at least 50 Mbit/s (downstream) by the end of 2018. In the draft award rules, however, the Chamber considered a requirement to provide a minimum downstream transmission rate of only 10 MBit/s as realistic for the 700 MHz band.

358 The Bundesnetzagentur left no room for doubt that it did not expect any newcomers to enter the market, hence the forecast was ultimately only based on the requirements of the three current market players who, however, had repeatedly and explicitly said that they would not need any of this spectrum as early as 2016.

359 Furthermore, a total of at least 170 MHz of spectrum was already available to the three remaining operators in the bands at 450 MHz, 2 GHz, 2.6 GHz and 3.5 GHz; although the spectrum was assigned, it was not actually all being used, which showed that the operators' current requirements did not correspond to those specified.

360 Several respondents stated that the Bundesnetzagentur had not yet sufficiently demonstrated how spectrum was scarce. The draft decision did not provide any details of the facts from which the Bundesnetzagentur had concluded that the demand for spectrum exceeded availability. Without a more detailed factual basis – or at least abstract information on overall spectrum requirements so as not to disclose confidential data – the order for award proceedings constituted an error in law on formal grounds. In connection with this, one respondent called for the notified requirements to be published.

361 In respect of the further proceedings, one respondent anticipated that the correctness of the choice of proceedings would be reviewed on the basis of the qualified requirements notified by those companies admitted to the proceedings.

362 There was also a call for the upper frequency block at 1875 to 1880 MHz to be included in the award proceedings to avoid regulation-induced scarcity.

The Chamber has ruled as follows:

363 Based on the qualified notified requirements of 31 January 2012 (cf demand identification proceedings of 21 November 2011, Order No 79/2011, Bundesnetzagentur Official Gazette No 23/2011, page 4138ff) and taking account of the submissions made by interested parties and other parties affected on 24 April 2012 (for details cf Communication No 275/2012, Bundesnetzagentur Offical Gazette No 8/2012, page 1150ff) and 9 November 2012 (for details cf Communication No 958/2012, Bundesnetzagentur Official Gazette No 22/2012, page 3960ff) and the updated notified requirements of 20 August 2014 (for details cf Order No 43/2014, Bundesnetzagentur Official Gazette No 14/2014, page 2121ff) the Chamber is convinced that demand for frequencies in the 700 MHz, 900 MHz and 1800 MHz bands referred to above, as well as in the 1.5 GHz band, exceeds the available spectrum and that these frequencies are therefore scarce resources within the meaning of section 55(10) first sentence, first alternative TKG.

364 Under section 55(10) first sentence TKG it may be ordered, without prejudice to section 55(5) TKG, that the assignment of frequencies be preceded by award proceedings according to section 61 TKG based on conditions to be determined by the Chamber when spectrum is scarce. The scarcity assumed in the two alternatives set out in section 55(10) first sentence TKG can result from either the established fact of a surplus of applications (section 55(10) first sentence, second alternative TKG) or the forecast of an insufficient number of frequencies (section 55(10) first sentence, first alternative TKG).

365 In consideration of the wording of the law and of the connection between the two possible cases referred to in section 55(10) first sentence TKG, the forecast mentioned in the first alternative refers to demand exceeding supply at the time of assignment with a greater number of applications being made than frequencies are

available. This forecast is based on the Chamber's determination that demand exceeds supply.

366 In order to determine spectrum demand a tried and tested, informative and multistage process is available in the shape of demand identification proceedings, by which the Chamber makes a public call for requirements for particular frequencies to be notified within a set period, paving the way for its decision on issuing an order for award proceedings. This process also takes proper account of the criteria of objectivity, transparency and non-discrimination, and grants an equal opportunity to all the applicants to access spectrum.

367 Formal demand identification proceedings are not explicitly prescribed in section 55(10) TKG. Moreover, the Chamber draws on information that offers a comparable guarantee for the accurate recording of current frequency requirements and thus is no less suitable as a basis for a forecast of sufficient or possibly insufficient spectrum (cf also Federal Administrative Court 6 C 3.10, No 25). Scarcity is therefore not exclusively established and determined by the requirements notified.

368 The Chamber held that it is appropriate and efficient to initiate, by its decision of 21 November 2011, demand identification proceedings to determine spectrum requirements in the 900 MHz and 1800 MHz bands as the first procedural step in order to ensure that frequencies are assigned in open, objective, transparent and non-discriminatory proceedings (for details see the decision of 21 November 2011 loc cit). Furthermore, by administrative order of 24 July 2014, the Chamber gave all interested undertakings the opportunity to update or notify their requirements also taking account of the changes in the market structure.

369 In total the qualified demand exceeds the supply of available frequencies in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands. In demand identification proceedings several undertakings notified their qualified requirements also with a view to the changing market structure in mobile networks. Further, some expressions of interest were submitted and requirements announced.

370 In assessing frequency demand for MFCN, the Chamber took those requirements into account where the interested undertakings had demonstrated their demand for frequencies was plausible and serious in accordance with qualified demand identification proceedings. Therefore the Chamber's determination regarding the potential scarcity of spectrum was only based on notifications for which the interested undertakings have clearly and conclusively demonstrated that they can secure the efficient and interference-free use of the spectrum within the meaning of section 55(5) first sentence para 4 TKG at the time of assignment. This clear and conclusive account must cover both the subjective requirements of reliability, financial capacity and specialist knowledge, and the presentation of a convincing concept for intended use of the frequencies for assignment. Respondents' earlier demands have been met in as much that a mere declaration of interest or the announcement of requirements are not sufficient criteria for inclusion when demand is identified.

371 The Chamber consequently applied stringent criteria before notified requirements were included in demand identification proceedings with the aim of ensuring that notifications of demand are plausible. In principle, requirements to be met by notifications in the demand identification proceedings were much the same as in a qualification procedure for an auction within the meaning of section 55(4) and (5), and section 61(4) third sentence TKG, without the need, however, to present applicable documentary evidence. The administrative order of 24 July 2014 on the demand identification proceedings sets this out as follows:

> *"Re 5: Presentation of spectrum needs*
>
> *Participation in proceedings to identify demand is not restricted. Interested undertakings are invited to state their requirements for spectrum assignment in*

the 900 MHz and 1800 MHz bands as from 1 January 2017. The proceedings are not restricted to existing mobile network operators. There is no apparent legal or objective reason for any such restriction of the demand identification proceedings.

In order to ensure that the notifications of demand are plausible and seriously meant, the notifications will have to comply with specific requirements for these proceedings. The Chamber thus considers qualified demand identification proceedings to be necessary. In line with the purpose of identifying demand – to establish whether demand is likely to exceed supply in order to have a basis for forecasting whether frequencies are not expected to be available for assignment in sufficient numbers (section 55(10) first sentence, first alternative TKG) – notified requirements are particularly convincing when account is also taken of the objective and subjective criteria for future frequency assignment (section 55(3), (4) and (5) TKG) in addition to setting out interest in a particular usage.

Preconditions for assigning frequencies are that "their efficient and interference-free use by the applicant [is] secured" and "their compatibility with other frequency usages [is given]" (see section 55(5) first sentence paras 3 and 4 TKG). Interested companies are thus called on to set out clearly and conclusively that efficient and interference-free use within the meaning of section 55(5) first sentence para 4 TKG will be secured by them from the time of assignment. This clear and conclusive account must cover both the subjective requirements of reliability, financial capacity and specialist knowledge, and the presentation of a convincing concept for intended use of the frequencies for assignment.

To demonstrate the efficient use of this spectrum, an aim to which the TKG is committed, it is recommended that applicants provide a frequency usage concept with reference to their particular business model. This is particularly relevant if they already hold suitable spectrum with which to implement their business model. In this context the Chamber has thus decided not to adopt the proposal of a respondent who called for the proceedings to take due account of the fulfilment of assignment conditions at a past time."

372 For further details on requirements concerning the plausibility of demand for spectrum subject to the criteria of reliability, financial capacity and specialist knowledge, as well as the frequency usage concept for the technical implementation of the planned service concept, the Chamber makes reference to its statements in the administrative order of 24 July 2014 (loc cit, page 12ff). At this stage of the proceedings it would place an unreasonable burden on parties requesting assignment to expect them to provide evidence (such as financing commitments) in addition to plausible frequency requirements – not least owing to the cost of providing such evidence. The Chamber cannot therefore accept the call, made by some respondents in their responses to the Scenarios Paper, that when identifying demand for frequency account should not be taken of the requirements notified by applicants who have not demonstrated fulfilment of assignment conditions in the past.

373 In this connection the Chamber points out that the purpose of the notified requirements is to identify potential excess demand and the legally envisaged procedures which consequently arise for frequency assignments. Demand is identified in accordance with section 55 TKG as well as on the basis of clear, objective and non-discriminatory proceedings. It is essential that the Chamber can act on the basis of frequency requirements that are rooted in objective fact and reflect the actual requirements of the interested undertakings. The exercise of strategic influence on this objective procedure, or on the actual demand situation in the market, is therefore incompatible with the purpose of the demand identification proceedings.

374 The frequencies will be assigned by the Bundesnetzagentur only after written application and only after participation in award proceedings. The Bundesnetzagentur will issue a call to apply for admission to the award proceedings shortly before conducting proceedings, section 61(4) third sentence TKG. Applicants that have already declared their substantiated interest in specific frequency usage in the bands at 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz in the demand identification proceedings are also required, under section 55(4) and (5) TKG, to provide more detailed accounts and evidence of compliance with the legal requirements for assignment under section 61(4) fifth sentence TKG.

375 Here, the Chamber would like to point out that – contrary to one respondent's opinion – it does not award spectrum to applicants irrespective of their actual requirements. Rather, it verifies compliance with the minimum legal requirements for admission to the auction (cf III.1.3). Section 55(5) first sentence para 4 TKG, for instance, requires the applicant to secure efficient spectrum use. Applicants should therefore set out, in the form of a frequency usage concept, how they intend to secure efficient use. This concept must be clear and conclusive and, in particular, contain information on the technical planning for the particular business model and service concept. A general distinction between the existing network operators and assignees and potential new entrants – as requested by some potential newcomers – is not possible because all applicants should have equal treatment.

376 The Chamber considers all qualified notified requirements to be sufficiently informative for the purpose of forecasting that the number of applications may be expected to exceed the available frequencies in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands (cf section 55(10) first sentence, first alternative TKG).

377 As provided for in the decision of 21 November 2011, in a first step interested undertakings have presented clear, conclusive concepts for a planning period of five years and longer. The results of the demand identification proceedings were made known at a public information event on 9 November 2012. At the same time, the interested undertakings confirmed or upheld their requirements.

378 After examining the updated notified requirements of 24 July 2014, the Chamber has reached the conclusion that total notified requirements clearly exceed available spectrum in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands by more than 100 MHz.

379 The spectrum totalling 270 MHz that is available for these proceedings is listed in the following table:

Frequency band	**Spectrum**	**Volume**
700 MHz	703 - 733 MHz / 758 - 788 MHz	2 x 30 MHz (paired)
900 MHz	880 - 915 MHz / 925 - 960 MHz	2 x 35 MHz (paired)
1800 MHz	1725 - 1785 MHz / 1820 - 1880 MHz	2 x 50 MHz (paired)
1.5 GHz	1452 - 1492 MHz	1 x 40 MHz (unpaired)

Table 5

380 In light of the intended channel arrangement of 5 MHz, this allows 2 x 30 MHz in the 700 MHz band, 2 x 35 MHz in the 900 MHz band, 2 x 50 MHz in the 1800 MHz band and 1 x 40 MHz in the 1.5 GHz band to be made available.

381 The requirements notified clearly exceed the spectrum available by more than 100 MHz even if account is taken of the changed market structure in the mobile radio sector and of the additional 2 x 5 MHz of spectrum now available in the 1800 MHz band.

382 The Chamber's forecast decision has taken the qualified requirements that have been notified and the resulting excess demand as its factual basis. Accordingly, the Chamber assumes that there will not be enough suitable spectrum available for assignment. Following thorough verification of the facts of the case, the Chamber has based its forecast decision in accordance with section 55(10) first sentence TKG on all the circumstances that are relevant for clarifying the availability of sufficient spectrum at the date of award.

383 The Chamber is of the opinion, bearing in mind the qualified, notified requirements and both its own and international forecasts on developments in the market, in technology and internationally, that at the time of award more applications will be made for award of frequencies than there are frequencies available.

384 After taking into account all the circumstances, and in particular the relevant objective facts, the Chamber's forecast must be reached on the basis of objective, transparent and non-discriminatory proceedings. At the same time account must also be taken of future developments in the market and, in addition to the use that is currently being made of spectrum and existing technologies and service offers, of foreseeable technical developments and innovative services.

385 The Chamber's forecast decision has taken the qualified requirements that have been notified and the resulting excess demand as its factual basis. Accordingly, the Chamber assumes that there will not be enough suitable spectrum available for assignment. Following thorough verification of the facts of the case, the Chamber has based its forecast decision in accordance with section 55(10) first sentence TKG on all the circumstances that are relevant for clarifying the availability of sufficient spectrum at the date of award.

386 Bearing in mind the complexity of measures to regulate frequencies on the one hand and the dynamic development of markets and ever shorter development cycles for innovative technologies on the other, a forecast cannot simply reflect the existing status quo but must, wherever possible, also include foreseeable future developments to ensure that frequency regulation takes account of the dynamic conditions that prevail in the market. For this reason, when reaching a decision relevant to scarcity, the Chamber regards one of its main tasks to be not only evaluating requirements that have already been notified but also assessing future market and technology developments in order to provide frequencies in a competitive environment in a way that satisfies demand and requirements.

387 The Chamber has come to the conclusion that parts of the spectrum that to date have been used for GSM will continue to be used for GSM services for a certain period of time. In addition to the gradual changeover from GSM to broadband technology, it is also necessary that additional spectrum is provided for mobile broadband at the earliest possible date. In view of an assignment period of around 15 years in the field of mobile communications, the Chamber also takes account of medium term developments in mobile communications and is providing further frequencies for broadband rollout in the 700 MHz band.

388 Against the backdrop of the successes achieved to date in the mobile communications market in Germany, the Chamber regards the enormous dynamism of technical progress and of the development of service offers, along with an appropriate price structure and the permanently growing number of users who are making increasing use of mobile broadband services, as indicators that there will continue to be growing demand for suitable spectrum resources for further rollout of the broadband network. The statements made by respondents to the analysis paper also generally confirm the assessments made by the Chamber.

389 In view of the sharp rise in the number of customers who use mobile data services and the dynamic, technological progress in mobile devices (eg smartphones), it must be expected that fast-growing demand for mobile broadband services, ie mobile

internet, will provide the impetus for further rollout of the high-speed broadband network. For example the number of smartphones and tablets sold in Germany has risen sharply. In February 2014 it was predicted that nearly 82% of all mobile phones sold in Germany in 2014 would be smartphones (cf BITKOM press release of 12 February 2014). Since 2012, there are now more smartphones in the German market than standard mobile telephones (cf Comscore study "Digitales Deutschland" of 2013).

390 In terms of the objectives of its broadband strategy, the federal government's aim is to provide the population with blanket coverage of 50 Mbit/s by 2018. In order to achieve these objectives coverage will need to be extended to poorly served areas in good time and the available data rates increased. It will only be possible to meet rising demand for high bit rate data services, however, if bandwidths of 10 MHz and more are used. The technical development of LTE into LTE Advanced will be standardised with a bandwidth of up to 100 MHz.

391 The key objective of the broadband strategy is that broadband rollout will primarily be undertaken competitively by telecommunications companies subject to market forces. In order to provide stimulus for broadband rollout, including in rural communities, further suitable spectrum resources will need to be provided for this purpose. The more sufficient and suitable spectrum that is made available to undertakings for broadband rollout over large areas, the more broadband will become available driving a competitive environment.

392 Wireless high-speed networks are an essential precondition for the provision of access to innovative mobile broadband services, while existing and continuously growing high demand for voice services will continue to use up corresponding network capacities. Correspondingly high network capacities will be required for this purpose. Increases in network capacities are influenced by technological developments in network elements and terminal equipment, as well as the optimisation of network architectures, which contribute to an efficient use of existing spectrum resources. Nonetheless, these measures will need to be accompanied by the early provision of additional suitable spectrum resources.

393 Foreseeable growth in demand for mobile broadband services means that the broadband objectives of providing at least 50 Mbit/s nationwide can only be met if corresponding transmission capacities can be provided cost effectively. The Chamber does not believe that other measures – such as making networks more dense – would be as cost effective in providing services to areas outside metropolitan areas. In fact the nationwide provision of services to increase capacity – particularly in rural areas – can be achieved more cost effectively with twice as much available spectrum rather than making networks more dense, which would involve a substantial increase in the number of locations. Acquiring new locations is a time consuming and costly undertaking. Rapid and cost efficient rollout to rural communities using the 800 MHz frequencies awarded in 2010 was primarily possible because existing locations could be used. This demonstrates that without sufficient spectrum being provided below 1 GHz there is no incentive for the continued rollout of high speed wireless broadband networks in rural communities and thus the objectives of the broadband strategy and the Digital Agenda 2014 - 2017 cannot be achieved. The digital divide between urban and rural areas would then grow even wider.

394 International studies on future market developments are also based on the assumption of an enormous increase in data volumes and corresponding frequency requirements. The ITU (International Telecommunication Union) forecasts in its report ITU-R M.2243 (Assessment of the global mobile broadband deployments and forecasts for international mobile telecommunications http://www.itu.int/pub/R-REP-M.2243-2011) the requirements for mobile broadband up to the year 2020. The huge success of new technologies and devices, such as smartphones and tablet PCs, innovative applications as well as new business models and the resulting change in

behaviour of cell phone customers have already led to a far greater volume of data than predicted in the ITU's Report ITU-R M.2072 for the period 2007 to 2011. In 2011 the ITU consequently adjusted its projections for volumes of data traffic up to 2015. Cisco's 2014 forecast (Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2012–2017) suggests that even these adjusted figures will be exceeded.

395 The Chamber forecasts that, bearing in mind the notified requirements as well as market and technological developments, more applications will be made for award of frequencies in the bands at 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz than frequencies are available.

396 In response to the comment that some spectrum assigned in the bands at 450 MHz, 2 GHz, 2.6 GHz and 3.5 GHz was not actually all being used and hence that the operators' requirements did not correspond to those notified and spectrum was not scarce, the Chamber would like to state the following.

397 The Chamber is not convinced by this argument even if it is true that some companies have notified requirements beyond their current demand and use as a result of longer term planning. Rather, the Chamber believes it would not be correct for a state authority to influence company decisions by excluding such qualified spectrum requirements. The only requirements to be excluded are those where it is clear that the notifying company plans to hoard spectrum or has other inappropriate intentions or where it is obvious that the assignment requirements are not met. Contrary to respondents' claims, the aim of the demand identification proceedings provided for by section 55(10) TKG is not to prevent scarcity by a frequency regulation assessment of the notified requirements by the Bundesnetzagentur.

398 Specifically:

399 It is each company's individual spectrum demand and not the user group's overall demand which is assessed (cf section 55(4) and (5) and section 61(3) TKG). An assessment of the requirements of a user group as a whole would disregard the fact that the total volume of spectrum assigned as referred to by the respondent is not assigned equally between the current operators. In addition, it would disregard the fact that assignees are generally allowed to use the spectrum with any of the intended technologies matching their individual business plans (cf section 54(2) TKG) and for any type of telecommunications service.

400 The process for identifying demand is therefore essentially based on the requirements notified by the market players themselves. These individual requirements are determined by the companies on the basis of their particular positions and options in the competitive market. The companies need to assess their options against two factors: firstly, the intramodal competition in the mobile sector, and in particular the need for adequate spectrum holdings given the new market structure and competitive environment following the merger between Telefónica and E-Plus; and secondly, the intermodal competition between mobile and fixed line services.

401 A company's particular competitive position comprises the characteristics of its network as the basis for the range, quality and price of the products to be offered. The network characteristics in turn influence the company's options in both intermodal and intramodal competition. Each company determines its own forecasts about market and communication developments and demand-oriented network capacity and its strategic and competitive objectives. Spectrum requirements will vary depending on several factors: whether or not a company is pursuing an "aggressive" business strategy aimed at gaining new customers or customer groups or marketing increasingly faster broadband services; whether or not it is designing the price, range and quality of its services with customers across the country or primarily urban customers in mind; or the company's forecasts about future business, market or

technological developments (LTE Advanced, 5G, etc) in connection with the future assignment periods.

402 The possibility for companies to notify requirements beyond their current demand and use as a result of longer term planning was essentially confirmed by Cologne Administrative Court on 3 September 2014 (21 K4413/11, page 21f):

> *"The companies' notified requirements which provide the basis for identifying demand can naturally be influenced by plans and developments relating to a point in time beyond the decision on account of the generally long assignment terms; where permitted by the applicable frequency usage conditions and where the discretionary power of revocation as provided for by section 63(1) first sentence TKG is not to be exercised, the notified requirements may comprise additional requirements expected to arise during the term of the assignment. Hence the fact that a party seeking assignment may still have some unused spectrum usage rights does not necessarily mean that the additional spectrum requirements notified by the party cannot be taken into account when identifying demand and predicting whether or not there will be a surplus of applications for assignments."*

403 Contrary to the respondent's view, the Bundesnetzagentur's discretionary power of revocation as provided for by section 63(1) first sentence TKG is not to be exercised for frequency assignments above 1 GHz.

404 In respect of the question about the need for frequency regulation action to ensure efficient use of the spectrum in the 3.5 GHz band, the Chamber drew particular attention to the following in its decision on the merger between Telefónica and E-Plus (loc cit, no 288f).

> *"In the 3.5 GHz frequency band, E-Plus is assigned 2 x 42 MHz (paired). The other parties concerned do not have any spectrum in this band. The merger between Telefónica and E-Plus would therefore not bring about a change in spectrum distribution in the 3.5 GHz band.*
>
> *The Chamber does not expect LTE to be deployed in the short term to such an extent that it would result in discrimination. Attention is also drawn to the fact that further frequencies in the 3.5 GHz band are available for assignment. The Chamber therefore does not currently see the need for frequency regulation action."*

405 In respect of the use of paired spectrum at 2.6 GHz, the Chamber drew attention in its decision on the merger between Telefónica and E-Plus to the following distinction in relation to the 900 MHz and 1800 MHz spectrum (loc cit, no 283):

> *"Furthermore, no discrimination is expected from spectrum holdings in this band in the short term since these frequencies are currently used primarily to supplement capacity in urban areas (such as hot spots), in contrast to the frequencies in the 800 MHz, 900 MHz, 1800 MHz and 2 GHz bands.*

406 In respect of the paired spectrum at 2 GHz, the Chamber stated in its decision on the merger between Telefónica and E-Plus (loc cit, no 285ff) that it would investigate the possible need for action following the re-award of the spectrum:

> *"Furthermore, the Chamber, in assessing a need for short term action at 2 GHz, also took into account the fact that the merged company is required to return spectrum in the 1800 MHz band before expiry. It should be noted here that the Chamber's assessment concerning the early return of frequencies also took into account the merged company's spectrum holding in the 2 GHz band. The merged company is capable of moving voice traffic from the 1800 MHz band to its UMTS network in the short term. With this also in mind, the Chamber does not currently see any discrimination as a result of the merged company's larger spectrum*

holding at 2 GHz. However, the Chamber will, taking an overall view, investigate the need for action in particular at 2 GHz in light of the spectrum holdings of all competitors following the re-award of frequencies in the 900 MHz and 1800 MHz bands (investigation into spectrum distribution)."

407 In respect of the use of unpaired spectrum at 2 GHz and 2.6 GHz, the Chamber stated the following in its decision on the merger between Telefónica and E-Plus (loc cit, no 285ff):

"The frequencies of most significance to mobile communications in Europe are the paired bands at 800 MHz, 900 MHz, 1800 MHz and 2 GHz.

In the President's Chamber's view, there is currently no need for frequency regulation action in the unpaired bands on account of expected discrimination against competitors. Mobile technology for the unpaired bands at 2 GHz and 2.6 GHz is not yet sufficiently available in Europe for the mass market or is not yet used. These frequencies are currently used in particular to supplement capacity in hot spots.

In respect of comments questioning the efficient use of frequencies and calling for spectrum to be redistributed in favour of competitors and potential new entrants, it should be noted that the merger is not expected to bring about a change in terms of efficient frequency usage. The Chamber expects that the (paired and unpaired) frequencies at 2.6 GHz will be used more extensively following the swift rollout of broadband networks – in particular with LTE – using the frequencies at 800 MHz and 1800 MHz."

408 Another factor to be taken into account in assessing spectrum requirements is that – contrary to the respondent's opinion – the spectrum to be awarded in the 700 MHz and 900 MHz bands is not necessarily interchangeable with spectrum at or above 2 GHz. Owing to their physical propagation characteristics, frequencies below 1 GHz are better suited for cost efficient coverage in rural areas than those above 1 GHz.

409 Furthermore, one respondent questioned the requirements of the existing mobile operators as, the respondent believed, they were not currently using all the spectrum assigned at 900 MHz and 1800 MHz efficiently. This requires further clarification not least because it is not possible to make an overall assessment of the efficiency of spectrum use by all current assignees but, rather, an individual assessment of the efficiency of use by each specific assignee needs to be made. Here, the Chamber would like to point out that, in its decision on the merger between Telefónica and E-Plus (BK1-13/002), it identified the need for short term action in the 900 MHz and 1800 MHz bands to ensure non-discriminatory spectrum holdings and efficient spectrum use (no 242f):

"In the Chamber's view, the amount of spectrum held by the merged company at 900 MHz/1800 MHz is not justified with a view to non-discrimination and efficient frequency usage. Even if the merged company used 2 x 20 MHz (paired) for LTE services at 1800 MHz, it would – with a comparable number of customers – still have about twice as much spectrum for GSM services as its competitors. Vodafone, for instance, has only 2 x 17.8 MHz (paired) for GSM in these frequency bands. This competitor does not have comparable spectrum resources to be able to introduce LTE alongside GSM in these frequency bands in the short term. Furthermore, there are concerns since the merged company, with almost the same number of customers as its competitors, would hold half of the spectrum in the 900 MHz and 1800 MHz bands. The competitors would not therefore be able to react promptly to the asymmetries produced by the merger. With regard to the principle of efficient frequency usage, Telefónica did not say why – even given the use of 2 x 20 MHz (paired) for broadband technologies – the amount of GSM spectrum, being twice as much as its competitors', was not

sufficient to provide its own customers with adequate GSM capacity without any relevant loss of quality."

410 The Chamber held that is appropriate to achieve the above-mentioned aims by reallocating the spectrum in the 900 MHz and 1800 MHz bands (cf no 324ff, loc cit):

"The early partial return of 900 MHz and 1800 MHz spectrum by 31 December 2015 in connection with reallocation in open, objective, transparent and non-discriminatory proceedings as well as the examination of frequencies distribution serve, in compliance with section 52(1) TKG, to secure the efficient use of frequencies and to promote the other relevant regulatory aims and principles set out in section 2(2) and (3) TKG. The Chamber took particular account of the regulatory aims of safeguarding user, most notably consumer, interests in telecommunications as per section 2(2) para 1 TKG, securing fair competition and promoting telecommunications markets with sustainable competition in services and networks as per section 2(2) para 2 TKG and expediting the rollout of public high speed next generation networks as per section 2(2) para 5 TKG. In following these aims, the Chamber applies objective, transparent, non-discriminatory and proportionate regulatory principles in accordance with section 2(3) para 2 TKG by guaranteeing that there is no discrimination between telecommunications network operators and telecommunications service providers in comparable circumstances. These aims and principles serve the interests of the general public. (...)".

Order for award proceedings

The following comments were made:

411 The current spectrum usage rights for the 900 MHz and 1800 MHz bands should be extended, at least for a transitional period.

412 The Chamber should consider making those bands available for public use which the established market players do not essentially need at the present time instead of reserving them for a technology which – on account of the size of the investment involved – could only be deployed by large market players. Alternatively, smaller companies could be given a chance in the market by reserving spectrum at the auction for new entrants. In addition, spectrum below 1 GHz could be made available for licence exempt use for WiFi. The planned duplex gap at 733 to 758 MHz could be used, for example, or the remaining DVB-T spectrum on a secondary basis.

The Chamber has ruled as follows:

413 The order for award proceedings is made under sections 55(10) and 61 TKG in conjunction with Article 87f of the Basic Law and sections 2(2) and (3) and 55(4) and (5) TKG in such a way that the assignment of spectrum for MFCN in the 700 MHz, 900 MHz and 1800 MHz bands and further spectrum in the 1.5 GHz band must be preceded by award proceedings.

414 Section 55(10) TKG states that the Bundesnetzagentur "may" order, without prejudice to subsection (5), that assignment be preceded by award proceedings according to section 61 TKG. In the case of scarcity, award proceedings are normally ordered under the law (ie are the normal case).

415 The spectrum available for assignment in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands is insufficient (cf 1.3). On account of the scarcity identified in these bands the law makes provision in section 55(10) TKG for award proceedings to be ordered.

416 Award proceedings are suited to ensuring fulfilment of the Bundesnetzagentur's statutory task. Extending the GSM frequency usage rights – as called for by

respondents – would not be equally suited to securing the regulatory aims as set out in section 2(2) TKG.

417 Conducting award proceedings essentially meets the regulatory aim according to section 2(2) para 1 TKG of safeguarding consumer interests by gaining the greatest possible benefits for consumers in terms of choice, quality and price. The spectrum available will be assigned on a technology and service neutral basis, thus promoting the nationwide provision of voice communication services and the expansion of broadband infrastructure in line with mobile operators' business models and consumer demand. The award proceedings will be designed so as to create incentives to encourage prompt and efficient use of the spectrum and hence the provision of affordable, innovative services for consumers. Extending the GSM usage rights would not be as effective in ensuring swift broadband expansion alongside GSM services. The current fragmentation in particular in the 900 MHz band would be retained; this could delay the use of the spectrum in blocks of 5 MHz, as suited to broadband technologies, with negative consequences on the provision of broadband services for consumers.

418 Award proceedings contribute to achieving the fundamental regulatory aim of securing fair competition and sustainable competitive markets (section 2(2) para 2 TKG). Award proceedings are objective, open, transparent and non-discriminatory proceedings which will provide both the current mobile operators and new entrants with equal access to spectrum resources to accommodate their business models. Fair competition for both existing market participants and new entrants can most notably be secured by means of award proceedings based on suitable rules. Extending the 900 MHz and 1800 MHz frequency assignments would not give new entrants access to the spectrum. Given the change in the market structure especially, access to spectrum resources needs to be guaranteed in open, transparent and non-discriminatory proceedings to promote competition in infrastructure and services.

419 The objective of promoting sustainable competitive markets can only be met if the framework and procedural conditions – when providing spectrum to competitors as well – are designed so as to enable well-functioning competition to be maintained and strengthened in as many areas as possible. Award proceedings are suited to preventing potential competitive disadvantages in respect of spectrum holdings. Unlike the option of extending frequency usage rights, award proceedings will enable existing mobile operators to adapt their spectrum holdings in response to the changed market conditions and in line with their business models.

420 In spite of the initial proposal to assign a "frequency reserve" of 2 x 5 MHz (paired) in the 900 MHz band to each current network operator upon application to ensure the availability of infrastructure as envisaged in Article 87f of the Basic Law, the Chamber wishes to draw attention to the following. The option of providing a frequency reserve was considered with a view to maintaining the four nationwide networks in place at the time, in particular in respect of voice communications. Providing a frequency reserve would have been the most appropriate regulatory measure given the market structure with four independent mobile networks.

421 In light of the change in the market environment and the consequent change in the ratio between the number of market players and the amount of spectrum available, the objective of maintaining the existing GSM infrastructure can, however, now also be reached by setting a spectrum cap. A spectrum cap of 2 x 15 MHz in the 900 MHz band is necessary to safeguard fair competition in rural areas as well and to promote sustainable competitive markets. This will enable each mobile operator to acquire a sufficiently large and suitable spectrum package, in turn enabling consumers to continue to enjoy the benefits of competitively operated nationwide mobile networks. All the mobile operators have additional spectrum in other bands, enabling them to offer both GSM and broadband services.

422 Limiting the bidding rights is both necessary and sufficient to guarantee seamless provision of nationwide mobile services for consumers. This will enable each mobile operator to acquire spectrum in the 900 MHz band to expand or maintain existing infrastructure.

423 At the same time, setting a spectrum cap will also enable a new entrant to acquire a sufficiently large and suitable spectrum package below 1 GHz in open, transparent and non-discriminatory award proceedings.

424 Award proceedings accommodate the regulatory aim of expediting the rollout of public high speed next generation telecommunications networks (section 2(2) para 5 TKG). Providing spectrum on a technology neutral basis in award proceedings will create incentives to encourage prompt and efficient use of the spectrum for high speed mobile broadband networks. Extending usage rights would not be as effective in ensuring the swift rollout of public high speed next generation telecommunications networks. A suitable channel arrangement based on 5 MHz or multiples of this is conducive to broadband rollout and would not be available should the usage rights for the 900 MHz and 1800 MHz spectrum be extended.

425 Award proceedings are suited to securing efficient spectrum use as envisaged in section 2(2) para 7 TKG. Award proceedings can serve to determine which of the parties seeking assignment are best placed to make efficient use of the spectrum to be assigned. A successful bid typically demonstrates the willingness and ability to make optimal use of the spectrum to be assigned in providing services in a competitive environment and to strive for efficient and economical use of the spectrum.

426 Having weighed up the regulatory aims and principles, it is not possible to meet respondents' calls for the spectrum usage rights in the 900 MHz and 1800 MHz bands to be extended.

427 In response to calls for bands below 1 GHz to be made available for public use, the Chamber would like to draw attention to the particular significance of this spectrum for nationwide mobile broadband rollout and to the corresponding call for nationwide availability and use of the spectrum.

Re II. Choice of award proceedings as provided for by section 61(1) TKG

428 The following comments were made:

429 It has been said that a spectrum auction was not appropriate, at least not at the present time, and would conflict with the federal government's broadband objectives as the auction would take the funding that the market urgently needs for rollout of the mobile broadband network.

430 Further, it was said that the auction proceedings were not the standard procedure as the spectrum in the bands at 900 MHz and 1800 MHz in particular had been assigned outside the auction process due to the GSM strategy.

431 **The Chamber has ruled as follows:**

432 The Chamber hereby orders that assignment of the spectrum in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands be preceded by auction proceedings as provided for by section 61(1) and (2) TKG.

433 Auction proceedings secure the regulatory aims set out in section 2(2) TKG. Under section 61(1) first sentence TKG award proceedings may take the form of auction or tendering proceedings. According to section 61(2) first sentence TKG, the auction proceedings laid down in section 61(5) of the TKG are generally to be conducted except where an auction is not likely to secure the regulatory aims set out in section 2(2) TKG. On this the Federal Administrative Court has stated the following (cf BVerwG ruling of 10 October 2012 – 6 C 13/11 – margin no 33):

"The Bundesnetzagentur does not have any discretionary powers in determining the proceedings given that, under section 61(2) first sentence TKG, auction proceedings are to be conducted as a general rule except where such proceedings are not likely to secure the regulatory aims. In this respect, however, the Bundesnetzagentur does have certain scope for discretion as far as the factual elements of the norm are concerned. This is justified by the need for a complex process of weighing up the regulatory aims and balancing out conflicting public and private interests to determine the suitability or lack of suitability of auction proceedings."

434 Section 61(2) first sentence TKG establishes auction proceedings as the rule to which exceptions may be made, hence such proceedings are to be assumed to be suited to achieving the regulatory aims. Auction proceedings can achieve the statutory aim of award proceedings, namely to select those bidders who are best placed to use the spectrum efficiently. On this, the following is stated in the explanatory notes to section 61(4) TKG (section 59(5) of the government draft of 2004, Bundesrat printed paper 755/03, page 109):

"The successful bid typically demonstrates the willingness and ability to make optimal use of the spectrum to be assigned in providing services in a competitive environment and to strive for efficient and economical use of the spectrum."

435 Insofar as respondents have stated that the auction would take the funding that the market urgently needs for rollout of the mobile broadband network, the Chamber is instead of the view that the auction proceedings would encourage the economic and optimum use of frequency resources. Auction proceedings create incentives to encourage the use of the most efficient possible radio systems and consequently the best and most economical possible use of the spectrum in a competitive environment. The Chamber is also of the view that there are no obvious indications that the auction proceedings will lead to any of the disadvantages for broadband deployment put forward by the respondents. In this respect, for example, the respondents' comments are rebutted by the swift broadband rollout following the auction in 2010.

436 According to section 61(2) second sentence TKG auction proceedings may not be suited to securing the regulatory aims in exceptional cases where spectrum has already been assigned without auction proceedings for the usage designated in the Frequency Plan or where an applicant can claim a legal right to preference for the spectrum to be assigned.

437 Spectrum in the 900 MHz and 1800 MHz bands was assigned in various proceedings. The spectrum was awarded together with the GSM licences (to set up and operate digital cellular mobile networks based on the GSM or DCS 1800 standard) as part of the opening up of the market for digital cellular mobile communications. At the beginning of the 1990s, 2 x 12.4 MHz (paired) in the 900 MHz band was first assigned to each of the two D network operators (Telekom Deutschland GmbH and Vodafone GmbH) and 2 x 22.4 MHz (paired) in the 1800 MHz band was later assigned to each of the two E network operators (E-Plus Mobilfunk GmbH & Co. KG and Telefónica Germany GmbH & Co. OHG) in tendering proceedings. In 1999 additional spectrum available for GSM 1800 services in the 1800 MHz band was awarded in an auction to the four existing mobile operators (cf RegTP President's Chamber decision of 21 June 1999; Administrative Order No 70/1999, RegTP Official Gazette No 11/1999, page 1751). The 900 MHz spectrum packages for GSM comprising 2 x 5 MHz (paired) held by the E network operators were awarded as individual frequency assignments (spectrum relocation) in accordance with the 2005 GSM concept for the award of additional spectrum for public digital cellular mobile communications below 1.9 GHz (Administrative Order No 88/2005, Bundesnetzagentur Official Gazette No 23/2005, page 1852; Communication No 168/2012, Bundesnetzagentur Official Gazette No 3/2012, page 361ff).

438 These GSM frequency usage rights expire on 31 December 2016 and the spectrum is to be made available in these proceedings for MFCN – without any restriction to GSM – as designated in the Frequency Plan. The fact that the spectrum was previously assigned for another usage without an auction does not undermine the suitability of auction proceedings as referred to in section 61(2) second sentence TKG to jointly re-award the spectrum in the 900 MHz and 1800 MHz for its new usage, namely MFCN. Auction proceedings will eliminate the heterogeneous market access conditions for parties seeking assignment and will thus provide equal and non-discriminatory access to the spectrum (section 2(2) para 2, section 55(1) third sentence TKG) for each of the parties.

439 Where a commentator states that the auction proceedings are not the standard procedure, particularly as the spectrum in the 900 MHz and 1800 MHz has already been assigned outside the auction proceedings due to the GSM strategy, the Chamber points out that the GSM spectrum - and thus essentially voice communication services - has been assigned under the GSM strategy.

440 By contrast, all the spectrum for mobile broadband has so far been awarded in auction proceedings: the 2 GHz spectrum was auctioned in 2000 and the 3.5 GHz spectrum in 2006, and further spectrum freed in the 800 MHz, 1800 MHz, 2 GHz and 2.6 GHz bands and designated for MFCN was auctioned in 2010 on the basis of the President's Chamber decision of 12 October 2009 (Administrative Order No 59/2009; Bundesnetzagentur Official Gazette No 20/2009, page 3623).

441 Auction proceedings are also suited to securing the regulatory aims as set out in section 2(2) TKG. The Chamber has made a detailed examination of the suitability of auction proceedings in terms of securing the regulatory aims despite the fact that the cases set out in section 61(2) TKG do not fully apply.

442 Auction proceedings constitute objective, open, transparent and non-discriminatory proceedings for the allocation of spectrum under competitive conditions. Auction proceedings in particular accommodate the mandate to ensure the availability of infrastructure as set out in Article 87f of the Basic Law while promoting sustainable competitive markets for telecommunications services and networks in rural areas as well.

443 Specifically:

444 Auction proceedings are the appropriate award proceedings in terms of the regulatory aim of safeguarding consumer interests as set out in section 2(2) para 1 TKG.

445 Awarding spectrum in incentive-based auction proceedings enables optimal spectrum allocation and gives the operators maximum flexibility to accommodate their own business models and meet the interests of consumers in terms of price, quality and choice. Awarding the spectrum in auction proceedings creates incentives to encourage prompt use of the spectrum for the provision of innovative services in a competitive environment in the interest of the consumers.

446 Auction proceedings are the appropriate award proceedings in terms of the regulatory aim of securing fair competition and promoting sustainable competitive markets for telecommunications services and networks and for associated facilities and services, in rural areas as well, as set out in section 2(2) para 2 TKG. Auction proceedings provide both existing mobile operators and new entrants with equal access to the spectrum resources in open, non-discriminatory and transparent proceedings in the interest of the consumers. Auction proceedings provide maximum transparency and flexibility in particular for new entrants in respect of the value and usage interdependencies between the various bands at 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz.

447 In this context, the Chamber wishes to draw attention to the fact that participation in the auction proceedings is not restricted, provided that a party seeking assignment

meets the minimum specialist and other requirements. The award and auction rules are designed so as to give both existing mobile operators and potential new entrants non-discriminatory access to the spectrum resources (cf III and IV).

448 Auction proceedings are suited to expediting the rollout of high speed next generation telecommunications networks as envisaged in section 2(2) para 5 TKG. The maximum bids in an auction create incentives to encourage prompt use of the spectrum for mobile broadband in line with demand, enabling the costs of purchasing the spectrum to be recouped as quickly as possible.

449 Auction proceedings are suited to ensuring efficient spectrum use as envisaged in section 2(2) para 7 TKG. Auction proceedings are suited to promoting optimal and economical use of the resources and create incentives to encourage the use of the most efficient possible radio systems and consequently the best possible use of the spectrum in a competitive environment.

Re III. Determinations and rules

Re III.1 Qualification requirements, section 61(3) second sentence para 1 TKG

Re III.1.1 No restrictions on participation

450 Any person or undertaking can in principle apply to take part in the auction. The Chamber sees no reason to restrict participation provided that the undertakings meet the minimum requirements.

Re III.1.2 Competitive independence

451 If insufficient spectrum is available, spectrum is assigned to companies that are competitively independent of each other, in line with the existing regulatory practice (as last set out in BK1-13/002, loc cit). The regulatory aim of securing fair and effective competition (section 2(2) para 2 TKG) requires the independence of the assignment holders, or network operators, as competitors. Undertakings may therefore apply for qualification to take part in the auction once only and must declare in their application that there are no objections to their form of organisation under the Restraints of Competition Act.

Re III.1.3 Requirements for admission to the auction

The following comments were made:

452 The spectrum resources to be auctioned are not only extremely important for maintaining the current German GSM mobile infrastructure but also for the rollout and expansion of the most up-to-date mobile broadband infrastructures in support of the federal government's broadband targets and therefore the applications for qualification should be checked with a very critical eye as to the type of frequency use planned by the applicant. At the same time it must be ensured that the spectrum is used in line with its designation for MFCN. Likewise , the intended spectrum usage right should focus on the effective use of frequency allocation nationwide.

453 The process to check applications should ensure that only those participants are admitted to the auction whose intended use of the frequencies includes nationwide deployment.

454 Other respondents said that the Bundesnetzagentur had made it clear that it did not see any new entrants entering the market. However, it was only within the scope of the qualification procedure that the Bundesnetzagentur was authorised to check this and only then would the necessary documentation be available. Besides this, it was emphasised that bidders who sought protection against strategic bidding behaviour

had to provide proof of a minimum level of efficiency to be determined. This would ensure the maximum social welfare gain for the state and the population.

The Chamber has ruled as follows:

455 Undertakings will be admitted to the auction upon application (section 61(4) third sentence TKG).

456 Entitlement to participate in the auction proceedings is free from restrictions. The Chamber once again expressly states that these proceedings will grant new entrants in particular an opportunity to take part in the auction. To this end, the Chamber has included rules in this decision that apply solely to new entrants (such as specific rules on the coverage obligation). The Chamber is of the view that different rules are necessary in the interests of small and medium-sized enterprises (cf section 61(4) TKG).

457 However, the right to apply for admission opens up only the abstract possibility to take part in the auction. Each undertaking must be formally admitted to the auction by the Bundesnetzagentur in a written notice of admission (qualification notice) (section 61(4) fourth sentence TKG). Applicants must declare and demonstrate in their application for admission that they meet the requirements stipulated in section 61(3) second sentence TKG and those applicable under section 55(5) TKG.

458 Applicants have a duty to demonstrate more than the personal characteristics of reliability, efficiency and specialist knowledge as referred to in section 61(3) second sentence para 1 TKG. Section 55(5) first sentence para 4 TKG, for instance, requires the applicant to secure efficient and interference-free spectrum use. Applicants should therefore set out, in the form of a frequency usage concept, how they intend to secure efficient use. This concept must be clear and conclusive and, in particular, contain information on the technical planning for the particular business model and service concept. The Chamber thus takes account of the respondents' requests, in particular with regard to an applicant's planned frequency usage, which call for a detailed description of the frequency usage concept for efficient frequency utilization, both as to its substance and geographical dimension, and its evaluation by the Bundesnetzagentur in the application process. These requirements apply to both current network operators and new entrants.

459 Applicants must declare and demonstrate the following to fulfil the minimum specialist and other requirements for admission to the auction as referred to in section 61(3) second sentence para 1 TKG (for more details see Annex 1):

- that they meet the legal assignment requirements within the meaning of section 55(4) and (5) TKG;
- that they secure efficient and interference-free spectrum use as required in section 55(5) first sentence para 4 TKG;
- that they have the necessary financial resources to purchase the spectrum;
- that they have a serious intention to bid; and
- details of their undertaking's shareholding and ownership structure.

460 To accommodate the public's need for information and in particular to create transparency for the auction participants, the Bundesnetzagentur will publish details of the bidders admitted to the auction and the auction results.

Re III.1.4 Individual minimum spectrum requirements

461 Applicants are entitled to state the individual minimum spectrum requirements they regard as the absolute minimum for their business model in light of spectrum efficiency and business management aspects ("minimum essential spectrum package").

462 The Chamber ruled in III.3.1 that no basic spectrum package would be stipulated. Bidders whose individual minimum spectrum requirements for their business model exceed the smallest unit available for award of 2 x 5 MHz (paired) may specify a minimum essential spectrum package for the whole spectrum available for award but not for individual bands. The minimum essential spectrum package must be set out clearly and conclusively in the frequency usage concept. The Chamber will examine each applicant's minimum essential spectrum package as detailed in the concept. The minimum essential spectrum package allowed for each applicant will be specified in the applicant's qualification notice.

463 Bidders with a minimum essential spectrum package will be awarded the spectrum blocks for which they hold the highest bid at the end of the auction only when the spectrum won matches or exceeds the minimum essential spectrum package specified (for more details see IV.3.7 and IV.3.17). This ensures that bidders do not receive less than the minimum spectrum package required for their business model. Newcomers especially benefit from this in that they avoid the risk of having to pay for a spectrum package that does not correspond to their business model. Bidders admitted to the auction with a specified essential minimum spectrum package must maintain a minimum bidding activity level: bidders will be eliminated from the auction if they do not bid for spectrum matching or exceeding their minimum essential spectrum package (for more details see IV.3.9 and IV.3.15).

464 The Chamber does not consider it necessary to restrict the minimum essential spectrum package in advance. It is not possible to specify a uniform minimum spectrum package above the smallest unit of 2 x 5 MHz for all conceivable business models since the spectrum available for award can be used to offer a vast range of telecommunications services. The Chamber takes a minimum essential spectrum package to be the spectrum absolutely necessary for technically and commercially viable network operation. The minimum essential spectrum package must be set out clearly and conclusively in the frequency usage concept (for more details see Annex 1).

Re III.1.5 Qualification notice

465 The President’s Chamber decides on each application for admission to the auction in accordance with section 132(3) in conjunction with sections 55(10) and 61(4) fourth sentence TKG (qualification notice).

466 The qualification notice confirms that the requirements for admission to the auction as stipulated in section 61(3) second sentence para 1 TKG and those applicable under section 55(5) TKG are met and specifies the minimum essential spectrum package and the bidding eligibility (in lot ratings) (for more details see IV.3.8). These specifications are binding for the auction. The specified minimum essential spectrum package and maximum eligibility are pre-set for each bidder in the auction software. Applicants will only be granted eligibility if their application demonstrates clearly and conclusively that they will make efficient use of the spectrum requested for their business models.

Re III.1.6 Opening of the qualification procedure

467 The procedure for qualification to take part in the auction opens with publication of this Decision (in German) on the Bundesnetzagentur's website. The Decision will also be published in the Bundesnetzagentur's Official Gazette. The qualification procedure precedes the auction. The qualification procedure serves to establish that the requirements for admission to the auction are met (cf Annex 1). The President's Chamber decides on admission to the auction in accordance with section 132(3) in conjunction with sections 55(10) and 61(4) fourth sentence para 1 TKG.

468 Upon publication of this Decision in the Official Gazette, applications for qualification for the auction can be submitted by 6 March 2015. Applications for admission to the auction are to be submitted by 3 pm on 6 March 2015.

469 Applicants must give their consent in their application to publication of the fact that they have qualified to take part in the auction and have been awarded spectrum, where applicable.

Re III.2Determining the frequency usage for which the spectrum to be awarded may be used in compliance with the Frequency Plan (section 61(3) second sentence para 2 TKG)

Re III.2.1 Spectrum usage

The following has been said:

470 There was a call for the allocation of spectrum of a minimum of 2 x 10 MHz in the 700 MHz band to the authorities and organisations concerned with public safety. Scenarios that envisage frequency usage by the authorities and organisations concerned with public safety at the spectral ends of the 700 MHz band are not a realistic alternative in technical and economic terms.

The Chamber has ruled as follows:

471 The purpose for which the spectrum to be awarded may be used in observance of the Frequency Plan is MFCN, which is defined in the general part of the Frequency Plan as follows: "This spectrum usage connects terminal equipment to radio-based networks via fixed stations, generally to provide telecommunication services." The spectrum may therefore be used on a technology and service neutral basis without any restrictions for MFCN as defined in the Frequency Plan.

472 In response to calls from respondents to make the frequencies available for the applications of public safety agencies, the Chamber draws attention to the following:

473 The spectrum may be used for infrastructure links or other applications such as internal networks in addition to wireless connections for subscribers. The spectrum may therefore also be used for other applications, provided that the coverage obligation is met. This applies particularly to the use of frequencies by mobile telephone operators for the applications of public safety agencies. Central government and the federal states intend to enter into a long-term agreement for the authorities and organisations concerned with public safety with one or several frequency assignment holders, which will enable the use of mobile broadband data services while respecting the specific needs of public safety agencies. In this respect the federal government expects the frequency assignment holders to be willing to enter into negotiations with the central government and the federal states. In return there is a general willingness to include the shared use of the public agencies' own network infrastructures in a contractual arrangement.

474 The spectrum in the 900 MHz and 1800 MHz bands is designated in the Frequency Plan for MFCN.

475 The spectrum in the 700 MHz and 1.5 GHz bands is also to be designated for MFCN. The 1.5 GHz band has already been allocated to the mobile service under the Frequency Ordinance. The appropriate designation for MFCN for the provision of telecommunications services is still required in the Frequency Plan. Both the Frequency Ordinance and the Frequency Plan need to be amended in respect of the 700 MHz band. The spectrum in the 700 MHz band cannot be assigned until it has been allocated to the mobile service and designated for MFCN.

476 In response to calls from respondents for the 1.5 GHz band to be made available for PMSE use, the Chamber pointed out that this is possible in line with the concept developed by the Bundesnetzagentur (cf I Timing of the order).

Re III.2.2 Nationwide use

477 The spectrum in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands will be available for use across the country.

478 National assignment of this spectrum for MFCN will enable networks for innovative mobile broadband services to cover rural areas as well. Moreover, the regulatory aim of efficient and interference-free spectrum use within the meaning of sections 52 and 2(2) para 7 TKG can best be achieved by national assignment of the spectrum, as this requires less coordination than regional or local assignment.

479 The Chamber wishes to draw attention here to the fact that although the spectrum in the 700 MHz band is to be assigned for nationwide use, use may initially be restricted in some regions owing to the switch from DVB-T to DVB-T2. The Bundesnetzagentur is developing a switchover plan, involving national and international frequency coordination, in an iterative process in close cooperation with the federal states and stakeholders. The plan enables use of the 700 MHz spectrum for mobile broadband while taking full account of the DVB-T2 requirements plan drawn up by the federal states. As part of this process, the Bundesnetzagentur has been active within the established inter-governmental groups and in bilateral negotiations to optimise and agree the spectrum usage conditions for mobile broadband access in Germany with its neighbouring countries.

480 National assignment of all the spectrum for MFCN reflects the practice followed by the President's Chamber (consistency requirement). Experience in the 900 MHz and 1800 MHz bands has shown that coverage for end customers can be ensured most efficiently by nationwide providers. The assignments made to date in these bands have therefore been on a national basis. The Chamber therefore also intends to make national assignments for the spectrum now available for award. The spectrum for award in the 700 MHz band is especially suited to national assignment on account of the frequency usage provisions and the particularly favourable propagation characteristics.

Re III.3Basic spectrum package and restriction of bidding rights, section 61(3) second sentence para 3 TKG and section 61(4) in conjunction with section 61(2) first sentence TKG

Re III.3.1 Basic spectrum package

The following comments were made:

481 A spectrum reserve for new entrants has been rejected by some.

482 By contrast, others have called for a spectrum reserve for new entrants to take account of the interests of small and medium-sized enterprises. In this respect, one respondent proposed that 2 x 10 MHz below 1 GHz be reserved for new entrants. This would make it possible to meet and fulfil the regulatory aims and tasks set out in section 2(2) TKG. In principle the Bundesnetzagentur cannot be opposed to a reserve as a reserve had already been suggested in the course of these proceedings. Alternatively, spectrum floors could be used.

483 The Bundesnetzagentur's comments on spectrum caps showed that new entrants would be supported as far as possible. However, it had to be ensured that new entrants had a realistic opportunity of acquiring enough suitable spectrum. Not having a reserve yet retaining minimum bids would create barriers to market entry for new entrants as the latter evaluate frequencies on the basis of their actual value, whereas

incumbent operators can take any expected losses due to successful new entrants or any profit based on preventing market entry into account in their bids.

The Chamber has ruled as follows:

484 A basic spectrum package will not be set. Pursuant to section 61(3) second sentence para 3 TKG the Chamber can determine, where necessary and prior to award proceedings, the basic spectrum package required for commencement of the particular telecommunications service.

485 It is not necessary to do so in this case. It is not possible to specify a uniform minimum spectrum package above the smallest unit of 5 MHz for all conceivable business models since the spectrum available for award can be used to offer a vast range of telecommunications services.

486 The spectrum for award here is being made available for MFCN. Hence a large number of business models are possible, so that a uniform basic spectrum package cannot be determined. Additionally, bidders whose individual basic spectrum requirements for their business model exceed the smallest unit of 5 MHz available here can specify this as their minimum essential spectrum package. In the auction, bidders will be awarded packages only when the number of packages won, in total, matches at least the minimum essential spectrum package specified (for more details see III.1.4). This will make sure that bidders do not receive less than the minimum spectrum they have identified and thus are not dependent on obtaining further spectrum after the auction – eg by way of transfer – in order to be able to start their intended service.

487 Also, the Chamber believes that bidders will be given maximum flexibility if a basic package is not set.

488 As regards the interests of possible new entrants, the President's Chamber wishes to draw attention to the following:

489 In the interests of competition, successful participation in the auction by new entrants would be welcomed. Ultimately, however, in view of the regulatory aims, it is neither objectively necessary nor in the interests of competition to set different conditions with a view to access to spectrum for a new entrant, for example by setting a specific basic package or by reserving particular frequency blocks.

490 This conviction is based on the following considerations:

491 Like situations should essentially be treated in like manner. It follows that different situations should be treated in a different manner. Like situations should not be treated in a different manner unless the difference in treatment is objectively justified, taking all interests into consideration.

492 Ultimately, setting spectrum access for new entrants ex ante is not objectively justified. The auction is founded on equal conditions and hence equal chances for all bidders to access spectrum to implement their business plans. Auction proceedings are the legal regulatory procedure in the event of spectrum scarcity as provided for in section 61 TKG. The highest bid typically demonstrates the willingness and ability to make optimal use of the spectrum to be assigned in providing services in a competitive environment and to strive for efficient and economical use of the spectrum (cf German Federal Parliament publication 15/2316, page 80 re section 59 TKG-E). If interested enterprises meet the qualification criteria for the auction proceedings, they must be permitted to take part in the auction without any restrictions.. Accordingly, there will be no restriction on admission to the forthcoming auction proceedings (cf III.1.1).

493 In the interests of an open, transparent and non-discriminatory auction, there is no obvious reason why new entrants will need to be given special protection by creating asymmetric conditions. Rather, successful participation in the open bidding is likely to

depend on considerable financial strength matching the required network roll-out investment costs and the spectrum value. What is more, a new entrant may not necessarily be a new player in the telecommunications market in Germany or elsewhere. A new entrant may well also be active in other telecommunications markets and have considerable financial strength, in which case he does not generally need special protection.

494 New entrants do not need protection in the form of preferential spectrum acquisition to compensate for any disadvantages vis-à-vis incumbent network operators as there is a significant amount of spectrum to be awarded in the proceedings. The Chamber assumes that through making sufficient spectrum available, both above and below 1 GHz, even a new entrant will be able to acquire a spectrum package suitable for his business model in open, transparent and non-discriminatory auction proceedings. A spectrum reserve would lead to a shortage of the remaining spectrum, which would make it more difficult for the bidders to acquire spectrum.

495 The Chamber also doubts whether the competitive advantages of the incumbent network operators as claimed by respondents can actually be effectively offset by the rules on the award of spectrum. The award rules are intended to ensure non-discriminatory access to scarce spectrum in transparent and objective proceedings. They have no effect or influence beyond this on the actual development of competition as this is affected by a number of factors.

496 In addition, particularly in view of the estimates for spectrum requirements for new entrants, it must be pointed out that any reserve would require the Bundesnetzagentur to estimate the specific requirements of the spectrum to be reserved as to both spectral amount and position. As regards the possible implementation of different business models in the frequency bands to be auctioned, it is not possible to make specific estimates of requirements that would fit all possible business models without any discrimination. Therefore, alongside a reserve, it could still be necessary for new entrants to acquire additional spectrum in the auction in order to enter into sustainable competition with the current mobile network operators In light of this, the Chamber rules out the possibility of setting "spectrum floors".

497 Instead, even a new entrant has the chance to buy spectrum to suit his business plans and — provided he is willing to make the appropriate investment — has exactly the same chance as other bidders.

498 The Chamber does not see any detriment to fair competition in the fact that potential new entrants must bid in the auction against incumbent network operators that already have well-developed extensive networks – even for broadband applications (UMTS and LTE). Irrespective of the fact that this advantage is markedly reduced by the costs of maintenance and modernisation, and that even the incumbent network operators would face considerable initial investment costs for using new technologies (eg LTE-Advanced) and frequency bands (eg 700 MHz), the actual differences in the basic conditions are inherent to competition especially for any new entrant but also to competition for scarce goods. Thus these differences do not impair fair competition per se.

499 In view of the regulatory aim of safeguarding user and consumer interests as set out in section 2(2) para 1 TKG, setting unilateral favourable measures for an additional mobile network operator is not forbidden. Consumer interests are not solely dependent on the specific number of network operators but also on the choice, quality and price generally available on the market. In this respect account should be taken of consumer interests following accelerated broadband rollout and blanket coverage of mobile services. In particular the growing demand for mobile services and the call for "everywhere availability" can only be met by mobile networks with a high degree of coverage. It is not evident that such a high degree of coverage could be achieved

within a short space of time by a new entrant, for instance, in a competitive environment.

500 The regulatory aim of securing fair competition and promoting telecommunications markets with sustainable competition in services and networks, as well as associated facilities and services, and extending to rural areas (section 2(2) para 2 TKG) does not suggest special measures to favour new entrants. In line with this aim, the Bundesnetzagentur also ensures that consumers enjoy the best possible advantages in terms of choice, price and quality. The Chamber refers in this connection to the merger between Telefónica and E-Plus, which was approved by the European Commission based on an examination of the competition law aspects. In its approval the European Commission stated that the market entry of a fourth network operator was not a mandatory requirement for the merger approval (cf European Commission, DG Competition, Case M.7018 Telefónica Deutschland and E-Plus).

501 A measure giving preference to new entrants is also not necessary as regards expediting the rollout of public high speed next generation telecommunications networks (section 2(2) para 5 TKG). The updated demand identifications in this area showed that the spectrum available for award is scarce as it will be needed – especially the 700 MHz bands – for further broadband rollout. It cannot be expected that incumbent network operators will invest less in new networks than new entrants. Hence it is not necessary, for example, to reserve spectrum for a new entrant instead an auction must be used to identify the most effective user who will use the spectrum to offer broadband services.

502 The regulatory aim of securing the efficient, uninterrupted use of frequencies pursuant to section 2(2) para 5 TKG in conjunction with section 52 TKG does not call for reserving spectrum. According to the purpose of the auction, a successful bid typically demonstrates the willingness and ability to make optimal use of the spectrum to be assigned in providing services in a competitive environment and to strive for efficient and economical use of the spectrum. This purpose is not met by reserving spectrum.

503 If spectrum were reserved for a new entrant, there is a bigger risk that this spectrum will not be used, or not to a sufficient extent, should the new entrant not be able to gain a sustainable foothold in the competitive market environment. Were the requirements of reliability, expertise and performance set too low, there would be a greater risk in general of inefficient use of spectrum. At the same time, the incumbent network operators would have to forego access to the reserved spectrum for years even though additional spectrum is needed for broadband rollout.

Re III.3.2 Restriction of eligibility

The following comments were made:

504 The considerations given in the draft consultation document of June 2013 that originally provided for the spectrum reserve (2 x 5 MHz in the 900 MHz band) were accepted. The aim should be to maintain sufficient infrastructure to provide uninterrupted supply to consumers. The spectrum reserve for current network operators should therefore be reinstated but organised more extensively. The Bundesnetzagentur has recognised the continued need for spectrum of more than 2 x 5 MHz to maintain the GSM supply of voice services. A minimum of 2 x 10 MHz per network operator has been provided for as a reserve, allowing the network operators to choose between the 900 MHz and 1800 MHz bands according to their present usage.

505 At the same time, the President's Chamber decision of 4 July 2014 stated that the spectrum reserve ensures the necessary planning certainty so that Telefónica could start restructuring its network early and clear spectrum in the 900/1800 MHz bands as

necessary. Should a reserve no longer be kept, the main reason for obliging Telefónica to clear the spectrum would cease to exist.

506 Some of the respondents welcomed the objective of not restricting eligibility in general. However, although a spectrum cap of 2 x 15 MHz at 900 MHz was welcomed in principle or considered to be sufficient, it was pointed out that the aim of a spectrum reserve of enabling all incumbent mobile network operators to acquire spectrum in the 900 MHz band could only be achieved if only these network operators were admitted to the auction.

507 Opponents of this claimed that the proposed spectrum cap was not suited to enabling new network operators to gain entry.

The Chamber has ruled as follows:

508 No spectrum cap will be set to limit the amount of spectrum that each bidder can win in the 700 MHz, 1800 MHz and 1.5 GHz bands. Essentially, the Chamber's working hypothesis is as follows:

509 While the Chamber believes that restricting each bidder's rights could, in principle, facilitate market entry for potentially interested parties, it feels that the spectrum for auction in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands, amounting as it does to some 270 MHz, provides enough scope for spectrum to be acquired. It does not consider it necessary to set a general spectrum cap so as to make it easier for new entrants to acquire spectrum. Moreover, on account of the amount of spectrum available, the probability of strategic bidding is seen as slight (demand reduction effect in competitive bidding).

510 Where respondents have pointed out that incumbent network operators will make strategic bids by bidding for more spectrum than they need so as to prevent new operators gaining entry, the Chamber draws attention to the large amount of spectrum of 270 MHz to be auctioned, which in relative terms has the effect of reducing demand. Where a bidder wants to strategically acquire more spectrum than he strictly requires, this would lead to the overall price - even that of his strictly required spectrum - increasing disproportionately.

511 Given the diverse uses to which the spectrum can be put, the different business strategies and the volume of spectrum available in these bands, the Chamber does not consider it necessary to limit the spectrum for award.

512 Eligibility in the 900 MHz band is capped at a maximum spectrum package of 2 x 15 MHz (paired). The Chamber has set the cap in light of the following considerations.

513 It is necessary to restrict bidding eligibility in the 900 MHz band so as to ensure the availability of infrastructure as envisaged in Article 87f of the Basic Law and secure the regulatory aims as set out in section 2 TKG.

514 The Chamber sees the need to look separately at the spectrum in the 900 MHz band and make special arrangements with a view to equal access. Hence setting a spectrum cap to limit the bidding eligibility per bidder is suitable, necessary and proportionate.

515 A minimum amount of suitable spectrum below 1 GHz ("rural area spectrum") is necessary to guarantee the availability of infrastructure. At the same time, it is necessary to ensure that potential new entrants are given equal access to the spectrum. The spectrum available for award in the 900 MHz band comprises only 2 x 35 MHz. The physical propagation conditions of the spectrum make it well suited for cost efficient network rollout in rural areas in particular and hence give it special importance. It is therefore necessary to secure equal access to the spectrum both for

current mobile operators – to maintain their existing infrastructure in accordance with the infrastructure obligation – and for potential new entrants.

516 By contrast, the Chamber does not consider it necessary to set a spectrum cap for the 1800 MHz band. In this context, the Chamber wishes to draw attention to the fact that the aim here is not to safeguard the integrity of the mobile operators' current GSM networks as a whole. The infrastructure obligation requires a minimum spectrum package to be provided so as to enable operators to maintain their current nationwide infrastructure. In terms of propagation conditions the spectrum at 900 MHz is better suited than the 1800 MHz spectrum for cost efficient network rollout in particular in rural areas. The Chamber therefore considers it sufficient to set a cap for the 900 MHz band only.

517 The Chamber believes that guaranteeing the provision of adequate and appropriate services for the population on the basis of competitively independent infrastructures accommodates the mandate to ensure the availability of infrastructure as set out in Article 87f of the Basic Law. The current near-nationwide mobile networks have mainly been optimised for voice services based on existing GSM infrastructure. Consumer demand for mobile voice services remains high and continues to grow. The Bundesnetzagentur's 2013 annual report highlighted the steady growth in mobile telephony. It is in the consumers' interest to enable new and affordable broadband services to be offered alongside the current range of GSM services. The aim here is for existing infrastructures to be operated with efficient technologies instead of being restricted to the current GSM systems.

518 In setting a cap for the 900 MHz band the Chamber is, in particular, pursuing the regulatory aim of securing fair competition and promoting sustainable competitive markets as set out in section 2(2) para 2 TKG and the regulatory principle of safeguarding competition for the benefit of the consumer and, where appropriate, promoting infrastructure competition as set out in section 2(3) para 3 TKG.

519 To ensure the availability of infrastructure as envisaged in Article 87f of the Basic Law and the regulatory aims and principles set out in section 2(2) and (3) TKG, and in particular equal access to this spectrum, the Chamber believes it is necessary and also sufficient to restrict bidding eligibility for this spectrum by means of a spectrum cap. Thus no spectrum will be reserved in the 900 MHz band for incumbent network operators as requested by respondents.

520 With 2 x 35 MHz (paired) of spectrum available for award in the 900 MHz band, restricting the bidding eligibility to a maximum of 2 x 15 MHz (paired) will allow each of the three competitively independent mobile operators bidding against each other to win at least one block of 2 x 5 MHz (paired). The Chamber considers a package of 2 x 5 MHz (paired) at 900 MHz to be sufficient to maintain existing infrastructures on account, amongst other things, of the foreseeable switch to new technologies generally using blocks of 5 MHz. This allows nationwide infrastructure to be maintained and also implemented on a technology neutral basis. Furthermore, the current operators have additional spectrum in other bands that can be used for mobile services to cover rural areas and expand capacity. The existing mobile network infrastructure can therefore be maintained for the benefit of the consumer.

521 Setting a cap of 2 x 15 MHz (paired) for the 900 MHz band also reflects the regulatory aim of safeguarding consumer interests as set out in section 2(2) para 1 TKG if consumers, as a result, can be offered broadband services at favourable prices.

522 Setting a cap of less than 2 x 15 MHz (paired) for the 900 MHz band is not appropriate. It would unreasonably restrict the current mobile operators in exercising their bidding rights. This is particularly relevant in view of the fact that two of the operators currently use more than 2 x 10 MHz (paired) efficiently. Furthermore, it cannot be ruled out that it would not be possible to win some of the 900 MHz spectrum that is particularly suited to nationwide coverage. Rather, in light of the

infrastructure obligation setting a cap of 2 x 15 MHz (paired) for the 900 MHz band can guarantee maximum flexibility in exercising bidding rights.

523 Likewise, a cap of more than 2 x 15 MHz (paired) for the 900 MHz spectrum would not be appropriate as it would not adequately accommodate the infrastructure obligation.

524 Restricting the bidding rights is designed to prevent a situation in which one company alone can acquire this spectrum. On the contrary, it enables a maximum number of bidders to win the spectrum. New entrants will then have the opportunity to acquire enough spectrum suitable for rural area coverage in open, transparent and non-discriminatory award proceedings to enable them to implement their particular business model. This is all the more true since further rural area spectrum is available in the 700 MHz band in addition to that at 900 MHz. In all, the spectrum available below 1 GHz for equal access amounts to 2 x 65 MHz (paired).

525 The Chamber does not consider it appropriate to set a cap for either the entire spectrum below 1 GHz or the spectrum in the 700 MHz band on account of the amount of spectrum available below 1 GHz of 2 x 65 MHz (paired). In setting the cap the Chamber was guided by the principle that potential bidders should, as far as possible, be able to determine their frequency requirements individually, in line with their particular business model, during the auction. Setting a cap for the 900 MHz spectrum only – to ensure the availability of infrastructure as envisaged in Article 87f of the Basic Law – is thus proportionate in terms of keeping the restriction to a minimum. Extending the cap to cover all the spectrum below 1 GHz does not ensure that each of the competitively independent mobile operators can win at least one block of 2 x 5 MHz (paired) in the 900 MHz band so that they can maintain nationwide coverage for customers using their existing infrastructures. Nor does the Chamber consider it necessary to set a spectrum cap for the 700 MHz band. The spectrum available for award below 1 GHz, amounting to 2 x 65 MHz (paired), provides sufficient rural area spectrum. The amount of rural area spectrum available for award in this auction is more than twice as much as that in the auction held in 2010.

526 In spite of the initial proposal to assign a "frequency reserve" of 2 x 5 MHz (paired) in the 900 MHz band to each network operator upon application to ensure the availability of infrastructure as envisaged in Article 87f of the Basic Law, the Chamber wishes to draw attention to the following. The option of providing a frequency reserve was considered with a view to maintaining the four nationwide networks in place at the time, in particular in respect of voice communications. Providing a frequency reserve would have been the most appropriate regulatory measure given the market structure with four independent mobile networks.

527 In light of the change in the market environment, the objective of maintaining the existing GSM infrastructure can now also be reached by setting a spectrum cap. A spectrum cap of 2 x 15 MHz in the 900 MHz band is necessary to safeguard fair competition in rural areas as well and to promote sustainable competitive markets.

528 The Chamber does not deny that the spectrum cap does not provide a full guarantee that bidders can acquire 2 x 5 MHz in the 900 MHz band to meet the infrastructure obligation as does the frequency reserve initially considered and also called for by respondents. The purpose of the auction proceedings is to identify the most efficient spectrum user (cf the explanatory notes to section 61(4) TKG (section 59(5) of the government draft of 2004, Bundesrat printed paper 755/03, page 109). In light of this, reserving spectrum seems appropriate only for higher reasons. It would not have been possible given the previous structure with four independent networks to secure the regulatory aims or meet the infrastructure obligation by setting a spectrum cap. In light of the change in the market structure, reserving spectrum – which is essentially foreign to the nature of an auction – is no longer appropriate.

529 The Chamber believes that at the most a spectrum cap now constitutes a proportionate means of achieving the objectives set out above. A spectrum cap provides maximum flexibility both for the current mobile operators and for potential new entrants. Reserving spectrum would considerably reduce the amount of spectrum available for award and thus could unduly increase competition in bidding for the remaining spectrum. Furthermore, the Chamber has also taken the fact into account that it would have been necessary to consider other measures to restrict bidding rights even given a frequency reserve. This is particularly true in so far that measures would still be necessary to prevent one bidder alone from acquiring all the spectrum.

530 New entrants will be in a position to compete against established market players and acquire sufficient spectrum usage rights owing to a "demand reduction effect", particularly in such an open simultaneous multiround ascending even without the need for reserved spectrum. This applies all the more when a large volume of frequency blocks is to be auctioned as in the present case and as evidenced by past spectrum auctions including those of neighbouring countries. Examples of this can be seen in the UMTS auctions in Germany and Austria where two new entrants each acquired spectrum usage rights. The fact that these new entrants could not prevail on the market was not because of the auction design or the award proceedings.

531 The proceedings are such that in an open simultaneous multiround ascending auction they generally tend to result in an economically efficient distribution of spectrum usage rights since in most cases it only makes sense for bidders to acquire sufficient rights to meet their actual requirements.

532 Further, the Chamber draws attention to the fact that it is currently not possible to justify reserving spectrum for new entrants. Given the latest consolidations in the mobile telecommunications market through the merger of Telefónica and E-PLus in Germany, and similar developments in other European markets, the Chamber cannot say with absolute certainty whether a fourth mobile network operator would have a chance on the market or whether three operators represent the ideal economic market structure. In fact it would be rather presumptuous to interfere in the "auction discovery proceedings" by reserving frequency for a new entrant. Hence it is not recommended to reserve spectrum for new entrants. This applies all the more so as a new entrant with a promising business model will have the opportunity to acquire spectrum usage rights in sufficient volume in an open simultaneous multiround acending auction .

Re III.4Frequency usage conditions, section 61(3) second sentence para 4 TKG

533 The Chamber determines under section 61(3) second sentence para 4 TKG, before the award proceedings begin, the frequency usage conditions, including the degree of coverage with the frequency usage and the time needed to achieve this degree of coverage. Besides the technical requirements, the frequency usage conditions give details of the type and scope of the spectrum to be awarded (eg position in the band, size of the blocks).

Re III.4.1 Purpose of use

The following comments were made:

534 One respondent proposed to provide blocks of 2.5 MHz in the 900 MHz band because the current efficient GSM usage in the 900 MHz band is expected to continue and because of the sharing of this spectrum so far between three operators with 2 x 12.4 MHz each for two operators and 2 x 10 MHz for one operator. This would allow existing networks to continue operations at least with respect to current spectrum requirements.

The Chamber has ruled as follows:

535 The spectrum for award in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands is to be used for MFCN. There are no restrictions on the technologies that may be used. Every available technology can be deployed in observance of the usage conditions. The Bundesnetzagentur is tasked under section 1 TKG with providing technology neutral regulation and hence technology neutral spectrum use.

536 With the broad designation of these frequency bands for MFCN, mobile, nomadic and fixed applications can be provided under the frequency usage conditions. This will give the network operators scope for a whole range of services in their respective business models.

537 The frequency usage conditions have been set in accordance with international provisions.

538 Internationally, there are many technical reports, recommendations and decisions addressing the spectrum for award that have to be accommodated in the frequency usage conditions.

539 The frequency available for MFCN is provided in 5 MHz blocks; this will not only encourage the use of new technologies to provide consumers with mobile broadband services but also meet the current demand for services using existing technologies (section 2(2) paras 1, 5 and 7 TKG). In the assignment period the Chamber expects a technology switch from GSM to broadband technologies that work efficiently with 5 MHz blocks or multiples thereof.

540 With this in mind, the Chamber cannot act on the proposal to provide 2.5 MHz blocks in the 900 MHz band.

Re III.4.2 Frequency usage conditions

The following comments were made:

541 Several respondents addressed the requirements, which are greater than those of other countries, for the permissible out-of-band emissions from mobile terminal equipment for the protection of "portable indoor" TV reception, particularly in channel 48. They deem the increased limit of -57 dBm/8MHz for "portable indoor" reception as too restrictive compared with the -42 dBm/8MHz for terrestrial fixed-location roof reception for the out-of-band radiated signals of mobile terminal equipment that broadcasts in the 703-708 frequency band and whose out-of-band emissions fall in the television channel 48. This is viewed as being too great a restriction on the use of mobile service use. One respondent found this stipulation did not strike a balance between the interests of the population in using DVB-T and the need for mobile-based broadband coverage, nor was it acceptable when compared with the protection measures in place outside Germany.

542 Several respondents pointed out that to stay within the limits of the out-of-band emissions the restriction on the output power of terminal equipment means a noticeable reduction in their service radius and the resulting required network intensification would render network rollout economically non-viable and could even make it more difficult or impossible to fulfil the coverage obligation.

543 Another respondent expressed the view that extending the measures or stricter limits should only be included in the decision once the technical discussions of this aspect have been concluded.

544 Other respondents welcomed the Bundesnetzagentur's planned limit for the maximum permissible out-of-band emissions. One respondent called for this level to be generally applicable to the entire federal territory for channel 48 or for the highest frequency TV channel that is used in the territory in question. One respondent called for a limit on out-of-band emissions to be enforced for channels 45 to 47. One respondent stressed that the limit of -65 dBm/8MHz reported in CEPT Report 30 was

stricter than the -57 dBm/8MHz provided for in the draft decision, whereas another respondent claimed that the levels in this CEPT Report were questionable given the technical progress in TV receivers.

545 Several respondents pointed out that mobile terminal equipment would observe the out-of-band emission limits set in the CEPT Report 53 below 694 MHz of -42 dBm/8MHz at maximum channel output power of 23 dBm, although it was not expected that there would be equipment on the market that guaranteed the stricter limit at the same channel output power. Nor was there any requirement made of mobile terminal equipment that necessitated a reduction in channel output power corresponding to a reduction in out-of-band emissions. Hence there is a lack of regulatory or legal force for operators to observe the limits. This is de facto the equivalent of prohibiting the operation of mobile terminal equipment corresponding to 3GGP band 28. To meet any such emission requirement, terminal equipment would have to be specially developed for Germany plus it would have to be possible to operate terminal equipment from other (European) countries in Germany when roaming for which only -42 dBm/8MHz for out-of-band emissions was required (the Chamber: to protect terrestrial fixed-location DVB-T roof reception). However one respondent noted that equipment usually performs at better levels than the guaranteed specification.

546 One respondent pointed out that mobile terminal equipment may transmit at -36 dBm/100 kHz (=-26 dBm/MHz, =-17 dBm/8MHz) and therefore this did not justify (mobile) terminal equipment in the 703 – 733 MHz band only being permitted to transmit at less than -57 dBm/8MHz.

547 The protection of "portable indoor" reception was challenged by one respondent as it has not been achieved at national level. In contrast, others criticised the fact that only the actual coverage requirements were to be protected by the additional requirements but not those frequently common areas where TV reception was also possible due to overspill.

548 Several respondents pointed out that the regions affected by the stricter requirements of out-of-band emissions had not been determined, which made it impossible to evaluate the spectrum in economic terms. Also the considerably higher requirements made of the lowest frequency block reduced its economic value.

549 Various respondents addressed the importance of foreign coordination for introducing DVB-T2 and using the 700 MHz band for mobile services. Agreement on frequency coordination was said to be a mandatory requirement for greater specificity in technical plans and subsequent migration, although so far no specific results had been achieved. Attention was drawn to the fact that the memoranda of understanding and letters of intent concluded to date with Germany's neighbouring countries (except for Belgium and Austria) did not contain any binding agreements on frequency coordination and thus were not binding in nature. Moreover, these memoranda or letters of intent have so far not been published by the Bundesnetzagentur. One respondent expressly supported the finalisation of these agreements with neighbouring countries.

550 Several respondents pointed to the different political time horizons in several neighbouring countries for clearing the 700 MHz band. In some countries the frequency band will be used for broadcasting until 2020. One respondent drew attention to the usage situation in Austria, where broadcasting frequency was assigned until at least 2023. Some respondents conclude from the EU Commission Lamy Report that it will first be possible to clear the 700 MHz band in the period 2018-2022.

551 In this connection, various respondents have deduced from the different political situations and time horizons in neighbouring countries that early clearing of the 700 MHz band in Germany will not lead to mobile service use. The parallel operation

of broadcasting organisations in neighbouring countries and LTE-700 in Germany would not be possible, or at least not in the same geographical region. As a result, these different time horizons for clearing the spectrum greatly decreased or even rendered impossible the use of the 700 MHz band before 2018 or 2017 by mobile services in Germany.

552 Respondents find the maximum allowable field strength of 80 dBµV in the 700-MHz mobile communications band at the radio monitoring and inspection service fixed-location measuring stations too restrictive. It would make network implementation economically non-viable near these measuring stations due to the restricted mobile range. The corresponding limit in the 800-MHz band is 90 dBµV/m.

553 One respondent called for only GSM technology to be allowed in parts of the neighbouring GSM-900 MHz spectrum to protect GSM-R and no broadband systems such as UMTS, WiMax or LTE/LTE-Advanced because of the broader spurious emissions. In addition, public mobile service networks using GSM technology served as an operational backup to GSM-R, so GSM technology and GSM supply in the 900 MHz band should continue to be available after 2016. According to another respondent, a "dynamic" procedure to coordinate base receiver stations for MFCN with GSM-R applications should form part of future frequency assignments. This would make it possible to reduce the restrictions on mobile service use along railway lines by not fixing set guardbands to meet the protection requirements of the railway but instead by determining and accommodating the actual local requirements.

554 One respondent called for more information on the current coordination process in order to evaluate the specific frequency blocks auctioned (925 – 930 MHz).

555 Several respondents suggested the Bundesnetzagentur hold comprehensive renegotiations of existing GSM preferential frequency agreements with all Germany's neighbouring countries. One respondent viewed this as requiring a subsequent migration period of 12 months to implement the measures.

556 Several respondents pointed out risks that could arise through extending the calculation methodology for the computer-aided case-by-case assessment for determinations at country borders (higher refusal rate). One respondent added that existing frequency usage rights were also very important for the service obligation as part of the new frequency assignment.

557 Several respondents called for a conversion of the current parameter settings to the new frequency assignments.

558 The sharing of mobile service downlinks in the stated frequency bands with PMSE applications was rejected by the majority of respondents as it was expected to cause interference between the broadcast systems.

559 Likewise several respondents considered it necessary to have guardbands/protection ratio at the frequency limits between applications for mobile services and PMSE applications. This would reduce the usable frequency for PMSE applications in duplex gaps.

560 Some of the respondents called for the 1780 – 1785 MHz / 1875 – 1880 MHz frequency blocks to be included in the upcoming award proceedings. Their inclusion was said to be possible and was recommended because DECT could detect channel interference and switch to channels not suffering interference, and besides the entire DECT band was rarely needed. Attention was drawn to the fact that in most European countries the upper frequency block had been assigned in whole or in part to mobile service, either with or without restrictions on the conditions of use. Several CEPT, ERC and ECC reports were also in favour of this.

561 In view of this, some of the respondents called for the inclusion of the 1780 – 1785 MHz or 1875 – 1880 MHz frequency blocks with restrictions if necessary. Such

a restriction, for example, could be the exclusive use of GSM in the frequency block with the addition that there would be no need for a broadcast control channel carrier (BCCH). With respect to LTE, use could be restricted to macrocells (outdoor). This would ensure no indoor use, such as for small cells, near buildings (spatial separation).

562 **The Chamber has ruled as follows:**

563 The frequency usage conditions will be set on the basis of international recommendations and decisions.

564 The use of the fundamental provisions in the relevant CEPT and European Commission decisions provides the necessary basis for efficient and interference-free cross-border use of the available spectrum.

565 The frequency usage conditions in Annexes 2 and 4 for the bands at 900 MHz, 1800 MHz and 1.5 GHz and the provisional conditions in Annex 3 for the band at 700 MHz are also intended to secure interference-free coexistence of different applications in the adjacent bands. For this, compliance is required with the usage conditions in Annex 3 such as spectrum masks and block edge masks.

566 As regards the definition of the term "interference", the Chamber draws attention to the fact that the prevailing international definitions based on the ITU's Radio Regulations (last edition 2012, in particular RR1-17, Chapter 1, Section VII, Nos 1.166 to 1.169) are already sufficiently comprehensive and that the Bundesnetzagentur is guided by these definitions. The term is defined as follows: "The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy."

567 The Chamber's view is supported by the Radio Spectrum Policy Group (RSPG), the European Commission's high-level advisory group: in its report on interference management (Report on Furthering Interference Management through exchange of regulatory best practices concerning regulation and/or standardisation, RSPG13-527 rev1 final of 28 June 2013) RSPG stated that the ITU definitions should also be used in the light of furthering interference management on a European level.

568 The Chamber also wishes to point out that studies of interference look not only at the transmission paths but also at the terminal equipment. The Chamber is guided here by the adequate and comprehensive statements on receiver parameters contained in Annex 2 to the RSPG Report (loc cit, Annex 2: Receiver parameters in interference management).

569 The Bundesnetzagentur determines block edge masks as part of its frequency usage conditions. These masks relate to the spectrum blocks assigned to the users. Such blocks are defined by the relevant parameters and may comprise several channels, irrespective of the technology used. The block edge masks describe both permissible in block emissions and out of block emissions. Essentially, these are regulatory requirements to reduce the risk of harmful interference between adjacent networks.

570 Specifically:

Article 5(2) of the Commission Decision of 16 October 2009 (2009/766/EC), as amended by the Commission Implementing Decision of 18 April 2011 (2011/251/EU), requires Member States to ensure that other systems referred to in Article 3 and Article 4(2) (UMTS, LTE and WiMax) and Article 5(1) give appropriate protection to systems in adjacent bands. To ensure such protection and with a view to achieving a harmonised approach, the Bundesnetzagentur bases the site-related usage parameters, which are set in a computer-aided case-by-case process, on the ECC's findings.

571 In setting the site-related parameters for the base stations, account must be taken both of adjacent MFCN in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands and of compatibility with applications using adjacent bands.

572 With out of block emissions, a distinction is made between general and specific requirements. As minimum conditions are described by the block edge masks, additional measures may be necessary locally or regionally to achieve coexistence with other users. This is assessed in light of the exact site and the local or regional conditions when the site-related parameters are determined.

573 It is up to the operators to decide how to limit the out of block emissions in their frequency block (eg by special filtering). This eliminates the need for a general limit on the base stations' radiated power.

574 Assignees may diverge from these conditions if they have made mutual arrangements ("operators' agreements") to this effect and divergence is without detriment to the frequency usage rights of third parties. They thus have considerable flexibility as far as specific use is concerned. The Bundesnetzagentur must be advised accordingly, in writing, in order that it may process reports of interference promptly and effectively.

575 In addition to such operators' agreements, site sharing is an effective means of minimising interference from adjacent applications and also reducing costs.

576 **Broadcasting services below 694 MHz:**

Additional mitigation techniques must be used or measures taken above 694 MHz to protect the broadcasting services (below 694 MHz) in the geographic regions for portable indoor reception.

577 The type and scope of the broadcasting service will be stipulated by the federal states and their notified requirements will be implemented by the Bundesnetzagentur, including the type of reception required in each coverage area (cf section 57 TKG).

578 Any reception that occurs outside the coverage areas specified by the federal states due to propagation properties is usually only a result of physical or unavoidable side effects due to the economic network design. This is not to be seen as part of the coverage requirements.

579 To protect portable indoor – DVB-T/DVB-T2 – reception, the Chamber has set the maximum permissible level of emissions from mobile terminal equipment in the band below 694 MHz at -57 dBm/8 MHz, which is then valid for all broadcasting channels operating at the relevant locality.

580 The reasoning behind this is that a broadcasting service designed in accordance with the criteria for portable indoor DVB-T reception requires greater protection for TV reception against mobile terminal equipment than a broadcasting service that is designed following the criteria for terrestrial fixed-location DVB-T reception via roof-top aerials (10 metres above ground). This is primarily due to the small distance possible during practical operation between the mobile terminal equipment and the portable DVB-T aerial. Compatibility studies carried out by CEPT for the adjacent 800 MHz frequency showed for DVB-T and LTE/UMTS that the out-of-band emissions of mobile terminal equipment can be reduced by 15 dB for portable indoor reception compared with roof reception (CEPT Report 30). These findings were transferred to the adjacent 700 MHz band for the same technologies and the same scenarios (protecting portable DVB-T reception against unwanted emissions from mobile terminal equipment) (cf CEPT Report 53). This leads to a reduction from -42 to -57 dBm/8 MHz in the maximum permitted emissions of mobile terminal equipment in the band below 694 MHz to protect portable DVB-T reception.

581 As already noted in the CEPT Report 53, depending on the spatial distance between the mobile terminal equipment and the broadcast receiver and the frequency

separation, additional measures may be required to meet this condition to ensure protection of portable indoor DVB-T/DVB-T2 reception, which is incumbent upon each mobile network operator. In cases in which the user uses both systems simultaneously (mobile device and broadcast receiver), the user can eliminate any interference to broadcast reception by putting an appropriate physical distance between the two types of equipment should portable indoor DVB-T/DVB-T2 reception be impaired. In these situations the mobile network operator's obligation does not apply.

582 Up-to-date information on current and planned broadcasting use in the 470 MHz – 694 MHz frequency band within Germany may be obtained from Section 222 at the Bundesnetzagentur.

583 **Broadcasting services in the 700 MHz band in adjacent countries:**

As regards the Federal Republic of Germany's border areas and implementation of the band plan, the President's Chamber wishes to draw attention to the following:

584 In the event of use of the 700 MHz band for mobile broadband in Germany, simultaneous use of the band for DVB-T in neighbouring countries could lead to restrictions. From a technical viewpoint, parallel operation of DVB-T and mobile networks in the same geographic regions is not possible. Any DVB-T applications in the 700 MHz band in neighbouring countries are still to be ensured protection as provided for by the existing coordination agreements.

585 The Bundesnetzagentur is aware of the importance of foreign coordination for the introduction of DVB-T2 from spring 2016, for the complete switch of terrestrial television broadcasting services in Germany from DVB-T to DVB-T2 by mid-2019 at the latest and for the use of the 700 MHz frequency band for mobile services from 2017. Binding agreements on frequency allotment and frequency positions with neighbouring countries may only be concluded if, on the basis of notified requirements from the federal states under broadcasting legislation, German plans are prepared for negotiation and the relevant coordination negotiations are held on this basis with foreign administrations. Plans are currently being drawn up in the UHF planning group (UHF AG) led by the Bundesnetzagentur together with the federal states, the state media authorities and the operators on the basis of the coverage requirements concept of the federal states submitted in July 2014. Coordination negotiations are taking place alongside this in an iterative process with all relevant neighbouring countries.

586 The Bundesnetzagentur has consulted at an earlier point in time with neighbouring countries within various bodies and forums at international level and has already agreed bilateral memoranda of understanding or letters of intent with nearly all the countries concerned to ensure compatibility between broadcasting and mobile services. The following aims were discussed with neighbouring countries:

- The provision of suitable frequency positions for the start of DVB-T2/HEVC transmission from spring 2016.
- The provision of suitable frequency positions for the complete migration of television broadcasting services in Germany from DVB-t/MPEG-2 to DVB-T2/HEVC. This migration involves the complete clearing of the 700 MHz band and must be finalised by mid-2019 at the latest.
- The gradual use of 700 MHz frequency for mobile broadband from 2017 at the latest.

587 By signing the memoranda of understanding or letters of intent, the signatory countries have expressly declared their willingness to make every effort to support Germany in this project. The level of commitment of these declarations was the highest possible at that time, as in Germany neither a political decision to redesignate

the 700 MHz band had been taken to binding effect nor was there a final guaranteed requirements concept under broadcasting legislation that would have allowed a German frequency plan to have been developed as a binding basis for negotiation. The memoranda of understanding or letters of intent provided the Bundesnetzagentur at the earliest possible date with a definitive basis to set up a gradual and iterative determination of appropriate frequency positions with neighbouring countries.

588 With respect to different political time horizons in the individual neighbouring countries, and the doubts expressed by respondents on the early date chosen to start using the 700 MHz band in Germany for mobile services, the Chamber points out that the German initiative on making early use of the 700 MHz band for mobile services has by itself had the effect of triggering, accelerating and even finalising internal political discussion of this use in practically all the neighbouring countries. All the decisions reached to date generally fall in the period that is mentioned in the Lamy Report (provision of the 700 MHz band for mobile services from 2018-2022). The Pascal Lamy Report contains recommendations to the European Commission based on a discussion between representatives from various industries (eg broadcasting, mobile services). According to the report, the statement on a four-year period for clearing the 700 MHz band (2018-2022) should be construed by the European Commission as a recommendation for the determinations required, as necessary. This is significant to the extent that even the Austrian frequency authority has recognised it cannot close itself off to European agreement on 700 MHz especially in respect of the time periods. Therefore, even given the comparatively long terms for existing frequency assignment in neighbouring countries, there is still considerable interest in agreeing a sustainable frequency plan with Germany in good time.

589 Moreover, a trend can be seen in nearly all the countries that have taken political decisions of speeding up the use of the 700 MHz band for mobile service where possible.

590 Interference with mobile service in Germany can only occur if the operation of actual broadcast transmitters in neighbouring countries correlates regionally and technically with a German mobile service. The mere presence of rights pursuant to the Regional Agreement GE-06, thereby creating the legal basis for the use of a frequency position, is not sufficient on its own to assume potential interference.

591 The Bundesnetzagentur will gradually - both as to time and geographically - make the 700 MHz band available for mobile service in Germany. It will effect legally secure determinations taking the individual usage situations in neighbouring countries into account. This will affect the relevant agreements in each situation on the non-use of frequency positions arising out of the Regional Agreement GE-06 for the 694 MHz to 790 MHz spectrum.

592 To simplify and speed up the procedure, the Bundesnetzagentur has assumed the following categories:

a) countries that completely relinquish the use of their 700 MHz bands by broadcasting at defined (earliest possible) times;

b) countries that relinquish the use of the channels 50 to 53 at defined (earliest possible) times;

c) countries with whom individual agreements will be agreed on the earliest possible relinquishment of individual channels.

593 Sweden has already been allocated to category a) (binding agreement on terminating broadcast use of the 700 MHz band by 1 April 2017 at the latest). The Bundesnetzagentur has been able to hold more specific talks with France, Luxembourg and Switzerland and binding assurances will likely be reached before the start of the spectrum auction.

594 For those neighbouring countries where a complete relinquishment of the use of the 700 MHz frequency positions for broadcast cannot be finalised, at the very least the Bundesnetzagentur will agree with binding effect and in good time a one-off non-use of the channels 50 to 53, which are particularly susceptible to interference.

595 If this cannot be agreed as standard and in good time with a neighbouring country, the Bundesnetzagentur will at least attempt to have individual channels and thus individual mobile service frequency blocks kept free regionally.

596 In addition, the Bundesnetzagentur will make every attempt in bilateral and multilateral co-ordination discussions together with the German operators to secure sufficient, available spectrum, coordinated with other countries, for the introduction of DVB-T2 in 2016 and the complete migration to DVB-T2 at the latest by mid-2019. The Bundesnetzagentur will support an agreement on a 4-1+x rights layer plan to safeguard equal access to spectrum, which will facilitate the implementation of additional frequency positions depending on the regional circumstances both within and outside Germany.

597 Those broadcasters still to be accounted for in the 700 MHz band in neighbouring countries are listed in Annex 8. They must be included, likewise the German broadcasting organisations, in each interference calculation to evaluate potential temporary restrictions in the use of mobile broadband in the 700 MHz band.

598 As was the case when implementing mobile service in the 800 MHz band, the Bundesnetzagentur is striving to improve foreign coordination.

599 The Bundesnetzagentur will provide a timely update before the auction of the DVB-T/DVB-T2 usages abroad still to be taken into account at certain times. The Bundesnetzagentur will also provide the future assignment holders with updates on the overall situation (international frequency coordination) after the auction.

600 **Compatibility with radio applications for public railways**

In addition, the following applies with respect to GSM applications:

Usage of a 5 MHz block in the 900 MHz and 1800 MHz bands may be subject to restrictions on account of the adjacent GSM applications which have to be protected.

601 No further requirements are needed in the 900 MHz and 1800 MHz bands to enable GSM operation since the prescribed 5 MHz masks still allow the implementation of 200 kHz GSM systems. The relevant usage conditions in Annex 2 take special account of the framework conditions for wireless broadband applications (5 MHz). Should GSM technology (200 kHz) be used in the 880 to 915 MHz and 925 to 960 MHz bands and in the 1710 to 1785 MHz and 1805 to 1880 MHz bands, the parameters of the harmonised standards for GSM will be applicable.

602 The Bundesnetzagentur will take full account of any need for modification resulting from CEPT/ECC and Commission decisions. The Chamber wishes to point out that the radio applications of public railways require higher levels of operating safety compared with other applications in the land mobile service because interference in the GSM-R network could, for instance, lead to trains having to brake abruptly.

603 Currently available for the radio applications of public railways in the 900 MHz band (GSM-R and E-GSM-R) are the duplex bands 873 to 880 MHz (uplink) and 918 to 925 MHz (downlink) both within CEPT and in Germany. The spectrum for MFCN begins at 880 MHz/925 MHz and is therefore immediately adjacent to these bands. According to CEPT Report 41, interference to GSM-R from MFCN applications cannot be ruled out. The CEPT (FM PT 54) is currently looking at the measures required to protect GSM-R. Its findings may lead at least to regional restrictions on the use of adjacent spectrum for MFCN.

604 The new Project Team is tasked with drawing up a new ECC Report on GSM-R presenting the results of various measurements (including those carried out by the Bundesnetzagentur itself) and proposals for improved coexistence between MFCN applications at 900 MHz and GSM-R. The ECC Report will provide the basis for a procedure to coordinate MFCN base stations (using the spectrum at 925-935 MHz) and GSM-R applications (in particular at railway stations, shunting areas and other hubs).

605 Ahead of this, it was necessary for the Bundesnetzagentur to develop its own procedure to set site-related usage parameters for MFCN base stations in the 900 MHz band in order to implement Commission Decision 2009/766/EC, as amended by Commission Implementing Decision 2011/251/EU.

606 ECC Report 162, currently providing the relevant basis, identifies potential mitigation techniques to address interference cases between GSM-R and public mobile networks at 900 MHz. To identify which sections of track managed by the infrastructure managers using GSM-R (in most cases DB Netz AG) may be affected, the Bundesnetzagentur uses a certain coordination field strength level in its procedure for setting the MFCN usage parameters and assumes that further measures might be needed should this level be exceeded.

607 Here, the Bundesnetzagentur has to weigh up the mobile operator's interests on the one hand and the rail network operator's interests on the other hand, while also keeping the regulatory aims in mind. Each spectrum user must have consideration for adjacent applications, ie must take suitable, justified and proportionate measures to ensure that no interference is caused to applications using adjacent spectrum (cf Administrative Court of Cologne, 21 K 8149/09 of 14 September 2011).

608 The coordination field strength level is determined on the basis of ECC Reports 96, 146 and 162, including Tables 16 and 17 in ECC Report 146. The Bundesnetzagentur is aware that using the values in these tables and, for example, assuming use of the directly adjacent channel may result in a very restrictive approach. The Bundesnetzagentur is therefore working together with the mobile operators and infrastructure managers concerned to find short term and mutually acceptable solutions based on its own measurements for use in the procedure for setting the usage parameters.

609 The current coordination procedure in the 900 MHz band between GSM-R and public mobile services follows the stipulations of the latest applicable ECC report and these stipulations also serve the WG FM 54 as the working basis for the new ECC report to be drawn up (working title: Guidance for improving coexistence between GSM-R and MFCN). This work considers the possible interference input towards GSM-R irrespective of frequency blocks.

610 Here again, the Bundnetzagentur would like to draw attention specifically to the advantages of site sharing in terms of minimising interference from applications using adjacent spectrum. This applies to public mobile network sites near railway lines, and in particular with respect to providing mobile broadband services to rail passengers.

611 With regard to calls for more details of the current procedure concerning coordination, the Chamber draws attention to the following:

The Bundesnetzagentur applies a two-stage frequency assignment and determination procedure for mobile network operators and GSM-R network operators. In the first stage the mobile network operator receives a frequency assignment for use throughout Germany. The frequency assignment includes the general frequency usage conditions eg block edge mask conditions, transmitter power specifications etc. In the second stage the results are given based on an IT-supported individual case basis of the specific site-related frequency utilisation parameters to be fixed for the fixed-location frequency utilisation. The second stage makes it possible to take

account of additional requirements such as the compatibility situation at the borders, or the protection of other facilities or installations of local or regional significance.

612 Point-to-point calculation is used as set out in the Harmonised Calculation Method Agreement to determine compatibility. The procedure is currently designed to protect the GSM-R minimum field strength (below 925 MHz) against emissions above 925 MHz from UMTS base stations. The use of frequency for UMTS in the 925 MHz to 930 MHz frequency block is refused if it generates a field strength of more than 74.3 dBµV/m at a height of 4 metres above the GSM-R railway line. Taking account of the fact that in reality the level of unwanted emissions is often lower than that permitted in the standard, the maximum permissible level stated above could be increased to 88.88 dBµV/m at a height of 4 metres above the railway line. Other technical checks have shown that in practice unwanted emissions in UMTS frequency usage in connecting frequency blocks (930 MHz to 935 MHz) are 8 dB lower than in the 925 MHz to 930 MHz frequency block. Consequently, the field strength limit for UMTS use in this block could be increased to 96.8 dBµV/m at a height of 4 metres above the GSM-R railway line (see also document CF-GSM-R(13)035). Once the WG FM 54 has produced suitable procedures to protect GSM-R from MFCN emissions, the process described above will be adapted accordingly.

613 The Bundesnetzagentur welcomes the suggestion of using the GSM-R signal field strength values actually measured along the length of the railway track to determine the coordination field strength, which could be a possible approach for the purpose of achieving operational agreements between mobile network operators and the operators of GSM-R networks. High field strengths from the use of MFCN could then be tolerated where the GSM-R field strength is higher than the GSM-R minimum field strength required.

614 Insofar as demands have been made for the 900 MHz band that both guaranteed GSM usage be implemented and a specific frequency block be reserved for several network operators to share a network, these demands cannot be met as spectrum must be used according to the Frequency Plan designation and assigned on a technology neutral basis (cf specifically the frequency usage conditions, Annex 2 and III.4.2.).

615 **Cross-border coordination for mobile services**

In the border areas and several other geographic regions in the Federal Republic of Germany, spectrum for MFCN is available to a limited extent only on account of the equal distribution of rights of use between spectrum users in Germany and its neighbouring countries and the consequent need for frequency coordination with these countries.

616 Restrictions in terms of spectrum and scope will vary from area to area, depending on whether coordination is required with two, three or four countries. Restrictions will also depend on the various radio applications and transmission methods in use either side of the borders.

617 The required coordination procedures are based on the agreements in place between Germany and its neighbouring countries.

618 The GSM band edges specified in the current preferential agreements dividing up the frequency usage rights for the 900 MHz and 1800 MHz bands at Germany's borders represent the spectrum (supplemented over time) held by the four German mobile operators and that held by operators in the neighbouring countries.

619 As part of the implementation of the Digital Dividend I in the 800 MHz band, and where possible in the 1800 MHz band, preferential frequency agreements have already been concluded with neighbouring countries based on broadband use. The Bundesnetzagentur will continue with negotiations.

620 In approving mobile base station sites, the Bundesnetzagentur uses a method agreed on by a large number of European frequency administrations and set out in the "Agreement on the co-ordination of frequencies between 29.7 MHz and 43.5 GHz for the fixed service and the land mobile service" as the harmonised calculated method ("HCM Agreement"). This method has been used in all the procedures to set usage parameters (for instance for GSM, UMTS and LTE). The aim here is to improve radio coverage at national borders.

621 To enable network operators to provide adequate coverage in areas with a different population density on both sides of Germany's borders, the HCM Agreement allows operators to make their own mutual arrangements in the form of operators' agreements. These agreements enable the operators to provide coverage at the borders that is more in line with demand, even in areas with peak demand. Site sharing could also, as a side effect, considerably reduce the restrictions resulting from coordination between two mobile operators in Germany using adjacent spectrum, which in turn would have positive effects on the investment needed.

622 Network rollout for Digital Dividend I showed that providing broadband coverage for a strip approximately 5 km wide along Germany's borders is very difficult, in particular if only the GSM base station sites coordinated in the 1990s are used. The Bundesnetzagentur wishes to point out that it will be necessary to invest in new sites and implement new technological methods, such as infrastructure sharing by German operators or by German and foreign operators, in order to provide broadband coverage for these areas.

623 The definitive cross-border coordination procedures for MFCN (5 MHz blocks) and television broadcasting (8 MHz channels) in the 694 to 790 MHz band will be laid down on a bilateral and multilateral basis, taking into account the Geneva Agreement 2006 (GE06).

624 No 5.312 of the ITU's Radio Regulations (2012) allocates the 645 to 862 MHz band additionally to the aeronautical radionavigation service on a primary basis in the countries specified in the provision. The definitive cross-border coordination arrangements for MFCN and aeronautical radionavigation applications will likewise be laid down on a bilateral and multilateral basis, taking into account the Geneva Agreement (GE06).

625 Insofar as respondents called for renegotiation of current GSM preferential frequency agreements, the Chamber points out that the current preferential frequency agreements generally permit the use of a broad technology mix from GSM to LTE at the country borders, in particular with a view to the greater future use of operator arrangements.

626 Inasmuch as respondents refer to a possible higher refusal rate as a result of extending the calculation method for the computer-aided case-by-case assessment at country borders, the Chamber states as follows:

627 Rollout of broadband coverage at the country borders and the provision of "white areas" in border areas would anyway require the development of new sites that must be planned and implemented on the basis of the applicable regulatory framework.

628 With respect to current spectrum usage rights in border areas, the Bundesnetzagentur is striving to ensure that the GSM usage rights under the pertinent preferential frequency agreements are retained during the longest possible transition period.

629 Although the Bundesnetzagentur draws attention to the fact that due to flexibility in the use of frequencies in neighbouring countries there may be restrictions in future on existing rights of use. The Bundesnetzagentur will continue to do all it can in dialogue with the network operators to promote an equal weighing up of the possibly different usage interests on both sides of the border with foreign frequency authorities.

630 If respondents call for the transfer of the previous parameter determinations to the new frequency assignments, the Chamber draws attention to the following: The Bundesnetzagentur's administrative practice so far has been to consider a current specified parameter as a future relevant parameter if, when a new frequency assignment becomes effective for a specific frequency usage based on continuing designation for the mobile service, the then applicable protection criteria for Bundesnetzagentur radio monitoring stations, the civil and military site coordination criteria and, as necessary, the regional protection of frequency usage nationally and internationally results in an identical coordination status that takes account of the cross-border coordination agreements currently applicable, operator arrangements with foreign network operators and the applicable HCM coordination procedure.

631 **Protection of the radio monitoring and inspection service stations**

The Chamber wishes to draw attention to the following in response to the view put forward that the limit to protect the Bundesnetzagentur's fixed radio monitoring and inspection service stations - in particular for the 700 MHz band - had been tightened:

632 Effective monitoring of frequency regulation in accordance with section 64 TKG assumes that the Bundesnetzagentur's radio monitoring stations will not be disrupted by the use of frequencies. The electro-magnetic fields of transmitting installations operated near the Bundesnetzagentur's reception facilities may cause desensitisation and overloading effects, and thus restrict the reception of the Bundesnetzagentur's measurement devices (cf Bundesnetzagentur Official Gazette 17/2012, Communication No 613/2012).

633 The Bundesnetzagentur’s view is that its administrative practice so far in setting parameters for MFCN, as developed in line with the aforementioned regulation, represents a balanced framework for weighing up on a case-by-case basis the interests of the mobile network operators in expanding their networks and those of the regulatory duties of the Bundesnetzagentur.

634 The maximum permissible limit laid down in Official Gazette Communication No 613/2012 to protect the radio monitoring stations at 790 MHz is based on bands that up to now have been used for the public mobile service. It is therefore also advisable to adjust the limit as this frequency band will be extended to mobile service by the planned award of frequencies. Consequently, this year the Bundesnetzagentur plans to set the field strength limit at 90 dBµV/m for the frequency band from 694 MHz to 790 MHz by way of an Order in the Official Gazette to protect radio monitoring stations.

635 In response to the proposal put forward by one respondent to relocate the radio monitoring stations from urban agglomerations to their outlying districts, the Chamber draws attention to the fact that the regulatory duty of monitoring frequency can only be met if radio monitoring stations are also located in the centres of population as naturally this is where the frequencies are mainly used.

636 In response to the argument from respondents that the shared use of mobile service downlinks by PSME applications in the stated frequency bands could lead to interference, reference is made to the statements below (cf point I, date of order).

637 Insofar as the inclusion of the 1780 – 1785 MHz / 1875 – 1880 MHz frequency block is required, this will be complied with. However the frequency block will be made available with restrictive conditions of use (cf specifically I, Availability and Annex 2).

Re III.4.3 Time limits for right of use

The following comments were made:

638 Some respondents are calling for frequency usage rights for an unlimited period or at least for the time limit to be extended to 20 or 25 years. The term provided of 15

years is too short given the investment cycles and the possibility of payback on investments, especially with respect to the 700 MHz band. A European comparison also shows that the planned term of 15 years lies at the lower end of the scale for typical European terms.

The Chamber has ruled as follows:

639 The assignments will all run until 31 December 2033. Section 55(9) first sentence TKG makes provision for frequencies to be assigned for a limited period. Section 55(9) second sentence TKG requires the time limit to be appropriate to the service concerned and take into proper account payback on the necessary investments.

640 In setting the time limit, the Chamber takes into account, on the one hand, the interest of the assignees in having an appropriate payback period for their investment. On the other, the Bundesnetzagentur's scope should not be unduly restricted, so that the time limit should not exceed a proportionate period to retain a measure of control. In view of this, the Chamber cannot agree to the call for an unlimited period.

641 Terms of 15 as well as 20 years have been agreed in the past. Initially, the GSM licences ran for 15 years. Frequency usage rights for the 2 GHz band were limited to 20 years in 2000. Also, in 2006, the term of the BWA assignments in the 3.5 GHz band was fixed at 15 years. Likewise, terms of 15 years were set in the award proceedings conducted in 2010.

642 To provide a suitable payback period, deciding in these proceedings that the assignments would run until the end of 2033 would seem appropriate and necessary. The assignees – and especially potential new entrants – must be given enough time to build and roll out their networks, to realise their business models and to recoup their investment. The period of 15 years applies all the more to operators that are already active in the market and already have infrastructures and in relation to whom shorter payback periods ought to apply. Against this background, the term of 15 years provided by the original planned expiry date of 31 December 2031 would therefore appear adequate. The Chamber has taken into account, however, that the national consensus between the central government and the federal states on providing the 700 MHz spectrum to promote broadband rollout expects the 700 MHz spectrum to first be available for national use after 2017. In light of this the Chamber considers it appropriate to take this situation into account and set the time limit accordingly. The Chamber therefore believes that setting a limit on the assignment terms to 31 December 2033 is both appropriate and adequate.

643 As all spectrum is being made available in the same proceedings, it would be expedient - as also put forward by the respondents - to assign the spectrum until the same fixed date. Accordingly, the spectrum assignments in the 900 MHz, 1800 MHz and 1.5 GHz bands also expire on 31 December 2033. In this respect, as noted by the respondents, the setting of a term of approximately 17 years for the frequency usage rights for mobile service also falls within the standard terms in Europe.

644 Hence the operative provisions have been amended as follows:

The frequency assignments will be valid until 31 December 2033.

Re III.4.4 Coverage obligation

The following comments were made:

645 While some respondents welcomed the linking of the 700 MHz spectrum with nationwide coverage targets, likewise factoring in the spectrum already assigned and the opportunity for cooperation and spectrum leasing, one respondent found the obligation on each network operator to meet the coverage targets with their networks to be disproportionate.

646 Some respondents said that the coverage obligation was unnecessary given the competition between operators. The obligation would also run counter to promoting broadband as areas already served could not be additionally supported. Moreover, not all the areas earmarked could be served due to the limited connectivity.

647 Coverage of the main traffic routes was welcomed given the growing connectivity of vehicles and consumer interest. However, it was said that not all the areas earmarked could be covered due to limited connectivity (eg in nature conservation areas, railway tunnels, building restrictions). In this connection safeguarding coexistence with various railway radiocommunications applications was highlighted and there were calls to introduce a procedure to set usage parameters with computer-based case-by-case testing to protect the GSM-R use of frequencies.

648 Some respondents were in favour of the coverage obligation set out in the draft decision or even a stricter one in view of data rates and coverage. Others rejected the setting of a minimum transfer rate as this could not be guaranteed. Instead the setting of field strengths or levels was preferred.

649 Some respondents considered the time allowed to achieve the coverage targets to be too short. There were also calls for sanctions for non-compliance with reference being made to the Transparency Ordinance.

The Chamber has ruled as follows:

650 The Bundesnetzagentur, under section 61(3) second sentence para 4 TKG, determines the frequency usage conditions, including the degree of coverage with the frequency usage and the time required for this, prior to the award proceedings. The coverage obligation is made a constituent part of the frequency assignment under section 61(6) TKG.

651 The federal states have set out the following framework conditions for broadband access ("Coverage requirements for the mobile industry in the award proceedings for the 694 to 790 MHz band (Digital Dividend II)", 14 October 2014):

> *"1. Under priority use of the 700 MHz frequency band (694 to 790 MHz), assignees must ensure nationwide broadband coverage of the population with a minimum downstream transmission rate of 10 Mbit/s with mobile-based transmission technology.*
>
> *2. Within three years of assignment of the spectrum, coverage of a minimum of 98% of households nationwide must be reached with the mobile-based broadband access referred to in 1., whereby a minimum of 95% must be achieved in each federal state and 99% in city-states. Full coverage must be ensured for the main transport routes (national motorways, high speed railways lines).*
>
> *3. Evidence of nationwide coverage shall be substantiated unequivocally and plausibly through appropriate simulations and submitted to the Bundesnetzagentur and shall be verified by the Bundesnetzagentur through appropriate measurement methods.*
>
> *4. Insofar as the aforementioned targets have not been achieved within three years of assignment of the spectrum, a rollout obligation is to be imposed by the Bundesnetzagentur on the users of the 700 MHz band to guarantee the aforementioned objectives within a reasonable deadline."*

652 On the basis of this proposal and the responses to the consultation the Chamber has laid down a coverage obligation. This coverage obligation is based on the following considerations:

653 First, the coverage obligation should ensure that network build is started promptly, and second, that this build is an ongoing process. The aim is to provide consumers

with telecommunications networks and services at the earliest opportunity. At the same time, the aim is to ensure efficient use of the spectrum assigned at an early point in time.

654 Hence imposing a coverage obligation is one way of achieving the regulatory aims flowing from the Federation's mandate to ensure the availability of telecommunications infrastructure (Article 87f of the Basic Law). In particular, the regulatory aims of safeguarding user, most notably consumer, interests in telecommunications (section 2(2) para 1 TKG), promoting sustainable competitive markets for telecommunications services and networks and for associated services and facilities (section 2(2) para 2 TKG), encouraging efficient investment in infrastructure as envisaged in section 2(3) TKG, expediting the rollout of public high speed next generation telecommunications networks (section 2(2) para 5 TKG) and securing efficient and interference-free spectrum use (section 52 in conjunction with section 2(2) para 7 TKG) are implemented.

655 The Chamber considers the degree of coverage and the compliance period of three years after assignment to be reasonable. The chosen compliance period of three years after assignment is enough to give assignees the necessary flexibility to respond to market and technological developments.

656 Coverage of a minimum of 98% of households – with a minimum of 97 % in each federal state – per assignment holder is suitable, necessary and proportionate so that the regulatory aims pursued in assigning the spectrum, taking into account the federal government's broadband policy and the Digital Agenda 2014-2017, are actually achieved.

657 This can ensure that broadband access is also provided in those rural areas currently without mobile broadband. Nationwide broadband coverage is primarily to be provided using spectrum in the 700 MHz band, although mobile operators will be able to use all their assigned spectrum. By equalising the degree of coverage in all federal states to 97% of households, the Chamber expects improved coverage in both rural and urban areas even in those federal states with less population density. The Chamber has thus met calls from respondents who said that an improvement in full area coverage was advisable. This also meets the broadband policy targets of improving coverage in rural areas (Federal Government Broadband Policy 2009 and the Digital Agenda 2014-2017).

658 The Chamber made clear that the coverage obligation can be met with all the spectrum assigned and not just the frequency blocks acquired in these award proceedings. Hence the Chamber cannot accept the respondents' argument that imposing a coverage obligation on each network operator was disproportionate. The coverage obligation also applies to a network operator that does not receive any assignments in the 700 MHz band.

659 The aim is to maintain existing nationwide network infrastructures to provide almost full coverage with mobile voice services in particular and also – in light of the broadband strategy and the Digital Agenda 2014-2017 – to ensure the steady progression of network rollout throughout the assignment area. The coverage obligation imposed on every assignment holder (excepting new entrants) requiring nationwide broadband access will ensure coverage for both private households and other institutions in continuous built-up areas such as industrial estates.

660 This applies all the more so as the Chamber anticipates that by imposing a coverage obligation on every assignment holder the competition in broadband rollout will lead to nearly complete coverage of all households even in rural areas. The Chamber has based this on the assumption that the three current nationwide network operators will each be required to serve 98% of households nationwide. In view of this, the Chamber finds it neither suitable or advisable nor even unreasonable to impose a

nationwide coverage obligation on assignment holders, which would entail having to provide service in areas where there is no demand.

661 The Chamber wishes to clarify that a coverage obligation in respect of geographical areas eg rural districts, administrative districts or federal areas without taking the population or demand there into account is neither reasonable nor suitable to achieve the broadband strategy and Digital Agenda 2014-2017 objectives. Even a stipulation to serve a geographical area, such as 98% of a specific region, will not ensure that every single household is covered.

662 Although a national coverage obligation higher than 98% of households or 97% of households per federal state could be suitable for achieving the aims of the broadband strategy and of the Digital Agenda 2014-2017 to improve rural service, any such obligation would be a restriction on entrepreneurial freedom, which is neither advisable nor appropriate for achieving these aims. It must also be assumed that an increase in network costs in connection with coverage obligations would cause an increase in consumer prices. The Chamber wishes to draw attention to the fact that coverage of the remaining percentage of households would incur costs in the billions of euros (cf for example the TÜV study "Scenarios and costs for a cost-effective area-wide supply of those regions that so far do not even have a minimum 50 Mbit/s coverage" commissioned by the Federal Ministry of Science and Technology; 2013, page 9).

663 The planned coverage obligation on all assignment holders may achieve both an increase in available network capacity and in choice with respect to the range of offers, quality and price, even for consumers in rural areas. Hence the Chamber does not find it necessary to impose specific quality parameters such as minimum transfer rates and latency periods. The Chamber wishes to draw further attention to the following: A latency period represents the time taken by a data packet to go from the transmitter to the receiver. It can vary depending on the mobile radio network, the transmission method, terminal equipment and location. The latency times for different applications – such as speech applications or emails – can vary. Taking both this and technology-neutral requirements into account (section 1 TKG), it is not possible to impose a specific latency period on an operator. Nevertheless, the Chamber expects competition and the use of new technologies such as LTE-Advanced to bring gradual improvements to these quality parameters.

664 Full coverage should be provided for the main transport routes (national motorways and high speed railway lines) to ensure mobile coverage for the population, as far as is legally and practically possible. In response to a request to secure the coexistence of railway radiocommunications (GSM-R) and mobile services, the Chamber stated that the compatibility of GSM-R and broadband mobile communications usages in the 900 MHz band was subject to a special coordination procedure as part of the site-related setting of frequency usage parameters (cf individual points III.4.2). If there are any further indications of interference with respect to usage of the 700 MHz band, the Bundesnetzagentur will agree solutions with those affected.

665 The aim is, in the consumers' interest, to maintain and promote the existing competitive nationwide provision of telecommunications services by the current mobile operators which cannot be fully replaced by other services or infrastructures provided under intermodal competition. In particular the growing demand for mobile services and the call for "everywhere availability" can only be met by the mobile networks with a high degree of coverage. It is not evident that such a high degree of coverage could be achieved within a short space of time by a new entrant, for instance, in a competitive environment. At the same time, efficient use of the spectrum assigned – especially in rural areas – can be ensured throughout the country.

666 The coverage obligation can help to achieve the aim of guaranteeing the nationwide provision of adequate and appropriate mobile services – and in particular voice services – for consumers into the future. The Chamber also included the provision of mobile broadband services (section 2(2) para 5 TKG) in its considerations. In light of the federal government's broadband strategy and the digital agenda, the Chamber considers it appropriate to specify a minimum transmission rate to guarantee the provision of mobile broadband services as well.

667 The coverage obligation has been changed to the effect that no guaranteed minimum transfer rate per subscriber will be set any longer. Instead – as requested by respondents – a minimum downlink transmission rate of 50 Mbit/s per sector has been stipulated. This should ensure the general availability of transmission rates of 10 Mbit/s and more in relation to the percentage of required household coverage.

668 The Chamber is of the view that the imposition of a coverage obligation of 50 Mbit/s on each network operator will lead to 98% of households nationwide in general having transmission rates available of 10 Mbit/s and more. In particular, different to the previous Digital Dividend I coverage obligation, service is now to be provided in parallel by all network operators, which the Chamber sees as leading to a marked improvement in rural area coverage with high transmission rates for the consumer.

669 Although the Chamber views a minimum transmission rate per subscriber or household as useful but not reasonable as the demands made of data rates are subject to dynamic changes in light of technical developments and the market demand during a spectrum usage rights term. Even given that high peak data rates are now possible, the Chamber does not consider it reasonable to specify data rates for every household. In deciding on the rate, the Chamber took account of the fact that mobile access is a shared medium, with all the users in one radio cell sharing the available capacity. In addition, data transmission rates depend on other factors such as the weather or where the users are within a particular cell so even if a minimum transmission rate were specified, it could not be guaranteed for every user at all times in one radio cell. In general the data rate can be seen as a statistical quantity that can fluctuate widely, both temporally and locally, owing to the dynamic functioning of a radio network and the user's dynamically changing requirements.

670 The Chamber instead expects that in future a considerably higher transmission rate than the 10 Mbit/s originally provided for per household will be achieved for a large number of subscribers. Experience with broadband rollout so far has shown that in those areas where network operators have extended their networks they make considerably higher data rates available than originally anticipated.

671 However, assignees must ensure nationwide broadband coverage of the population with mobile-based transmission technologies that can achieve a minimum transmission rate of 50 Mbit/s per sector in the downlink. Under the current circumstances any such transmission rate represents the minimum requirement for nationwide broadband coverage.

672 The Chamber took account of the need for the nationwide provision of appropriate broadband services, including broadband applications requiring a high bit rate. The Chamber considers a minimum transmission rate of 50 Mbit/s per sector to be appropriate so that consumers can actually enjoy state of the art and innovative services. The Chamber anticipates that – on account of the obligation to roll out competitive mobile networks – higher data rates will be achieved for the benefit of the consumers within the meaning of section 2(2) para 1 TKG. This will also be possible when more modern mobile technologies such as LTE Advanced are used. Moreover a transmission rate of 50 Mbit/s per sector fixed by the Bundesnetzagentur can be verified unequivocally, whereby the Chamber points out that the transmission rates per subscriber will also be verified (cf point III.4.5).

673 This coverage obligation for each assignee aims to ensure that competitive broadband networks are rolled out nationwide as soon as possible and the spectrum is used efficiently in accordance with the regulatory aims set out in section 2 TKG. The Chamber expects this to help improve broadband coverage in particular in those areas which currently have inadequate or no broadband access.

674 Consequently it may be possible to increase the aggregate network capacity made available by several network operators significantly especially in rural areas and, because of competition among operators, the services offered to consumers may improve given the transmission rates. Moreover, it is expected that each network operator will roll out broadband in different geographical areas and not congruently, so that overall a higher degree of coverage will be achieved than 98% of the population nationwide or 97% per federal state.

675 An assignee that has not operated a nationwide mobile network is required to use the spectrum to cover at least 25% of the population from 1 January 2021 and at least 50% of the population from 1 January 2023. It is not appropriate to impose a higher coverage obligation as regards population and quality on a new entrant who – unlike the existing network operators – does not have the relevant infrastructure in place. With this rule the Chamber has taken account of the interests of small and medium-sized enterprises (cf section 61(4) TKG) so that the coverage obligation does not restrict the possibility of market entry disproportionately. This also applies to the availability of the 700 MHz spectrum. The Chamber anticipates that a new entrant in the mobile market will also build and roll out his network in line with demand in order to be in a position to compete successfully.

676 Assignees must provide evidence that the coverage obligation imposed on them has been met. In particular, the obligation to ensure 50 Mbit/s per sector and to achieve a general transmission rate of 10 Mbit/s per household will be verified. Evidence of nationwide coverage is to be substantiated through appropriate simulations. The Bundesnetzagentur will check this using appropriate measurement methods. The parameters to be met under the obligation will be decided subsequently in line with established practice, taking account of the technology deployed.

677 In light of the planned coverage obligation – and as requested by respondents – the Chamber wishes to draw attention to the following: In the event of non-fulfilment of the coverage obligation the Telecommunications Act provides, in section 63(1) para 2, for the possibility of revoking the frequency assignment. However the Chamber reserves the right to examine individual cases and to exercise discretion as to whether other measures to ensure compliance with the coverage obligation are suitable, necessary and reasonable, such as the deadline extension put forward in the federal states' proposal under point 4.

678 In response to arguments that a coverage obligation conflicts with promoting broadband as areas already served cannot receive additional assistance, the Chamber points out that this decision does not cover federal assistance initiatives. The Bundesnetzagentur is not responsible for federal assistance decisions.

679 Therefore the operative provisions have been amended as follows:

> Assignees must ensure nationwide broadband coverage of the population with mobile-based transmission technologies that achieve a minimum transmission rate of 50 Mbit/s (Megabit per second) per sector in the downlink.
>
> The imposition of a coverage obligation of 50 Mbit/s per sector on each network operator is to ensure the general availability of download transmission rates of 10 Mbit/s and more in relation to the percentage of required household coverage.
>
> Within three years of the award of spectrum, each assignee must achieve coverage of a minimum of 97 % of households in each federal state and a

minimum of 98 % nationwide with the above-referred mobile-based broadband access. Full coverage must be ensured for the main transport routes (national motorways and high speed railway lines), as far as is legally and practically possible.

Assignees may enter into cooperation agreements and lease frequencies, as long as this is permitted under the regulatory and competition law frameworks.

An assignee that has not previously operated a nationwide mobile communications network is required in its frequency usage to cover at least 25 % of the population from 01 January 2021 and at least 50% of the population from 01 January 2023.

Assignees must provide evidence that the coverage obligation imposed on them has been met. Evidence of nationwide coverage shall be substantiated unequivocally and plausibly through appropriate simulations. The Bundesnetzagentur will check this using appropriate measurement methods. The parameters to be met under the obligation will be decided subsequently, taking account of the technology deployed.

Re III.4.5 Reporting requirements

680 From the time the spectrum is assigned, assignees must report to the Bundesnetzagentur every year on the progress of spectrum use and network build and rollout.

681 The purpose of the reporting requirement is to ensure that the coverage obligation imposed in III.4.4 is met. It is appropriate for the Bundesnetzagentur to be informed regularly of progress so as to guarantee that each assignee uses the assigned spectrum swiftly.

682 The report must specifically state the broadband network capability, also including the use of LTE and further enhancements, to ensure that the regulatory aims pursuant to section 2(1) paras 1 and 5 TKG are met. This report should also include the degree of coverage with respect to nationwide provision, the average transmission rate actually available and the current status regarding the deployment of innovative applications and technological developments (such as autonomous operation or digital routes).

683 Here, the Chamber would like to point out that the network operators are required to allow technical testing of the coverage obligations by the Bundesnetzagentur*s radio monitoring, telecommunications investigation and inspection service. This requirement includes making appropriate technical aids available for network access such as providing suitable SIM cards free of charge for measurement purposes. The Bundesnetzagentur will carry out radio measurements as part of the coverage obligation test to determine the data rates actually made available by each assignee (drive tests).

684 The operative provisions have been amended as follows:

> From the time the spectrum is assigned, assignees must report to the Bundesnetzagentur every year on the progress of spectrum use and network build and rollout. This report should also include the degree of coverage with respect to nationwide provision, the average transmission rate actually available and the current status regarding the deployment of innovative applications and technological developments.

Re III.4.6 Condition subsequent for spectrum in litigation

685 A condition subsequent will be attached to assignments of spectrum in litigation for the event that the Bundesnetzagentur is forced by court ruling to assign the usage

rights to other undertakings. Such secondary conditions are absolutely necessary to enable compliance with the court rulings.

686 The Chamber believes that a condition subsequent as specified in section 36(2) para 2 VwVfG is the appropriate legal means to employ in order to assign frequency usage rights in compliance with a court ruling. Attaching a condition subsequent means that the assignment will expire without the need for further administrative action when the condition is fulfilled, whereas exercising a reserved right of revocation would require a new administrative act which could be subject to legal appeal. In the interests of legal certainty, a condition subsequent should therefore be attached to the assignments. The wording of the condition subsequent will be finalised when the assignments are granted.

Re III.4.7 No service provider obligation

The following comments were made:

687 Some respondents called for the imposition of a service provider obligation to secure fair competition and to promote markets with sustainable competition. The relevant market was said to have changed so much following the merger of Telefónica and E-Plus that without a service provider obligation there would be a squeezing out of suppliers without their own network infrastructure to the detriment of competition or there would be an oligopoly within the meaning of the German Restraints of Competition Act (GWB).

688 A service provider obligation would also have a positive effect especially given the opportunity for network capacity utilisation.

689 Section 60(2) TKG provides sufficient powers to impose a service provider obligation without the requirement of an assignee's significant market power.

The Chamber has ruled as follows:

690 No obligation will be imposed on assignees in these proceedings to offer service providers access to services on a non-discriminatory basis.

691 In its decision of 2009 (cf BK1a-09/002 loc cit) the Chamber had already stated the following in this respect:

> *The Chamber is not legally empowered in the proceedings under section 61 TKG to impose obligations requiring assignees to offer service providers access to services on a non-discriminatory basis.*
>
> *Section 61(4) second sentence para 4 TKG does not provide sufficient authority for this purpose. Under this provision, the Bundesnetzagentur determines the frequency usage conditions, including the degree of coverage with the frequency usage and the time required to achieve such degree, prior to carrying out award proceedings. Frequency usage conditions in this sense not only include technical specifications which ensure efficient and interference-free use, but can also include arrangements for achieving other regulatory aims set out in section 2(2) TKG. The Chamber takes the view, however, that section 61(4) second sentence para 4 TKG cannot be interpreted as giving authority to impose a service provider obligation.*
>
> *There are no objective grounds for believing that the law was intended to give the Bundesnetzagentur powers, other than instruments for regulating the market, to impose a service provider obligation on assignees, regardless of their market power. It is important to consider in this context that the obligation to offer access to service providers would represent interference with the constitutionally protected private autonomy of the assignees. As the law stands such private autonomy can only be restricted if very specific conditions apply (see in this context section 21(1) and (2) TKG). Restrictions on private autonomy may also*

be justified under certain circumstances by the right to use a scarce public resource – such as spectrum – given that the holder of the right to such a scarce resource enjoys a benefit not available to the public as a whole. This benefit might be compensated in the sense of public welfare by subjecting the network operator to a special obligation in the public interest. Nonetheless, whether or not this is justification enough for interfering with network operators' constitutionally protected rights can only be ultimately decided by legislation, as in fact is the case in section 21(2) para 3 TKG

For these reasons the Chamber does not consider that section 61(4) second sentence para 4 TKG provides sufficient powers to impose a service provider obligation.

Section 60(2) first sentence TKG does not provide a basis for such powers either for the same reasons.

692 The Chamber draws attention in this connection to the fact that the UMTS/IMT-2000 licences still include obligations with respect to service providers. This follows in particular from section 150(4) TKG. Since these service provider obligations form a constituent part of licences or frequency assignments granted to specific persons and whose regulations still produce legal effects, the obligations continue to apply to all three mobile network operators irrespective of the spectrum assigned and the technology deployed.

693 In view of the service provider obligation under the UMTS licences and frequency assignments still in force, the Chamber does not see the need at present to impose any such obligation. Service providers continue to have an opportunity to provide their customers with mobile services on the basis of the on-going obligation. In particular, due to licences or frequency assignments being granted to specific persons, the existing service provider obligation is not restricted to specific frequencies held by a licence/frequency assignment holder. Hence the service provider obligation imposed in 2000 applies beyond and irrespective of the frequency assignments awarded in these proceedings. The Chamber does not consider the repeated imposition of an obligation to be appropriate as service providers currently have access to services on the basis of the entire spectrum assigned to mobile network operators.

694 The Chamber considers the service providers' contribution to network utilisation stated by the respondents to be a component of efficient spectrum usage. Moreover the service providers also safeguard consumer interests by extending the mobile services on offer and as additional market participants serve to maintain a competitive environment in the market. In this respect the Chamber welcomes the fact that service providers continue to offer mobile services due to the service provider obligation remaining in force and as a result continue to play a role in achieving the regulatory aims.

695 Irrespective of the question raised in the 2009 award proceedings as to whether sufficient statutory powers are provided, the Chamber does not see a need for a decision at this point in time. The previous UMTS/IMT-2000 licences apply for a fixed period until 31 December 2020. This gives service providers the certainty of being able to continue providing mobile services in the coming years. The Chamber will address the issue of re-imposing a service provider obligation, taking account of the aforementioned positive effects on spectrum usage, market and consumers, in good time before the new award of the UMTS/IMT-2000 licences or frequency assignments. In its examination it will also consider how the market and competition have developed in the years following the Telefónica/E-Plus merger in light of the TKG's regulatory aims. The Chamber will examine without any bias the need to re-impose a service provider obligation in view of a reallocation of the UMTS licences

that expire in 2020 on the basis of an examination of frequencies distribution to be carried out following the auction.

696 Inasmuch as respondents have stated that the imposition of a service provider obligation is necessary at this moment in time given the Telefónica/E-Plus merger, the Chamber draws attention to the following:

The President's Chamber decision on the frequency regulation aspects of the merger between Telefónica and E-Plus (cf BK1-13/002, loc cit) ruled that the applicable rights and duties of the companies until then - and thus also the existing service provider obligations - remained in force and continued to apply to the merged company as a result of the merger.

697 In the course of an examination of the merger under competition law by the European Commission, Telefónica had undertaken to go beyond this and to expand and prolong existing agreements with service providers and expressly make LTE services available to them. Moreover, up to three but a minimum of one MVNO (mobile virtual network operator) or service provider had the opportunity to acquire up to 30% of the merged company's capacity (cf specifically: COM, DG Competition, case M.7018 Telefónica Germany and E-Plus).

Re III.5Minimum bid, section 61(4) second sentence TKG

The following comments were made:

698 It was said that the minimum bids were too high. Compared with the 2010 auction, the minimum bids had been raised dramatically (some as much as 30 times higher). It was stated with reference to section 142(7) TKG that it was not appropriate to set the assignment fee as a minimum bid. In addition, minimum bids did not have to function as a steering mechanism towards an optimum and mandatory TKG aim of effective use of spectrum as the auction already provided an incentive for effective spectrum usage. High minimum bids diametrically opposed the principle of encouraging efficient investment and innovation in new and improved infrastructures, and could hinder fair competition. The minimum bids should instead be based on those of 2010.

699 It was additionally stated that it was inappropriate for the minimum bids in the 700 MHz band to be based on the fees ordinance even though this was warranted. The high minimum bids acted as a barrier to market entry, which did not exist in the fixed line area. The Bundesnetzagentur must take the concerns of small and medium-sized enterprises into account when setting the minimum bids in accordance with section 61(4) para 4 TKG, hence the minimum bids that exceed the assignment fees represent a departure from the former regulatory practice. Overall there was no justification for the minimum bids in the 700 MHz band. Also a fee item was missing for the 700 MHz band.

700 There was still no standard technical eco-system in the 1.5 GHz band and demand for this band was completely open. A European comparison showed that unpaired spectrum in the 1.5 GHz and 2.6 GHz bands had generated significantly lower proceeds. Thus the minimum bids here should be set lower than for the 1800 MHz band. Additionally there was no fee item for 1.5 GHz.

701 One respondent said that the minimum bids were not capable of guaranteeing the necessary funding for promoting broadband. Minimum bids of €131.25 million were set off against the federal share required of €4 billion.

702 It was said that the planned minimum bid amounts together with increments of up to 10% could lead to a heavy financial burden especially given that no bidder wanted to lose eligibility points. Neither was it possible in this way to acquire the spectrum for an assignment fee.

703 It was further stated that the Frequency Fee Ordinance (FGebV) was unlawful as different to the 2010 auction it now set a multiple minimum bid.

The Chamber has ruled as follows:

704 The minimum bids will be stipulated for the paired and unpaired 5 MHz blocks.

705 Section 61(4) second sentence TKG provides for a minimum bid to be stipulated for participation in the auction.

706 The minimum bids are based on the Frequency Fee Ordinance (FGebV) in force and on the phased availability of spectrum in the 700 MHz band. Thus, according to the ordinance, the fee for assignment for 15 years of a paired 5 MHz block in the 900 MHz band is €75m and in the 1800 MHz band is €37.5m.

707 There are no compelling reasons to stipulate a different minimum bid for the spectrum additionally included at 700 MHz than for the other spectrum available upon award at 900 MHz. The bands are comparable as regards their propagation characteristics and are hence treated the same as far as the minimum bid is concerned.

708 Where some respondents have said that the amount of the minimum bids puts small and medium-sized enterprises at a disadvantage, attention is drawn to the fact that the fixed minimum bid amounts do not exceed the statutory assignment fee. The assignment fees as per the Frequency Fee Ordinance would be payable upon assignment of frequencies and do not pose a barrier to market entry (cf section 142(7) TKG).

709 With a view to the phased availability of the 700 MHz spectrum – and also in the interests of potential new entrants – the Chamber refrains from setting higher minimum bids despite the extended time limit to 2033 compared with that given in the draft decision.

710 The minimum bid for the spectrum in the 1.5 GHz band is therefore based on the fee for spectrum in the 1800 MHz band.

711 The Chamber wishes to make it clear that the higher minimum bids when compared with the 2010 auction are due to amendments to the frequency fee ordinance now in force. The Bundesnetzagentur is required to apply this ordinance pursuant to article 20(3) of the Basic Law (GG).

712 The following minimum bids therefore apply:

Spectrum	Frequency block	Minimum bid
700 MHz	2 x 5 MHz (paired)	€75,000,000
900 MHz	2 x 5 MHz (paired)	€75,000,000
1800 MHz	2 x 5 MHz (paired)	€37,500,000
1.5 GHz	1 x 5 MHz (unpaired)	€18,750,000

Table 6

713 The same minimum bids are envisaged for spectrum in litigation since they are based on the assignment fee which would in any case have to be paid.

Re IV. Auction rules

Re IV.1 General provisions

Re IV.1.1 Venue

The following comments were made:

714 Holding an auction on site in Mainz was out of date, all the more so because bids were to be placed (manually) using a computerised tool. The auction should instead take place remotely over a secure internet connection, as in many other European countries. This, it was said, would enable bidders to direct the process more effectively, simplify communication within the bidders' teams and facilitate decision making at management level. It would also reduce the risk of errors and enable efficient spectrum assignment. In addition, not having the bidders on site together would reduce the risk of collusion.

715 It was also said that preparing for and participating in the auction involved considerable expense and effort for the bidders in financial and logistical terms, and that this expense and effort would be even greater if a physical auction were to be held.

716 One respondent said that if it was too late to switch to an online auction without causing delays, then at least unnecessary restrictions on communications should be removed.

The Chamber has ruled as follows:

717 Because of very heavy demand and in order to implement the federal government's broadband strategy, the Bundesnetzagentur has a strong interest in providing the market as quickly as possible with the spectrum which is available for award. For this reason the auction will be held in Mainz in the physical presence of the bidders, using locally networked computers (a so-called presence auction). This is intended to ensure that the frequency award proceedings are conducted briskly, smoothly and efficiently.

718 With respect to calls for a remote auction to be held, the Chamber feels the following must be considered. Additional extensive preparations and an expanded testing phase would be needed to ensure proper proceedings and counteract collusion in a remote auction; this would delay the auction considerably. A delay would conflict with both the federal government's broadband strategy and the implementation of the merger decision. Previous physical auctions have proved effective as brisk and smooth proceedings. On account of the high security requirements laid down by the Bundesnetzagentur – and in the past by the bidders – for such spectrum auctions, the Bundesnetzagentur believes that it is still absolutely necessary to run a physical auction; in particular in light of the most recent events relating to data security and the internet the Chamber is convinced that only an independent network is capable of providing the required degree of data security and confidentiality.

719 A physical auction at a central location therefore provides a significantly greater guarantee that proper proceedings will be ensured and collusion counteracted than if bidders were to bid from their own business premises. Hence the Chamber cannot agree in particular with the comment that a remote auction would carry a lower risk of collusion than a physical auction held on site at the Bundesnetzagentur's office. The Chamber admits that a remote, online auction would enable bidders to direct the process more effectively, but it does not see how it would facilitate decision making at management level and enable efficient spectrum assignment since these two factors do not depend on where an auction is held. Bidders on site at a physical auction can still be in constant contact with their companies. Nor does a physical auction carry the risk of error as claimed by respondents, as secure data transmission is guaranteed and bidding can also be done carefully under the eyes of several team members. In addition, the auction software is designed so that errors are avoided: before a bidder submits a bid, a window appears on the bidder's screen showing all the intended active bids and the resulting eligibility points for the next auction round; the bidder has the opportunity to check if all the information is correct before finally submitting the bid. The Chamber would also like to point out that the information shown on the

screen can be printed out at any time. Past spectrum auctions in Germany have provided no indication of a higher risk of error.

720 The Chamber understands that preparing for and participating in a physical auction involves considerable expense and effort for the bidders in financial and logistical terms. However, this does not outweigh the advantages of a physical auction. Having weighed up all the arguments, the Chamber has decided that a physical auction will be held.

Re IV.1.2 Eligibility

721 IV.1.2 lists the formal requirements to be met by an applicant for participation in the auction as a bidder, namely formal qualification, the provision of security and authorisation of the bidder's representatives.

722 Before conducting the auction the Bundesnetzagentur will issue a public announcement stating which applicants are entitled to take part in the auction as bidders.

Re IV.1.3 Security

The following comments were made:

723 Respondents said that it should be possible for the security to be provided through an institution in another European country.

The Chamber has ruled as follows:

724 One of the conditions for participation in the auction is that the qualified applicant provides security. The point of the security is to demonstrate that the applicant has a serious intention to take part; it also serves as cover for at least part of the amount to be paid by the successful bidder. It is without prejudice to the need to supply proof of financial capacity, which is done primarily by submission of a financing statement.

725 The security can be furnished by transferring the amount in question to an account to be specified by the Bundesnetzagentur. The account must be credited not later than 14 days before the start of the auction.

726 Alternatively the provision of the security may also take the form of an unconditional, continuing, irrevocable, absolute bank guarantee issued by a domestic (ie German) financial institution or a financial institution authorised as a customs and tax guarantor. Under section 766 first sentence of the German Civil Code (BGB), the surety bond must be in written form; and if this method is used the original must be submitted to the Bundesnetzagentur. If the bond is notarised, only the copy intended for the Bundesnetzagentur need be submitted. The purpose of restricting authority to issue the bond to the financial institutions defined above is to ensure that the payment transaction and its enforceability are governed by German law. The Chamber does not share the respondents' view that this condition should be changed. The surety bond must have been received by the Bundesnetzagentur not later than 14 days before the start of the auction.

727 The security amount will be determined by the maximum number of eligibility points held by the applicant, determined on the basis of the application to qualify. The benchmark used is the minimum bid for an unpaired frequency block above 1 GHz, which in this case is €18,750,000. The security therefore amounts to €18,750,000 for each eligibility point (expressed as lot ratings).

728 The purpose of making the security amount dependent on the minimum bid is to ensure that interested undertakings are not deterred from participation in the auction solely because of the security amount.

729 Once the security amount has been transferred to the Bundesnetzagentur's account it will, under the rules of the auction, be set off against the contract price or other accounts payable in the event of a successful bid.

730 If the security was furnished in the form of a bank guarantee, this will be returned after payment has been made.

731 The security will not earn interest. If a bidder has not been awarded spectrum and has no other payment obligations, the security will be reimbursed immediately the complete auction proceedings have been ended. In this case the surety bond will be returned.

Re IV.1.4 Lots

The following comments were made:

732 The respondents essentially welcomed the regulations on awarding frequency blocks in abstract and specific form, in particular in respect of the 700 MHz, 900 MHz and 1.8 GHz bands. However, they pointed out that awarding the blocks in abstract form meant that all the blocks in one category had to be equal in value, which would not be the case if some blocks were to be available one year earlier than others.

733 In connection with the question as to whether abstract or specific frequency blocks should be awarded, respondents also drew attention to uncertainties linked to the planned allotment process and called for more explicit regulations (with reference to IV.4.2).

The Chamber has ruled as follows:

734 The lots auctioned will be all the frequencies available for the award of spectrum for MFCN in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands.

735 The Chamber awards the frequency blocks in the above-stated bands as far as possible in abstract form, ie without stating the specific position of the particular block in the specific band. The spectral position of the blocks won at auction is determined after the auction in separate allotment proceedings, as regulated in IV.4.2. The said blocks are allotted to the individual highest bidders in the period between the close of bidding proceedings (by award of the individual lots via delivery of the award certificates) and the issue of the spectrum assignment notices. Details of the allotment procedure can be found in IV.4.2.

736 The preference given to the award of abstract rather than specific frequency blocks offers advantages to both the bidders and the auctioneer. For one thing, the abstract form makes it easier for bidders to take bidding decisions. For another, it facilitates the acquisition of contiguous spectrum, which is of prime interest to bidders. The combination of various frequency blocks in a single package of contiguous spectrum means that the frequencies can be used more efficiently: usage efficiency is a great deal higher with contiguous spectrum than with individual frequency blocks which are not contiguous. Furthermore, it becomes decidedly less likely that the use of adjacent frequency blocks by different operators will cause impairments of service. Bidders therefore have a justified interest in ensuring that they can acquire contiguous spectrum.

737 The award of abstract spectrum, as defined above, makes it possible to achieve the aim of securing efficient and interference-free use of spectrum, as stated in sections 2(2) para 7 and 52(1) TKG. After abstract spectrum has been acquired during the bidding proceedings it is then, in separate proceedings, allotted to form a package of specific contiguous frequency blocks.

738 The Chamber is satisfied that the abstract award of frequency blocks proved its worth in auction proceedings in the past. It found the approval of past bidders, and it is a procedure that interested parties are familiar with.

739 Nor does the fact that spectrum in the 900 MHz and 1800 MHz bands forms part of the subject of legal disputes militate against the award of spectrum in abstract form:

Action by Telefónica Deutschland Holding AG vs the Federal Republic of Germany (Cologne Administrative Court, 21 K 4205/14) contesting the ruling on the frequency regulation aspects of the merger of Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG of 4 July 2014. The frequencies concerned here are those in the 900 MHz and 1800 MHz bands which Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG are required to return by 31 December 2015 insofar as they hold no assignment for these frequencies beyond 2016 at that time (early return of 900 MHz and 1800 MHz spectrum).
Action by E-Plus Mobilfunk GmbH & Co. KG vs the Federal Republic of Germany (Cologne Administrative Court, 21 K 4151/14) contesting the ruling on the frequency regulation aspects of the merger of Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG of 4 July 2014. The frequencies concerned here are those in the 900 MHz and 1800 MHz bands which Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG are required to return by 31 December 2015 insofar as they hold no assignment for these frequencies beyond 2016 at that time (early return of 900 MHz and 1800 MHz spectrum).
Action by Airdata AG vs the Federal Republic of Germany (Cologne Administrative Court, 21 K 4178/14) contesting the ruling on the frequency regulation aspects of the merger of Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG of 4 July 2014. The frequencies concerned here are those in the 900 MHz and 1800 MHz bands which Telefónica Deutschland Holding AG and E-Plus Mobilfunk GmbH & Co. KG are required to return by 31 December 2015 insofar as they hold no assignment for these frequencies beyond 2016 at that time (early return of 900 MHz and 1800 MHz spectrum).
Objections by DB Netz AG dated 12 January 2011 and 11 January 2012 to the flexibilisation of the spectrum usage rights held by E-Plus Mobilfunk GmbH & Co. KG in the 880.1 to 885.1 MHz and 925.1 to 930.1 MHz bands.
Objection by E-Plus Mobilfunk GmbH & Co. KG to points 3 and 5 of the notice dated 14 December 2010 on the flexibilisation of the frequencies in the 880.1 to 885.1 MHz and 925.1 to 930.1 MHz bands.
Objection by Airdata AG dated 27 September 2010 to the rejection of the application for assignment of frequencies in the 890.1 to 914.9 MHz and 935.1 to 959.5 MHz bands. The preliminary action by Airdata AG for annulment of the President's Chamber decision dated 23 January 2012 (GSM concept) was dismissed by the Federal Constitutional Court in its final and absolute ruling of 22 July 2014 (no 6 B 50.13).
Objection by Airdata AG dated 6 September 2012 to the assignment notice dated 1 August 2012 issued to E-Plus Mobilfunk GmbH & Co. KG concerning the extension of the E1 licence until 31 December 2016 and the application for assignment of the relevant frequencies.

740 As all the frequency blocks available for award in the 900 MHz and 1800 MHz bands are the subject of ongoing legal proceedings or administrative appeal proceedings, they are in this respect of equal value and could in light of this be awarded in abstract form.

741 On the other hand the award of specific frequency blocks must be preferred when there are substantial differences of value between the blocks. Otherwise serious conflicts of interest would in certain cases arise in the next phase, the allotment

procedure. Moreover, uncertainty over value during the auction phase could result in inefficient bidding.

742 The general provisions for the use of frequencies are stated in the grounds for the decision on the purpose of use (cf III.4.1) and the provisions for frequency use (cf III.4.2); they are also set out in specific detail in Annexes 2 to 4.

743 Given the above, the abstract award of frequency blocks in the bands at 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz is possible in the present proceedings. Abstract award of spectrum is in principle conditional on the frequency blocks in a band being shown, by analysis, to be of equal value.

744 The frequency blocks available for award in the 1.5 GHz and 1800 MHz bands with the exception of the highest frequency block at 1800 MHz are of equal value in every case and can therefore be awarded in abstract form.

745 Re the 1800 MHz band:

The highest frequency block in the 1800 MHz band (1780 to 1785 MHz / 1875 to 1880 MHz) will be awarded at a specific spectral position on account of the spectrum directly adjacent being used for DECT. In the band above 1880 MHz there are DECT applications to be protected (cf I Availability).

746 The remaining paired frequency blocks in the 1800 MHz band will be awarded in abstract form. Such assignment of contiguous spectrum is directed at the above-stated aim of ensuring efficient frequency usage, as required in section 52 in conjunction with section 2(2) para 7 TKG.

747 Re the 1.5 GHz band:

The unpaired frequency blocks in the 1.5 GHz band will be awarded in abstract form. Such assignment of contiguous spectrum is directed at the above-stated aim of ensuring efficient frequency usage, as required in section 52 in conjunction with section 2(2) para 7 TKG.

748 The use intended for the blocks in the 1.5 GHz band is as a supplemental downlink (SDL). They can only be used in conjunction with other frequencies for MFCN, and they can be coupled with paired frequencies in a variety of frequency bands. All the blocks must therefore be regarded as equal in value and they can accordingly be awarded in abstract form.

749 Re the 900 MHz band:

The lowest frequency block in the 900 MHz band (880 to 885 MHz / 925 to 930 MHz) will be awarded at a specific spectral position. In the directly adjacent block below 880 MHz / 925 MHz there are GSM-R applications to be protected (cf III.4.2), which means that limited use can be made of this block. Particularly in the vicinity of railway lines, nodal points and railway stations there is restricted choice of transmission parameters, such as transmitter power or the maximum radiation direction of antennas.

750 The remaining paired frequency blocks in the 900 MHz band will be awarded in abstract form. Such assignment of contiguous spectrum is directed at the above-stated aim of ensuring efficient frequency usage, as required in section 52 in conjunction with section 2(2) para 7 TKG.

751 Re the 700 MHz band:

The lowest frequency block in the 700 MHz band (703 to 708 MHz / 758 to 763 MHz) will be awarded at a specific spectral position on account of the spectrum being close to broadcasting applications. In the band below 694 MHz there are broadcasting applications to be protected (cf Annex 3).

752 The remaining paired frequency blocks in the 700 MHz band will be awarded in abstract form. Such assignment of contiguous spectrum is directed at the above-stated aim of ensuring efficient frequency usage, as required in section 52 in conjunction with section 2(2) para 7 TKG. Details of the type of award for the frequency blocks can be found in Annex 6.

Re IV.1.5 Restriction of bidding rights

753 No restriction (spectrum cap) will be imposed on the volume of spectrum that can be bid for by each bidder in the 700 MHz, 1800 MHz and 1.5 GHz bands (for details cf III.3.2).

754 For the 900 MHz band there is a spectrum cap per bidder, and it is set at a maximum of 2 x 15 MHz (paired).

755 Because of the spectrum cap in the 900 MHz band the number of eligibility points is limited to a maximum of six lot ratings.

756 All told, therefore, bidders can apply for a maximum of 46 eligibility points each (expressed in lot ratings). By way of clarification it should be pointed out that this figure derives from the total of all lot ratings from the 700 MHz, 1800 MHz and 1.5 GHz bands and the maximum possible number of eligibility points, due to the spectrum cap, for the 900 MHz band (for details cf Annex 6).

Re IV.2 Power of attorney and auction tutorial

Re IV.2.1 Power of attorney

757 To ensure that the auction can be conducted in brisk and orderly fashion it is necessary for the applicants to be represented at the auction by qualified persons who have familiarised themselves, before the auction, with the auction rules and the IT-based technical procedures.

758 To this end the applicants must, before the start of the auction tutorial, confer power of attorney on persons who will then have to take part in the auction tutorial.

759 During the auction at least two authorised and tutored persons per bidder must be present in the bidding room, so as to ensure the auction runs briskly and smoothly. They must have been authorised as required in IV.2.2.

Re IV.2.2 Auction tutorial

760 It is necessary to have clear auction rules for the practical conduct of an open simultaneous multi-round ascending auction. It is also important to have software that will put the auction rules into practical effect, since otherwise the auction cannot be conducted in the first place. The persons authorised to bid must familiarise themselves with the auction rules and the software that will be used, and this is what the tutorial, backed up by the consultations on the auction rules, is for. As the tutorial is indispensable to the smooth conduct of the auction, participation is obligatory. Invitations to the auction tutorial will be sent out by the Bundesnetzagentur, Section 215.

761 At the end of the tutorial the persons to be authorised to bid at the auction must submit to the Bundesnetzagentur a written declaration that they have understood and will comply with the auction rules and the electronic bidding procedures. Only then will the persons empowered to represent the undertakings be formally authorised to take part in the auction. The authorisation procedure serves to clearly define areas of responsibility and prevent legal uncertainties.

762 Provided that there is sufficient capacity in an individual case, the Bundesnetzagentur will tutor up to twelve persons from one undertaking at a time.

763 Immediately after the auction tutorial the bidders will be given the opportunity to try out the software on their own. They will also be given written information in the form of a handbook. The tutorial will take place in good time, that is, about three to six weeks before the start of the auction.

Re IV.3 Conduct of the auction

Re IV.3.1 Type of auction

The following comments were made:

764 All but one respondent commenting on the auction format agreed with that proposed. Open simultaneous multi-round ascending auctions had been tried and tested and had proved their worth over many years in Germany and in other countries, they said. This kind of auction was transparent, efficient and non-discriminatory.

765 By contrast, combinatorial clock auctions as tested in various European countries had considerable disadvantages, produced substandard results and at worst could even lead to distortion of the market.

766 One respondent however said that the proposed auction format conflicted with the Bundesnetzagentur's statutory tasks: "There is reason to suspect that the Bundesnetzagentur, guided by the Federal Ministry of Transport and Digital Infrastructure's political aims of creating a financial source for fibre based broadband rollout in rural areas, is neglecting its own statutory task."

The Chamber has ruled as follows:

767 The auction will be held as an open simultaneous multi-round ascending auction.

768 All the frequency blocks in the particular frequency bands will be offered at the same time (ie simultaneously) in each round of the auction. The auction will be open in the sense that, in each round, bidders will be given information on the bids of the other bidders. The idea is to enable bidders, during the auction, to assess the evaluations of various frequency blocks by other bidders. As the current auction standings are apparent to all bidders at the end of each round, they can adjust their bidding strategies accordingly. The effect is to reduce the risk of a bidder putting an unrealistically high value on a frequency block and consequently paying an excessively high price for it (the so-called winner's curse). The term multi-round ascending auction is used because the auction ends when no further and higher bid is made for any of the frequency blocks. Up till that moment bids can be made in principle for all the frequency blocks. No limit is placed on the number of rounds.

769 In an open simultaneous multi-round ascending auction bidders are free to decide – depending on their particular bidding eligibility – which frequency blocks in which frequency bands they wish to bid for, irrespective of the particular price levels. The simultaneity also makes it possible for bids to reflect implicitly existing interdependencies of value between the blocks in the various frequency bands. In a simultaneous multi-round auction these options are in principle available up to the end of the auction. Given the possibilities open to bidders it is reasonable to expect that, at the end of such an auction, pretty much the same prices will have to be paid for blocks of equal value.

770 The simultaneous multi-round auction is a tried and trusted procedure which is fully adequate to the needs of the present situation. All the spectrum auctions conducted in Germany to date (ERMES in 1996, GSM in 1999, UMTS in 2000, BWA in 2006 and MFCN in 2010) have been simultaneous multi-round auctions. From the regulatory point of view there are no apparent reasons to depart from this model in the present case. The procedure has been sufficiently tested, and it is comprehensible, transparent and non-discriminatory.

771 By subjecting the simultaneous multi-round auction to specific rules it is possible, to a large extent, to guard against potential risks related to the procedure's fitness for purpose.

772 The offer of comparatively small frequency blocks creates the risk for a so-called new market player, who needs a specific minimum volume of spectrum to realise his business model, of not in fact winning that minimum spectrum package at auction (known as the aggregation risk). It will be kept at a sufficiently low level in the auction format now being planned by giving the bidders, before the auction, the opportunity to specify an essential minimum package, as regulated in III.1.4. If during the auction a bidder gains less spectrum than the specified essential minimum package, he will be eliminated from the auction and will thus be under no payment obligation (for details cf III.1.4, IV.3.9 and IV3.15). This means that he no longer faces the aggregation risk involved in the required number of frequency blocks. In order to prevent abuse in the form of strategic bidding, the bidder in turn is obliged to bid for at least the volume of spectrum in his specified essential minimum package in each round of the auction, provided he has not used any available waivers as specified in IV.3.10. Otherwise he will be eliminated from the auction.

773 It must also be borne in mind that the offer of small frequency blocks does not in the first instance ensure that contiguous spectrum will be acquired, though this is the aim pursued in the interest of efficient use of spectrum. It was therefore necessary to minimise this risk by including special provisions among the auction rules.

774 The risk arises when frequencies from different bands or concrete frequency blocks are auctioned in a specific band. In order to prevent the inefficient assignment of individual frequency blocks the bidders at the auction are permitted to withdraw bids (for details cf IV.3.11). This enables them to switch their total bids over to contiguous blocks. It should also be emphasised that the available spectrum is for the most part offered in the form of abstract blocks. The risk is kept to a minimum for the frequency blocks that can be awarded in the 700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands, as the allotment procedure laid down in IV.4.2 aims to ensure that the frequency blocks won at auction in abstract form are assigned by the Bundesnetzagentur as contiguous spectrum.

775 The open simultaneous multi-round ascending auction format can be said to promote competitive market structures and a "wide distribution" of the available frequency blocks.

776 The Chamber would like to make it clear that an auction is the standard procedure when spectrum is found to be scarce (sections 55(10) and 61(2) TKG). The aim of the proposed auction format – an open simultaneous multi-round ascending auction – is to determine the market prices and not, as claimed by one respondent, to maximise profits, especially considering that the minimum bids are based on the assignment fees laid down in the current Frequency Fee Ordinance (cf III.5).

Re IV.3.2 Procedure

The following comments were made:

777 It was not clear from the draft if a data link would be available although it was absolutely necessary for direct communications between the bidders' rooms and their companies. Nor was it clear why, in a transparent auction, no electronic communications should be permitted.

778 The planned technical resources were not acceptable. A broadband internet connection and the possibility to set up individual communication links were necessary. The 2010 spectrum auction had shown that the restrictions on communication had not provided added value but had, rather, created significant additional work and above all a major obstruction to linking up the bidding teams with

their companies. The communications companies were quite capable of making their internal communications adequately secure so as to prevent third parties from gaining information. Compliance with legal communication restrictions could not be sufficiently ensured through restrictions on the use of communications equipment, especially when outdated equipment had to be used.

The Chamber has ruled as follows:

779 The auction will take place in the Bundesnetzagentur's office building in Mainz. Having it at a central location goes a long way towards ensuring that it will be conducted smoothly and briskly and that the proceedings will pass off in orderly manner. It will cover a complete day, with a one-hour break between 12:00 hours and 14:00 hours. The start of the break will be announced by the auctioneer at the end of a round.

780 In order to ensure that bidders can participate and confer privately during the auction without being disturbed, each bidding undertaking is given its own room (bidding room). The room is equipped with telephones and a fax machine which are exclusively for communication with the auctioneer and the undertaking's decision makers. No later than the bidding tutorial the bidders must designate two numbers, a telephone number and a fax number, which may be used solely for communication between the bidding room and the undertaking. No other phone numbers are connected.

781 The Bundesnetzagentur will meet the respondents' request and will provide an internet connection in each bidding room for communications between the teams on site and their companies. The Chamber would like to make it clear at this point that the basic aim of providing an internet connection for data and/or voice communications is to enable the auction to run smoothly and briskly. The Bundesnetzagentur will therefore provide an internet connection with a bandwidth of at least 2 Mbit/s in each bidding room. Each connection will be restricted to two numbers specified by the bidder in advance and no later that the bidding tutorial.

782 No other telecommunication devices (eg mobile phones) are allowed in the auction/bidding area. This rule does not aim to restrict individual communications but, rather, is absolutely necessary to ensure confidentiality and security within the bidding area. This is why no radiocommunications whatsoever will be allowed in the bidding area. The Chamber would like to make it clear that bidders may leave the bidding area at any time they like, provided at least two members of their team remain in the bidding area (cf IV.2.1), and that they are not subject to any restrictions on individual communications whatsoever once they are outside the auction/bidding area.

783 Apart from the communications infrastructure provided by the Bundesnetzagentur, the software employed makes it possible for paper printouts and printouts of the results following the evaluation of an auction round to be made of every image on the bidder's monitor at any time. These printouts can be faxed to the undertaking whenever required, which means that it can be informed more or less immediately about the status of the auction. For security reasons it will not be possible for the undertakings to have direct electronic access to data in the auction network in the bidding room, for instance results of auction rounds.

784 Further, it will be up to the bidders to decide whether to use encryption devices for communicating with their decision makers. If they do so they will have to provide them themselves. Any encryption devices required will have to be compatible with the analogue switched connections supplied in addition to the internet connections by the Bundesnetzagentur for the period of the auction. It should be borne in mind that the auction will not be interrupted in the event of technical defects in the encryption devices or other technical equipment used by the bidders. In light of the fact that the bidding teams on site are able to communicate with their companies via telephone,

fax and internet, the Chamber does not agree with the claim that links between the teams and their companies would be obstructed.

785 Provision has been made for qualified bidders to be able to test their encryption devices on site, prior to the auction, if they so wish. They simply need to arrange a date in advance.

786 The auction will be conducted via locally networked computers.

787 In addition bidders will be free to use or have ready for use their own laptop and their own printer, together with one backup device for each. They will however have to ensure that any existing radio interfaces in their devices are deactivated in the bidding area.

788 The Bundesnetzagentur will arrange for the results of the various auction rounds to be announced in a room on the auction premises which has been made specially accessible to the public (the so-called public room). The planning is also for not only the final result of the auction but also the results of the various rounds to be published on the internet promptly after evaluation of the round, so as to satisfy the informational needs of the general public. It has been decided to disclose only the current highest bids and the names of the respective highest bidders.

789 On account of the decision to provide an internet connection the operative provisions have been amended as follows:

790 The auction will be held Monday to Friday. It will begin at 08:00 hours and finish as a rule at 18:00 hours.

791 Each bidder will be provided with a separate room within the building. Each room will be equipped with a computer for making bids, a telephone permitting connections solely to the auctioneer, and a second telephone, fax machine and internet access permitting connections solely to the decision makers in the qualified undertaking.

792 Any suspension of the auction will be announced by the auctioneer, who will also inform the bidders of the time at which the auction will be resumed.

793 The auction results will be announced publicly.

Re IV.3.3 The bidder

794 A bidder is an undertaking that has qualified to take part in the auction. Bidders will be represented by persons with powers of attorney and authorised agents who have attended a bidder tutorial before the auction, as required in IV.2.2.

Re IV.3.4 Bid submission

795 Bids are submitted by means of locally networked computers using special auction software.

796 A distinction is made between the entry and the submission of bids or withdrawals. In an ongoing round each participant in the auction, using the auction software, first enters all intended bids for the particular frequency blocks and the intended withdrawals (the entry). Then, by activating the right button in the software, he submits these intended bids and withdrawals en bloc, after he has had the opportunity to recheck them (the submission). Up to the moment of submission he can change his entries at any time during the current round.

797 The bids are processed automatically by the software, the results of a round being transmitted to each bidder via his computer (cf IV.3.13). The use of electronic processing reduces the possibility of error and the time needed for the procedure. Should however a technical defect occur, the auctioneer will decide whether to suspend the auction for the prompt remedying of the defect and then resume, or break off the auction and have it restarted at a later time (cf IV.3.12).

798 The auction software includes a so-called click box which lists all the possible bids for the current round, thus making it impossible to enter invalid bids (cf IV.3.5). After the application to qualify has been checked, the number of eligibility points that can be utilised has a ceiling imposed on it by the Chamber's qualification notice (cf III.1.5) and by the fact that securities have to be provided (cf IV.1.3). The individual eligibility points per bidder are activated in the auction software as stipulated in III.1.5 and IV.1.3. The bidder can therefore use only the number of eligibility points for which he has provided security.

Re IV.3.5 Valid bids

799 To be valid, a bid for a frequency block in an auction round must exceed the current highest bid by at least the amount of the minimum bid increment (cf IV.3.6). If no valid bid was made for a particular block in the earlier rounds of the auction, the minimum bid will be treated as valid.

800 If the highest bid in a round is withdrawn (cf IV.3.11) and no new valid bid for this block is submitted in that round, the new minimum valid bid will be derived from the amount of the withdrawn highest bid plus the current minimum bid increment.

801 The auction software includes a so-called click box which displays all the valid bids which can be placed for each round per frequency block. Click box bidding simplifies the bidding procedure because bidders have no means of entering specific amounts manually. On the one hand this prevents the entry of invalid amounts and thus ensures that the auction proceeds at a brisk pace.

802 On the other hand, though, click box bidding is also designed to stop what is known as code bidding or signalling, that is, bidders using their bids as signals to other bidders, eg via the final digits of a bid. Such signals are tantamount to collusion.

803 With reference to the calculation of the new valid bid after the withdrawal of a highest bid, the Chamber wishes to make it clear that the minimum bid increment is laid down by the auctioneer in each round. If, after due consideration, the auctioneer decides that it is expedient to set the minimum bid increment on a percentage basis, this is what he will do, with a view to ensuring brisk conduct of the auction. The auctioneer can also however stipulate the minimum bid increment for each frequency block separately. If bidding patterns develop which suggest that the minimum bid increment should be higher or lower than the figure calculated by percentage, the auctioneer will set a suitable minimum bid increment for the frequency block in question, but it must be at least €1,000.

Re IV.3.6 Minimum bid increment

The following comments were made:

804 The proposed minimum bid increments of 10%, 5% and 2% were too high. These increments were set in the 2010 auction, but the starting price was much lower. This meant that in absolute terms the increments in the forthcoming auction would be many times higher than those in 2010 and would soon amount to considerable sums, particularly since almost all the blocks for bidding would be abstract blocks. Since it was unlikely that the bidders would automatically divide their bids equally between all the available blocks in a band, the mere process of “finding their way” in the sense of dividing up their bids between the various blocks in a band would result in eight-figure incremental bids. There was a risk that the winning bids would diverge from the bidders’ actual valuations. The large increases in absolute terms conflicted with the basic aim of an open simultaneous multi-round auction, namely to determine the market prices. They would, rather, lead to a maximisation of revenue by the auctioneer. This however should not be the aim of an auction aimed at underpinning broadband rollout in Germany.

805 It was proposed that lower increments should be set: 5% for the initial stage, 3% for the next stage, and 1% for the final stage.

806 One respondent said that the minimum bid increment for the first stage should not exceed 5%. Another respondent said that a maximum increment of €100,000 should be set.

The Chamber has ruled as follows:

807 The minimum bid increment is a specific sum of money by which the highest valid bid in a round must increase as a minimum. During the auction the auctioneer stipulates the minimum bid increment effective at any particular time. In doing so he must give particular attention to two aspects:

808 Firstly, the higher the level at which the increment is set, the faster the auction will be over and, secondly, the greater the likelihood that the results produced by the auction will diverge from the actual valuations of the bidders.

809 Although the Chamber had omitted the highest incremental phase (15%) included in the auction held in 2010, it will meet the request made by a number of respondents to lower the increments to 5%, 3% and 1%. This is because the minimum bids in the forthcoming auction will be considerably higher than those in the 2010 auction and because of the risk that a 10% increment at the start of the auction might hinder the process of determining the actual value of the frequency blocks, which is intrinsic to this auction format, and that the results might even diverge from the bidders' own valuations. The Chamber does not believe it is necessary to set a maximum price increment. Here, it should be noted that the auctioneer has the opportunity after each auction round to adjust the minimum bid increments after due consideration and depending on the progress of the auction.

810 In determining a minimum bid increment the auctioneer should orientate himself to the following guidelines:

811 In the first phase of the auction the minimum bid increment is calculated as 5% of the highest valid bid (incremental stage 1). As a rule it falls by degrees as the auction proceeds, first to 3% (incremental stage 2), and towards the end of the auction to 1% of the highest bid (incremental stage 3). It is at the discretion of the auctioneer to decide – depending on the course the auction takes – when the move is made from one stage to the next. In order to take account of the way a particular auction proceeds the auctioneer can, at his discretion, deviate from the above rule by stipulating the minimum bid increments separately for each frequency block as a particular (but not minus) amount.

812 The minimum bids are orientated to the current assignment fees as specified in the Frequency Fee Ordinance. It can be assumed that the actual economic value of the frequency blocks is appreciably higher. So 5% in the first incremental stage is requisite, appropriate and proportionate to the aim of moving the auction along briskly, and this percentage cannot be expected to distort the economic outcome of the auction. Furthermore it is possible for the auctioneer to decide at an early point in the auction to move on to the next incremental phase, which provides for lower minimum bid increments.

813 The Chamber believes that gradually lowering the minimum bid increment through 3% to 1% in the third and final incremental stage is a sensible way of ensuring that the auction will continue to proceed relatively briskly as it approaches its end.

814 The Chamber has intentionally decided not to have a separate minimum bid increment rule for each frequency band. In the first place such an arrangement would detract from the organisational clarity of the procedure. In the second place it must be

reiterated that the auctioneer can in fact stipulate increments separately for different frequencies and bands, and thus react appropriately to the course the auction takes.

815 When the application of the above percentages results in uneven numbers, the minimum bid increments are rounded to the next whole multiple of €1,000.

The operative provisions have been amended as follows:

> If there is a highest bid for a frequency block after a round in the auction, the auctioneer will stipulate a minimum bid increment for it for the subsequent rounds.
>
> The minimum bid increment is a particular (not minus) sum of money by which the highest valid bid in a round must increase as a minimum.
>
> In the first stage, the minimum bid increment is 5% of the designated highest bid. Depending on how the auction proceeds, the minimum bid increment can be lowered step by step by the auctioneer for further stages to 3% and 1% of the designated highest bid (incremental stages).
>
> Diverging from this, the auctioneer can stipulate a specific amount for individual frequency blocks as the minimum bid increment.
>
> The auctioneer will notify bidders at the start of a round of the level of the particular minimum bid increment, rounded to the next whole multiple of €1,000.

Re IV.3.7 Highest bids

The following comments were made:

816 One respondent said that if identical highest bids were made, it should not be the bid placed first which is considered to be the highest bid but the highest bid should rather be determined using a random algorithm. Using a time stamp to determine which of the bids was placed first and was therefore considered to be the highest bid would encourage bidders to make their bids as quickly as possible. This however was not the point of the auction – the actual aim being to determine the market prices – and would increase the risk of error. A random mechanism would eliminate such false incentives.

817 Another respondent suggested that if identical highest bids were made, both the bid placed first and that placed second should be shown.

818 The Chamber was asked to clarify whether or not bidders would have the opportunity to increase existing highest bids.

The Chamber has ruled as follows:

819 With regard to the distinguishability of the abstract frequency blocks the Chamber wishes to make it clear that all frequency blocks – including the abstract ones – are designated individually in the auction software, each being given a capital letter (cf Annex 6). In each round the bidders bid for such individually designated frequency blocks and not, for example, for a frequency band in which frequency blocks are awarded in abstract form. The result is that the abstract blocks too are distinguishable from each other, even if their specific position in the spectrum is not determined until after the auction.

820 If identical highest valid bids are made, the bidder who submitted his bid first will be considered to have made the highest bid. The Chamber does not agree that the proposed rule for identical highest bids would increase the risk of error or jeopardise the aim of determining market prices. The proposed elimination rule has proved its worth in the past, and it also helps to speed up proceedings as it supplies the bidder with an incentive to place his bid as quickly as possible.

821 Furthermore, the rule is clear, transparent and verifiable for all parties.

822 For the sake of clarity, and as requested, the Chamber wishes to draw attention to the following. Each bidder is able to choose a bid amount from a click box list of valid bids; this minimises the probability of identical valid bids being made for the same frequency block. A bidder holding a highest bid is able to outbid or increase his own highest bid in this way. The bidders are informed of all the active bids of all the bidders via the auction software (cf IV.3.13); this means that if identical highest bids are made, the bid made first and that made second will be shown.

823 Bidders will be held to be active in the following round to the volume of the highest bids they hold.

Re IV.3.8 Lot ratings

The following comments were made:

824 One respondent welcomed the lot ratings proposed in the draft decision, saying that the clear and simple structure provided the required flexibility in the auction and reduced the risk of substitution. The respondent welcomed the particular fact that all the paired blocks would have the same lot rating: even if the value of the blocks varied, in some cases significantly, the blocks were to a certain degree substitutes, hence a lot rating system which allowed bidders to switch between the blocks in the course of the auction seemed adequate. The respondent pointed out however that the lot rating structure should not be connected to the minimum bids. It would be inappropriate to set the same minimum bids for all the paired blocks. The purpose of the lot ratings was to provide optimum flexibility and substitutability during the auction, hence they did not need to reflect the value of the spectrum.

825 By contrast, another respondent said that the lot ratings given were not appropriate in terms of a fair and transparent auction, especially as regards the paired spectrum above and that below 1 GHz. It could not be said that this spectrum was equal in value. The rule proposed in the draft might enable bidders to drive up prices without actually wanting to satisfy their own requirements.

826 To avoid such misuse, the lot ratings should be based on the actual value of the spectrum: 4 for each 2 x 5 MHz block (paired) below 1 GHz, 2 for each 2 x 5 MHz block (paired) above 1 GHz, and 1 for each 1 x 5 MHz block in the 1500 MHz band.

827 Attention was drawn to the fact that bidders might "park" bidding rights to avoid losing them. This could very quickly become very expensive for a bidder on account of the required minimum bids and increments of up to 10%, even if the bidder were to place his bids with his actual requirements in mind.

The Chamber has ruled as follows:

828 Lot ratings are standardised numerical values which reflect the spectral extent of individual frequency blocks. Because the various blocks which are available for award differ in terms of their spectral volume (unpaired 5 MHz and paired 5 MHz blocks), the standardisation of the eligibility by giving them a lot rating of 1 or 2 makes it easier for bidders to grasp the broad outlines of the auction and simplifies the bidding process. A frequency block of 1 x 5 MHz (unpaired) has a lot rating of 1 and a block of 2 x 5 MHz (paired) has a lot rating of 2. Details are given in Annex 6. Assigning lot ratings makes it possible in principle for active bids to be switched among the various frequency blocks in all frequency bands at any time, including the final phase of the auction when there is a high level of activity (cf IV.3.9).

829 At the beginning of the auction a bidder's eligibility corresponds to the total lot ratings and is linked to the application for the volume of frequency blocks which can be won at auction from the total frequency spectrum available for award.

830 It should be mentioned by way of clarification that the lot ratings are predefined for each frequency block. However, every bidder is free to decide in each auction round which frequency blocks he will bid for, within the limits of the eligibility points, expressed in lot ratings. This means that new bids in each round can basically be distributed at will over the blocks in all the bands, and also that in the rounds thereafter bids can be entered for frequency blocks which had not been previously bid for by the particular bidder.

831 The Chamber wishes to make it clear that the lot ratings do not have any influence on the minimum bids: they have an influence solely on the bidders' activity. The lot ratings of 1 and 2 only reflect the bandwidth of the blocks: 1 lot rating stands for 1 x 5 MHz. Hence all the blocks of 2 x 5 MHz have a lot rating of 2, irrespective of which band they are in. This clear and simple lot structure also reduces the risk of substitution. The Chamber has therefore not met respondents' requests to alter the structure of the lot ratings.

832 It can be assumed that blocks with the same amount of bandwidth (eg 2 x 5 MHz) are to a certain degree substitutes, irrespective of their actual position in the spectrum. This lot rating system allows bids to be switched between such blocks, irrespective of the blocks' exact spectral position. Only then can the system give the bidders the flexibility they need to choose which frequency blocks and which bands to bid for. The Chamber is aware that this may indeed result in very different highest bids being made for blocks in the individual bands, irrespective of the lot rating.

833 The fact that different minimum bids have been set for blocks with the same bandwidth shows that the minimum bids are not linked to the lot ratings. Rather, the minimum bids are based on the Frequency Fee Ordinance and depend on whether the blocks are above or below 1 GHz.

Re IV.3.9 Activity rules

The following comments were made:

834 One respondent said that the minimum activity levels should be changed to 50% in activity phase 1 and 75% in activity phase 2 and that a third activity phase with a minimum activity level of 100% should be introduced; this was in line with the auction held in Germany in 2010 and comparable spectrum auctions in other countries.

835 Another respondent welcomed the fact that there was no 50% activity phase but was critical of the fact that there was no 100% activity phase, since this did not reflect the Bundesnetzagentur’s past practice. The purpose of the different activity phases was to provide a pricing mechanism which minimised both the risk of exposure and the risk of aggregation. Bidders would be able to slowly edge their way towards what they were willing to pay and what they aimed for in terms of a spectrum package. Ending the auction with an 80% activity phase would increase the risk of bidders being taken by surprise by the auction finishing before they had acquired all the spectrum they needed because they had taken a more cautious approach.

The Chamber has ruled as follows:

836 Activity rules in a multi-round auction lay down the extent to which active or new valid bids must be made by bidders, with due consideration for the highest bid held by them, if they are not to lose any eligibility points for the remainder of the auction. On the one hand the activity rule should be designed to ensure that the auction can proceed briskly. It should also seek to counter dilatory tactics and thus stop bidders holding back information on their valuation of specific frequency blocks. On the other hand it should be flexible enough to allow bidders enough time to make reasonable bidding decisions, which ought in the end to ensure that the spectrum is assigned efficiently.

837 When frequency blocks are auctioned in different frequency bands, bidders enjoy even greater flexibility by virtue of 100% activity not being required. Consequently different minimum levels of activity were laid down for different activity phases, depending on how the auction developed. The minimum activity level starts at 65% and is raised to 100% for the last activity phase. If a bidder does not reach the stipulated activity level his eligibility points are reduced.

838 The Chamber believes that two activity phases (65% and 80%) would in principle have been sufficient to ensure that on the one hand bidders are allowed the greatest possible scope for switching between frequency bands and on the other that the auction proceeds in brisk fashion. The Chamber does not believe that a third activity phase with a minimum activity level of 100% is absolutely necessary. At the same time however the Chamber has met the request for a 100% activity phase to be included so as to give bidders what they consider to be maximum certainty as regards being able to foresee the end of the auction. The Chamber does not believe it is necessary to lower the minimum activity level in phase 1 to 50%, as requested, to ensure that the auction proceeds briskly because the minimum bid increment in phase 1 has been reduced from 10% to 5% (cf IV.3.6).

839 If a bidder has specified a minimum essential spectrum package he must in every case, irrespective of the minimum activity level, place bids to the full extent of his eligibility points for his specified package. Depending on how the auction proceeds the auctioneer will, after due consideration, decide when to switch over to the next activity phase, with a view to ensuring that the auction moves briskly forward.

840 If however in any auction round no new valid bid is submitted and no active waiver utilised, and the auctioneer does not find it advisable to end the auction prematurely (cf IV.3.16), he will move on to the next activity phase.

841 If a bidder falls below the required activity level, his eligibility points for the following rounds will be reduced. The eligibility points for the following round are calculated as the product of his activity in the round just completed and the minimum activity level in the particular activity phase, rounded up to the next highest whole number. For example, a bidder who in the first (65%) activity phase delivered an activity of 4 lot ratings and thus failed to reach the required level would have his eligibility for the next round calculated as follows: 4 lot ratings (activity) x 100/65 = 6.15 lot ratings, rounded up to 7 lot ratings.

842 A bidder who does not submit a new valid bid in a round, does not hold a highest bid and does not use a waiver (active or passive) will lose all his eligibility points and be eliminated from the auction. The only possible conclusion to be drawn from his bidding performance is that he is no longer interested in acquiring further frequency usage rights. The same applies to bidders who have been granted a minimum essential spectrum package if they fail to bid actively for the package in a round and also do not use a waiver.

The operative provisions have been amended as follows:

> A bidder’s activity in a round is the sum of all eligibility points, in lot ratings, used for frequency blocks for which the bidder has submitted an active bid.
>
> An active bid for a block in a round is deemed to have been given when, at the beginning of the round, either the bidder holds the highest bid for the block – and does not withdraw it in the current round as set out in IV.3.11 – or submits a valid bid for a block in the current round in accordance with IV.3.5.
>
> A bidder must exercise his bidding eligibility to a certain extent if he is not to lose any (minimum level of activity), unless he makes use of a waiver as provided for in IV.3.10.
>
> The auction is divided into three consecutive activity phases:

Activity phase 1 requires a minimum activity level of 65% of the current bidding eligibility.

Activity phase 2 requires a minimum activity level of 80% of the current bidding eligibility.

Activity phase 3 requires a minimum activity level of 100% of the current bidding eligibility.

The auctioneer will decide when to move on to the next activity phase in accordance with the progress of the auction.

The minimum activity level determines the minimum activity a bidder has to engage in. Minimum activity is derived from the product of the number of the bidder's eligibility points and the minimum activity level in the particular activity phase, rounded up to the next highest whole number.

A bidder keeps his full bidding eligibility for the next round if he has complied with or surpassed the minimum activity level in the current round.

If a bidder falls below the minimum activity level and does not use a waiver (cf IV.3.10), his bidding eligibility will be determined anew for the next round:

in activity phase 1 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/65;

in activity phase 2 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/80;

in activity phase 3 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/100.

A bidder not submitting a new valid bid in a round for any frequency block, not holding a highest bid and not using a waiver (active or passive) as provided for in IV.3.10, will be eliminated from the auction.

Notwithstanding this activity rule, a bidder must in any case place bids to match the extent of the minimum essential spectrum package he has specified (cf III.1.5). If fewer bids are placed than the minimum essential spectrum package agreed, the bidder will lose all his bidding eligibility and will be eliminated from the auction, provided he has not used any waivers (active or passive) as specified in IV.3.10.

Re IV.3.10 Waivers

The following comments were made:

843 The respondents welcomed the provision of waivers in the auction. One respondent said that five waivers per bidder were too many: to avoid unnecessary delays in the auction, bidders should be given three waivers each.

844 Respondents were critical of the fact that a distinction was made between active and passive waivers. According to the draft decision, if no valid bid was made in a round but one of the bidders used an active waiver, the auction would not end. However, the auction might end if no valid bid was made in a round and only passive waivers were effected. It would therefore be possible for the auction to end early if none of the bidders were in a position to submit a valid bid or use an active waiver. To avoid this situation, no distinction should be made between active and passive waivers. Even in the unlikely case that a bidder decided not to make any more bids but to use passive waivers instead, the auction could only be extended by a maximum of five rounds.

The Chamber has ruled as follows:

845 The purpose of allowing the use of waivers is to enable bidders to take an extended break for reflection during the auction. In a round during which a bidder exercises a waiver he does not lose any eligibility points, whatever his bidding activity has been. An extended break for reflection can become necessary if, from the point of view of the bidder, the auction takes an unexpected turn which will possibly oblige him to modify his bidding strategy. The number of waivers must however be limited, since otherwise bidders could slow down the auction for strategic reasons, which would also result in increased administrative costs.

846 It seems reasonable to limit the number of waivers to five, as a way of reaching two goals at the same time: giving bidders adequate protection against the loss of eligibility points, and ensuring that the auction is not slowed down unnecessarily.

847 In the interests of the bidders, the Chamber has not met the request for the number of waivers to be reduced to three so as to avoid unnecessary delays in the auction. A total of five waivers is justified by the large amount of spectrum for award in the various bands and the associated degree of complexity in bidders assessing other bidders' strategies and adjusting their own bidding strategies. The Chamber wishes to make it clear however that it is not necessary for all the bidders to have used all their waivers for the auction to end. Furthermore, bidders with a specified minimum essential spectrum package are not eligible for the second way of using an active waiver, which is described below in this subsection, if their active bids in a particular round fail to match the package. That is to say, the combination of an active waiver with the submission of new valid bids – which is the second possible use of an active waiver – does not release a bidder from the obligation to submit new valid bids on a scale matching the volume of the package.

848 It should be stressed that only the exercise of an active waiver has any effect on the auction's termination rules. This means that the auction cannot end when a bidder uses an active waiver, as the waiver is a signal that he is considering making new valid bids in a later round of the auction. With regard to the significance of a passive waiver it should be pointed out that a bidder can avoid passive waivers through his own actions, for instance by submitting a bid, confirming an existing highest bid or using an active waiver. Past auctions have shown that bidders are aware of the distinction between an active and a passive waiver and have consciously chosen one or the other. The Chamber therefore considers it necessary to retain this option and, consequently, the distinction between active and passive waivers will be retained and not dropped as requested.

849 The auction software includes a precisely designed instrument to cover the case of a bidder consciously or unconsciously exceeding the time during which it is possible to submit a bid. What happens in this case is that a passive waiver is automatically activated, and the bidder is thus protected against losing bidding rights or, in the worst-case scenario, being eliminated.

Re IV.3.11 Withdrawal of highest bids

850 When frequencies are offered in relatively small blocks from different bands, or when concrete frequency blocks are offered in a specific band, the bidder basically faces the risk that he may acquire blocks of spectrum that are not contiguous. The risk arises when a bidder who has been the highest bidder for one or more than one specific frequency block wants to switch his still available eligibility points to a different band owing to the price levels developing there. As he is tied to his highest bids (the so-called lock-in effect), the result is that he comes away with non-contiguous spectrum.

851 In the interest of promoting the efficient assignment of individual frequency blocks, bidders are allowed the possibility of withdrawing highest bids. This releases eligibility points which they can then use to bid for other frequency blocks. All bidders are

entitled to withdraw, in part or in full, highest bids that they hold in any ten rounds of the auction, which they can select at will. They can also submit new valid bids in the same round with the eligibility points that have been released.

852 The possibility of withdrawing bids can however also lead to bidding being misused for tactical reasons. A bidder could for example, with impunity, drive up the price levels for certain frequency blocks with the aim of preventing other bidders from acquiring spectrum usage rights for those blocks.

853 In order to prevent this sort of bidding a rule was introduced which made it possible, in certain defined circumstances, for payment to be obligatory in the case of a bid being withdrawn. Specifically, if no new valid bid is submitted for the frequency block in question during what is left of the first stage of the auction, the withdrawing bidder will be obliged to make payment in the amount of the bid that was withdrawn. In this case the bidder will be obliged to pay a sum equivalent to the bid he has withdrawn. If the frequency block is awarded in the second stage of the auction, the bid price for the block will be deducted from the amount to be paid by the withdrawing bidder. If the price for the block is higher than or just as high as the highest bid in the first stage of the auction, the withdrawing bidder will no longer be obliged to pay.

854 The following rule, which applies to bidders with a set minimum essential spectrum package, is also intended to prevent abuse of bidding procedure. If such package has been determined for a bidder the withdrawal of one or more than one highest bid will only be possible if he has submitted an active bid in at least the volume of his package in the round concerned. That is to say, the total of the frequency blocks for which he holds highest bids must correspond at least to the volume of his minimum essential spectrum package. The withdrawal of a highest bid and the exercise of an active waiver (the second active waivers possibility, as defined in IV.3.10) do not release the bidder from the obligation to submit active bids matching the volume of the spectrum package.

855 The Chamber is satisfied that the two stated obligations – firstly the obligation to pay and secondly the obligation to submit active bids in the volume of the minimum essential spectrum package – provide sufficient protection against bidding abuse.

856 It is not possible for bids to be withdrawn after announcement of the results of the auction or stages of the auction.

Re IV.3.12 Time of a round, completion of a round, discontinuation of a round and suspension of the auction

The following comments were made:

857 The respondents welcomed the fact that the time for a round at the beginning of the auction would be 60 minutes. It was said however that the time allowed should be extended to 90 minutes and later to 120 minutes each time there was a change, for instance in the minimum bid increment or minimum activity level.

858 One respondent stressed that bidders also needed to be given sufficient time between the rounds, as substantial volumes of data needed to be analysed after each round especially at an auction on such a scale covering several bands. The data served as a basis for the decisions taken at the bidders' headquarters and relayed to the bidding teams on site.

859 At the auction held in 2010 bidders had only had a few minutes between rounds and had therefore needed to analyse the data from the previous round during the round itself. If the Bundesnetzagentur were to shorten the times allowed for each round, bidders should be given a fixed period of time of at least 60 minutes for analysis and decision making between the rounds. The time allowed for each round could be reduced as and when required in the course of the auction once the bidders had

become used to the procedures; however, the time should not be shorter than 40 minutes, unless all the bidders had made their bids before the time was up.

The Chamber has ruled as follows:

860 In an open simultaneous multi-round ascending auction it is necessary to stipulate how much time bidders have, in a round, to submit their bids. On the one hand the time must be long enough for bidders to be able to make their bidding decisions and submit their bids. On the other it must not be so long that that it slows down the auction unnecessarily. Given these considerations and in view of the complexity of the auction, a period of 60 minutes as a limit for the process of bidding seems to the Chamber to be appropriate for the starting stage.

861 However, in order to take account of what a particular auction actually requires, the auctioneer can decide on a different time limit, thus ensuring that he can react appropriately when an auction takes an unpredictable course. If, during the auction, the auctioneer finds that a shorter period will suffice, he can reduce the time for the round in the interest of keeping the auction moving at a brisk pace. The Chamber wishes to make it clear that it is possible for a round to be extended depending on how the auction is proceeding. The Chamber has therefore not met the request for the time allowed to be extended each time the auctioneer makes a change, for example when the auction is moved into the next incremental or activity phase, because the duration of each round will depend on the progress of the auction.

862 There will be an automatic reminder ten minutes before the round expires so as to protect bidders from the risk of accidentally failing to submit their bids.

863 With a view to ensuring that the auction does not drag on unnecessarily long, it is stipulated that the round must be evaluated as soon as possible, ie as soon as all bidders have submitted their bids. In this connection the Chamber wishes to stress the following points.

864 As soon as the last bidder has submitted his bid or entered an active waiver, or confirmed the highest bid held by him at the start of the round, the auctioneer will commence the process of evaluation, thus ending the round without waiting for the time limit to expire.

865 After evaluation of a round the next round will not start automatically, for example activated by the software at a predetermined moment. Instead the auctioneer will start the new round manually, as soon as he has analysed the result of the round and taken the necessary decisions for the new round. The time needed for this evaluation depends on the course of the auction and cannot be predetermined. The Chamber is well aware that the bidders and their decision makers will also analyse and assess the results of each round, which will take some time. This will be taken into account by the auctioneer. It is not possible to set a fixed period for analysis and decision making between the rounds because the time needed will vary. Bidders need not be concerned however that important information from the previous round will not be available after the start of the new round, as steps are taken to ensure that bidders have access to all the round results throughout the new round.

866 Each bidder is given one opportunity, not per round but per auction, to request the auctioneer to suspend the auction. The request must be declared to the auctioneer, who places it on record. The auctioneer then suspends the auction, and it is resumed at 13:00 hours the following working day. If the request for a suspension is made while an auction round is in progress, the starting point for the next round is the result of the last completed round. Bidders are thereby given enough time to take the necessary decisions regardless of what time of day the request for a suspension is made.

867 It is the Chamber's belief that it is sufficient for each bidder to have a single opportunity to exercise a suspension option, since otherwise there would be a risk of

misuse of suspension requests and unnecessary delays in the progress of the auction. For the Chamber it is a given that a bidder will only exercise the suspension option if, in his view, there are compelling reasons which justify an extended suspension.

868 Should there be a technical or other similar defect which jeopardises the proper conduct of the auction round, it is incumbent on the auctioneer, after due consideration, to dispense with the evaluation and discontinue the round. In this case the auction will resume with the result of the previous round. To keep the proceedings transparent, bidders will be informed accordingly.

Re IV.3.13 Provision of information to bidders

The following comments were made:

869 The respondents essentially considered the degree of transparency in the bidding and the scope of the information provided to the bidders as pleasing and sufficient. The comprehensive information given to the bidders provided a sound basis for efficient spectrum assignment, especially since blocks in different bands were available for award. One respondent suggested that if identical highest bids were made, both the bid placed first and therefore considered to be the highest bid and the other identical bids submitted later should be shown.

870 Another respondent said that the names of the highest bidders and of the bidders eliminated or excluded should not be disclosed to the other bidders during the auction so as not to encourage strategic bidding. An established market player could otherwise be certain of winning spectrum by strategically bidding the minimum possible amount above the intrinsic value because it would be clear at any time whether or not a new entrant had already been successfully priced out of the market.

The Chamber has ruled as follows:

871 At the beginning of an auction round the auctioneer advises all bidders of the parameters which determine the conduct of that round. This procedure guarantees the highest possible level of information and transparency, and enables bidders to submit appropriate bids.

872 At the close of every round bidders are told the active bids (all highest bids and new valid bids) of all bidders. Because every bidder can keep the bidding activity of all the others, with reference to active bids, under comprehensive observation, they have the means of correcting their own valuation of the frequency blocks. This makes it possible to reduce the risk of the so-called winner’s curse.

873 In respect of the comment to the effect that the names of the bidders should not be disclosed so as not to encourage strategic bidding, the Chamber believes that new entrants will be in a position to compete against established market players and acquire sufficient spectrum usage rights owing to a “demand reduction effect”, particularly in such an open simultaneous multi-round ascending auction and all the more so when large amounts of blocks are to be auctioned. The proceedings are such that they generally tend to result in an economically efficient distribution of spectrum usage rights since in most cases it only makes sense for the bidders to acquire sufficient rights to meet their actual requirements. This applies irrespective of whether or not the names of the bidders and of the highest bidders are disclosed. There is sufficient spectrum available to enable a bidder who has been outbid to bid for another block at any time. Hence the argument concerning strategic bidding is not convincing because any potential strategic bidding would ultimately result in excessively high bids for all the frequency blocks offered.

874 Open and transparent auction proceedings have proved their worth in the past. On account of the amount of spectrum for award and the other measures taken (eg spectrum caps, return of spectrum) potential new entrants will have sufficient

opportunity to win spectrum. Open and transparent proceedings in which bidders' names are disclosed will still enable new entrants to react to bids and mirror their valuations in their bidding in full knowledge of the other bidders' valuations. The Bundesnetzagentur is convinced that only transparent proceedings can provide firm auction results. By choosing not to place any further valid bids in the last round the bidders accept the full (potential) auction results disclosed to them at that point in time. It is not necessary to provide express information on the withdrawals of highest bids as such information is implicit in the statement of all active bids of all bidders.

875 In the Chamber's opinion there is no need for further information (eg on waivers exercised by other bidders) since extra information is not necessary for bidders to form their own valuations of frequencies, and it could also, in certain circumstances, be misused for the purpose of tactical bidding.

876 In the interest of bidders and in view of the complexity of the proceedings it has been found advisable to enable them to carry out the electronic processing of specific data (all valid bids in the previous round and the current highest bids with the identity of the bidders concerned). They are thus given an overview of the current status of the auction within the shortest possible time, and can take their next bidding decisions on that basis.

877 The Bundesnetzagentur will therefore see to it that this information is, in addition, made available to bidders at the auction by electronic means for further processing.

878 Arrangements have been made for the said information to be supplied to authorised persons in the form of a file with a clear-cut summary. The file can be printed out and sent to the undertakings by fax. The Bundesnetzagentur will provide the qualified undertakings with details of its format and syntax at an early date, where possible before the auction tutorial.

Re IV.3.14 Exclusion of bidders/collusion

879 The exclusion of a bidder for irregular behaviour serves both to ensure the auction is conducted briskly and smoothly and to prevent bidders, or their authorised agents (cf IV.2.2 and IV.3.3), from working together to influence the course or the result of the auction (collusion).

880 Bidders can be excluded not only for collusion but also for acting in any other way that jeopardises the smooth progress of the auction or is in conflict with the rules. Exclusion can also be justified if there are clear signs that a bidder is deliberately trying to hinder the proper conduct of the auction.

881 The rule that excluded bidders continue to be bound to the bids they have submitted is a necessary means of ensuring that the auction proceedings are objective and non-discriminatory, that collusion is countered by rigorous sanction mechanisms and that the prohibition of collusion is effective.

Re IV.3.15 Elimination from the auction

882 The point of this rule is to make it clear that a bidder will be eliminated from the auction if, under the activity rule (cf IV.3.9), he has no eligibility left.

883 It should also be made clear that a bidder who has been excluded will automatically be eliminated from the auction.

884 A bidder will be eliminated from the auction proceedings as a whole if he does not submit active bids to the full extent of the minimum essential spectrum package he has been granted (cf III.1.4 and IV.3.9). A bidder who was granted such package in the notice of qualification must, under the activity rule (cf IV.3.9), submit bids to the full extent of his eligibility for the said package. For further details see the rule for the minimum essential spectrum package in III.1.4.

Re IV.3.16 End of the auction (termination rule)

The following comments were made:

885 The possibility set out in IV.3.9 and IV.3.16 for the auctioneer to end the auction early appeared to be arbitrary. This could significantly distort the auction results and created additional uncertainty for the bidders. The auction rules should therefore be changed to allow for the auction to be ended only after consultation with and agreement from all the active bidders. Otherwise, one more round should be conducted. If however there was no more bidding activity in this round, the Bundesnetzagentur would be free to decide whether or not to end the auction.

The Chamber has ruled as follows:

886 The auction will end automatically if no valid bid has been made in the last activity phase of the completed round for any of the frequency blocks offered and none of the bidders has used an active waiver.

887 In this case it must be assumed that the total value of the bids submitted has exhausted the individual valuations of the undertakings bidding for the frequency blocks. As long as a valid bid has been made for at least one frequency block the auction can continue and further valid bids can be submitted for the other blocks as well, subject to the requirements of the activity rule (cf IV.3.9).

888 The Chamber has, as requested, introduced a third activity phase with a minimum activity level of 100% (cf IV.3.9); this means that bidders will be forced to exercise all the bidding rights matching the amount of spectrum they wish to acquire. Consultation with the bidders is therefore not necessary. The bidders themselves determine whether or not the auction will end by submitting new valid bids or active waivers.

889 As regards the concern that the auctioneer will arbitrarily end the auction early, the Chamber wishes to make it clear that all the auctioneer's decisions are taken after due consideration of the progress of the auction and all relevant aspects.

Re IV.3.17 Award

890 In an open simultaneous multi-round action the highest bidder for any particular frequency block is awarded the block at the end of the auction. A frequency block for which

a) there is no valid bid at the end of the auction,

b) no new valid bid was submitted after a bid was withdrawn,

c) award was denied, or

d) there is a bid, but the highest bidder failed to acquire his agreed minimum essential spectrum package,

will not be awarded in the auction.

891 In this connection the Chamber wishes to make it clear that point c) refers to the case of a bidder being excluded from the rest of the auction under IV.3.14. Reasons for the exclusion can include not only collusion but also other behaviour which would jeopardise the orderly progress of the auction. In addition, any deliberate acts by a bidder which are designed to hinder the proper conduct of the auction can justify exclusion.

892 The bidder holding the highest bid for a frequency block at the end of the auction will be awarded the block and will therefore be required to pay the price he bid. This kind of auction is known as a highest price auction.

Re IV.3.18 Second stage of the auction

893 If there are frequency blocks which have not been awarded at the close of the first stage of the auction (so-called “stranded blocks”), the President’s Chamber will take a decision within two working days on whether, and if so when, these blocks should be auctioned in full or in part in a second stage. This is particularly expedient if the blocks in question were not awarded in the first stage of the auction because bids were withdrawn or because a bidder failed to reach the volume of his individual minimum spectrum package. It is also conceivable that no bid was made for certain blocks at any time in the first stage of the auction.

894 With a view to offering available spectrum promptly, the second stage of the auction should in principle take place very soon after the first stage. The result of the first stage can however be such that it does not seem desirable to have the next stage of the auction immediately after the first. A particular scenario for this is when, contrary to expectations, a comparatively large number of frequency blocks were not awarded or only a relatively small number of bidders acquired frequency usage rights in the first stage of the auction. As a basic rule the Chamber reserves the right to suspend the award of stranded blocks until further notice and then, as requisite, develop whatever special rules seem appropriate to these blocks.

895 The Chamber has decided that currently the following rules will apply during the second stage:

896 The stranded blocks will be offered anew at the minimum bid, ie the reserve price.

897 The next rule is that eligibility to participate will be restricted to bidders who bid successfully in the first stage. This rule gives bidders an incentive to acquire frequency usage rights before the end of the first stage of the auction and not to speculate on the second stage for tactical reasons.

898 The maximum number of eligibility points in the second stage will be derived from the difference between the number of eligibility points established on the basis of the application and the eligibility points successfully used in the first stage. Bidders may in addition submit bids for frequency blocks for which they withdrew a bid in the first stage (cf IV.3.11). It is also possible to use eligibility points which were “lost” during the first stage of the auction under the activity rule defined in IV.3.9.

899 If a bidder does not acquire spectrum to the level of his minimum essential spectrum package in the first stage (provided he has specified such package), he will already have been eliminated from the auction and will no longer be eligible to participate (cf V.3.9). Bidders must use the first stage to satisfy their individual spectrum requirements for the implementation of their business models. It was made possible to determine a minimum essential spectrum package precisely for the reason that a bidder who needed more than one frequency block to realise his business model would definitely have the essential amount of spectrum needed, or no newly gained spectrum, at the end of the first stage. The only reason there is a second stage is to cover the case of certain frequencies not being awarded in the first stage.

900 In contrast to the first stage, it is not possible to withdraw bids in the second. The point of this is to ensure that there will only be stranded blocks at the end of the second stage if not a single bid has been submitted for a specific block.

Re IV.4 Auction close

Re IV.4.1 Obligation to pay

The following comments were made:

901 Some of the respondents said that the due dates for payment of the award prices for spectrum in the 900 MHz/1800 MHz band and in the 700 MHz and 1.5 GHz bands

should be based on the date of assignment or the date on which the spectrum was actually available for use. It was also said that a period of 30 days should be allowed for payment.

The Chamber has ruled as follows:

902 The bidder awarded a frequency block at the close of the auction must pay the amount of his highest bid.

903 A bidder that has withdrawn a current highest bid must pay his highest bid if no new valid bid is made for the frequency block in question in the course of the first stage of the auction. If the frequency block is awarded in the second stage of the auction, the bid price for the block will be deducted from the amount to be paid by the withdrawing bidder.

904 This obligation to pay is both necessary and a means of preventing bidders from misusing bidding procedure for tactical reasons by withdrawing bids. Otherwise a bidder could with impunity drive up the price of a frequency block in order to stop other bidders gaining the frequency usage rights concerned. The obligation to pay in the event of no higher valid being submitted acts as a deterrent against the abuse known as tactical bidding. The obligation also cannot be called disproportionate, since the bidder can allow for the payment risk when he decides on his bid, particularly in a late activity stage.

905 The award notice will be presented together with the notice of amount payable against acknowledgement of receipt. Payment of the award price for the spectrum usage rights in the 900 MHz, 1800 MHz and 1.5 GHz bands, less any security deposited as a sum of money (cf IV.1.3), is due immediately after presentation of the notice of amount payable and must be paid within five banking days onto the account specified by the Bundesnetzagentur. The security will likewise be deducted if there are other payment obligations notwithstanding the withdrawal of a highest bid. There is no provision for payment in instalments. The surety bonds will be returned following receipt of payment. The security will not earn interest.

906 The Chamber believes it is reasonable to require immediate payment of the award price for the spectrum usage rights in the 900 MHz, 1800 MHz and 1.5 GHz bands. In light of the regulatory aims set out in section 2(2) TKG, it is not appropriate to allow the award prices for rights in these bands to be paid in instalments, unlike payments for the 700 MHz spectrum. The Bundesnetzagentur is obliged to ensure that any payments due are made in full and in time. Payments are therefore to be made due as from the legally feasible date. It is both legally feasible and appropriate to make payment due upon presentation of the notice of amount payable. This applies even though the spectrum in the 900 MHz and 1800 MHz bands will not be assigned until at least January 2017. The Chamber believes that awarding this spectrum at an early stage will enable the winning bidders to incorporate their new spectrum into their network rollout plans immediately and hence encourage use of the spectrum in particular for broadband rollout as soon as possible. Finally, the Chamber believes it is reasonable to make payments due immediately because the bidders are aware of this in advance and can factor it into their bids.

907 The Chamber cannot meet the request to allow 30 days for payment of the award price. The respondents did not state why it might not be possible to pay the award price within five banking days of presentation of the notice or why this might place an unreasonable burden on the winning bidders, nor are such reasons clear.

908 Payment of the award price for the spectrum usage rights in the 700 MHz band, less any security deposited as a sum of money (cf IV.1.3), is due immediately after presentation of the notice of amount payable and is, by way of exception, to be paid in three equal instalments. This is in line with the national consensus reached between the federal government and the federal states on providing the 700 MHz

spectrum to promote broadband rollout. Accordingly, the first instalment will be due upon presentation of the notice of amount payable, the second instalment by 1 July 2016 and the third instalment by 1 July 2017. Payment of the first instalment must be made within five banking days of presentation of the notice of amount payable to the account specified by the Bundesnetzagentur. Payment of the second and third instalments must be made by the due dates stated to the account specified by the Bundesnetzagentur.

909 The surety bonds will be returned following receipt of the final instalment. The security will not earn interest.

910 Bidders who are not awarded a frequency block and have no other payment obligations will have their security refunded, or alternatively the surety bonds will be returned, immediately after the close of the entire auction proceedings.

911 The spectrum will generally be assigned after the bidder has met all his payment obligations. The spectrum in the 700 MHz band will be assigned once the winning bidder has paid the first instalment. This exception is appropriate so as to avoid delays in providing broadband coverage to rural areas in particular. These frequency assignments are subject to the condition that the bidders pay all the instalments in time.

Hence the operative provisions have been amended as follows:

The bidder awarded a frequency block at the close of the auction must pay the amount of his highest bid.

A bidder that has withdrawn a current highest bid must pay his highest bid if no new valid bid is made for the frequency block in question in the course of the first stage of the auction. If the frequency block is awarded in the second stage of the auction, the price bid for the block will be deducted from the amount the withdrawing bidder has to pay (cf IV.3.11).

The award notice will be presented together with the notice of amount payable against acknowledgement of receipt.

Payment of the award price for frequency blocks in the 900 MHz, 1800 MHz and 1.5 GHz bands, less any security deposited as a sum of money (cf IV.1.3), is due immediately after presentation of the notice of amount payable and must be paid within five banking days onto the account specified by the Bundesnetzagentur.

Payment of the award price for frequency blocks in the 700 MHz band, less any security deposited as a sum of money (cf IV.1.3), is due immediately after presentation of the notice of amount payable and must be paid in three equal instalments. The first instalment is due immediately upon presentation of the notice of amount payable. The second instalment is due by 1 July 2016 and the third instalment by 1 July 2017. Payment of the first instalment must be made within five banking days of presentation of the notice of amount payable to the account specified by the Bundesnetzagentur. Payment of the second and third instalments must be made by the due dates stated above to the account specified by the Bundesnetzagentur.

Compliance with each deadline is determined by the time at which the sum is credited to the account (value date). The debtor automatically defaults if payment has not been made before the deadline expires. There is no need for a reminder. Interest will be charged during the period of default on the award price less any security deposited as a sum of money. The interest rate for the year shall be five percentage points above the base rate in accordance with section 274 of the German Civil Code (BGB).

The security will likewise be deducted if there are other payment obligations under the auction rules.

The security will not earn interest. If a bidder has not received any award and has no other payment obligations, his security deposit will be refunded without undue delay after the close of the entire auction. The surety bonds will be returned following receipt of payment.

Re IV.4.2 Allotment of the abstract frequency blocks won

The following comments were made:

912 Respondents welcomed the fact that existing usage in the 900 MHz and 1.8 GHz bands would be taken into account to minimise switching costs, particularly since GSM networks would continue to be operated in large parts of the country. However, attention was also drawn to some uncertainties. For instance, the probability of bidders being able to agree on who should be allotted which blocks would be low should some blocks be available one year earlier than others (owing to spectrum being returned by Telefónica).

913 In light of the fact that reallotment of the frequencies would affect the availability of preferential frequencies at the national borders, a period of ten days within which winning bidders should make their individual preferences known was seen as too short; rather, a period of three months should be allowed for agreements between network operators.

914 Respondents were also critical of allotting blocks by lot as this would not guarantee coverage at the national borders.

915 One respondent said that the early return of spectrum not won at auction coupled with the fact that some spectrum bought at auction would not be available for use until after expiry of the current assignments in 2016 would result in disruptions to Telefónica's service, which constituted an anti-competitive disadvantage. One respondent was critical of the provision for existing usage rights to be taken into account in the event that Telefónica acquired a second block in the 900 MHz band and then supplementary spectrum above this band, as this would pose a risk to other operators' existing usages.

916 Another respondent commented on the provision for existing usage to be taken into account, saying that in particular the hardware currently used was of considerable importance in this context.

The Chamber has ruled as follows:

917 In accordance with the procedure laid down in IV.1.4 the frequency blocks are for the most part awarded in abstract form, ie bidders initially acquire the desired number of blocks in the particular band without knowing exactly where the blocks are. At the end of the auction the abstract frequency blocks won will be allotted specifically to their highest bidders. The allotment proceedings are carried out in an objective, transparent and non-discriminatory manner in accordance with the following rules.

918 The winning bidders will first have the opportunity to reach agreement amongst themselves on who should be allotted exactly which blocks in the various bands. They will have one month for this. The Chamber has thus met calls from respondents who said that the period originally proposed was too short. The aim here is to ensure that the frequencies are assigned as soon as possible after the auction in the interest of achieving the objectives of the federal government's broadband strategy. In light of this it is not possible to extend the time allowed to three months.

919 Insofar as no agreement is reached between all the bidders involved within the time allowed, the Bundesnetzagentur may allot the abstract blocks band by band taking

account of current use, the aspect of contiguous spectrum and any preferences stated.

920 The idea is to ensure that in each band maximum account is taken of existing usage and the aspect of contiguous spectrum. In allotting the abstract blocks the Bundesnetzagentur will as far as possible take account of the winning bidders' preferences.

921 Account is also to be taken of existing usage with a view to maintaining as much of the existing infrastructure as possible. By applying this principle the Bundesnetzagentur is discharging its duty to ensure the availability of infrastructure as required by Article 87f of the Basic Law and pursuing the regulatory aims defined in section 2(2) TKG. Consumers in particular have a powerful interest, as stated in section 2(2) para 1 TKG, in having existing network infrastructure maintained. This aim can be achieved by the broadest possible allotment of spectrum which has been assigned and used in the past. The undertakings are thereby enabled to keep the mobile radio infrastructure set up in the past in operation, immediately and without interruption, and to use it for mobile broadband at the earliest possible time, in line with the regulatory aim defined in section 2(2) para 5 TKG.

922 The allotment of contiguous spectrum is however also important as a means of attaining the efficient use of spectrum called for in section 52 TKG. Section 2(2) para 7 TKG also states that it is a regulatory aim to ensure the said efficiency, and the allotment proceedings are instrumental in achieving that objective. The principle applies equally to all successful bidders, and it offers, even before the auction, the certainty that the allotment proceedings will be open, transparent and non-discriminatory. When an undertaking already has frequency usage rights immediately adjacent to the abstract blocks that have been auctioned, the blocks in the volume of its successful highest bids in the band will in principle be concretely allotted to the undertaking in an immediately contiguous position.

923 In allotting spectrum the Bundesnetzagentur will as far as possible take the preferences of the bidders into consideration. In this context it will need to be borne in mind that frequencies will be usable at an earlier date than 1 January 2017 (cf BK1-13/002, loc cit).

924 The Chamber wishes to draw attention to the following in this context.

925 The allotment procedure aims to ensure that the abstract blocks won at auction are assigned as contiguous spectrum. The aspect of allotting contiguous spectrum can however not be accommodated in every case – depending on the amount of spectrum actually won within one band – as in the Chamber's view due account also needs to be taken of existing usages.

926 The Chamber wishes to point out that in most cases existing applications in the 1800 MHz band also use contiguous spectrum. Some of this spectrum is assigned until 2025, and this also needs to be taken into account in allotting the abstract blocks. The Chamber is therefore considering the following approach in allotting the abstract blocks won in the 1.8 GHz band to accommodate the aim of assigning contiguous spectrum: Where a company holds spectrum usage rights expiring in 2025, the Bundesnetzagentur will allot the blocks so that the spectrum assigned is contiguous. This may mean that spectrum already assigned may have to be "relocated" in order to be able to allot the remaining abstract blocks.

927 If there are abstract frequency blocks that have been won and awarded but cannot be allotted in accordance with the foregoing principles, their allotment will be decided by lot. The Chamber believes that allotting the blocks by lot is the best way to allot the blocks swiftly in cases where the winning bidders have been unable to agree on exactly which blocks should be allotted to whom and where the Bundesnetzagentur is unable to make a clear-cut decision on the basis of the above-mentioned principles

on how to allot the blocks. Where blocks are allotted by lot, only those options are considered which take utmost account of the principles set out above.

928 The Chamber wishes to make the following clear in respect of Telefónica's obligation "to return by 31 December 2015 the frequencies in the 900 MHz and 1800 MHz bands whose current assignment term does not run beyond 2016 (return of 900 MHz/1800 MHz spectrum before expiry" (cf 2 of the President's Chamber decision on the merger between Telefónica and E-Plus BK1-13/002, loc cit).

929 Telefónica is only required to return spectrum in a band ahead of schedule (by 31 December 2015) if it buys less spectrum at the auction than it was previously assigned. This means, for instance, that if Telefónica buys at least two abstract 900 MHz blocks, a competitor buying the first specific 900 MHz block will not be able to use the block until 1 January 2017.

930 It is impossible for a bidder to hold more spectrum in the period between 1 January and 31 December 2016 than won at the auction. In conjunction with the allotment rules this means that bidders will be able to tell during the auction which frequencies Telefónica might need to return. With a view to enabling the use of contiguous spectrum in the 1800 MHz band as early as possible and to ensuring efficient spectrum use, the Chamber reserves the right to make final allotment of the blocks applicable as from 1 January 2016. This means that existing frequency assignments may need to be shifted as from that date.

931 In light of the existing usages, and in particular the fragmented use of the 900 MHz spectrum, the Chamber anticipates that the assignment holders will agree on using each others' frequencies for a certain period of time to ensure that the existing GSM coverage can be maintained to a sufficient degree. In the Chamber's opinion the above approach makes it possible for the currently fragmented use of 900 MHz spectrum by mobile network operators to be continued for a certain time, where it seems expedient, even if the spectrum is allotted in 5 MHz blocks. The priority here is to serve the interest of consumers by ensuring uninterrupted use of frequency.

Hence the operative provisions have been amended as follows:

> At the end of the auction the abstract frequency blocks won will be allotted to their highest bidders. The allotment proceedings are carried out in an objective, transparent and non-discriminatory manner in accordance with the following rules:
>
> 1. Successful bidders have the possibility of reaching agreement within a period of one month from the close of auction on the specific location of the blocks auctioned in the specific spectrum.
> 2. Insofar as no agreement is reached between all the successful bidders involved before the end of the set deadline, the Bundesnetzagentur may allot the abstract frequency blocks won taking account of current use, of connected spectrum and of any preferences stated.
> 3. If there are abstract frequency blocks that have been won and awarded but cannot be allotted in accordance with the principles under point 2 above, their allotment will be decided by lot.

Re V. Applications

932 Separate proceedings will be held to decide on the applications submitted by Telefónica on 8 January 2015.

933 In accordance with section 10 of the Administrative Procedures Act (VwVfG) the administrative proceedings must not necessarily take a particular form, unless there are particular legal regulations on the form of the proceedings. They are to be carried out simply, suitably and swiftly.

934 The Chamber considers it appropriate to deal with and decide on the applications in separate proceedings. Telefónica may, on the basis of this decision taken in ex officio proceedings, decide whether to pursue or to withdraw the applications.

Information on legal remedies

Actions against this notice may be filed in writing with the administrative court in Cologne, Appelhofplatz, 50667 Köln, Federal Republic of Germany, or placed on record with the registry clerk within one month of its publication. The action must state the appellant, the respondent and the matter to which the action relates. It should specify the remedy pursued and state the facts and evidence justifying the action. Under section 137(1) TKG legal actions do not have suspensory effect.

The action and all supporting documents should be accompanied by a sufficient number of copies for all parties concerned.

Bundesnetzagentur für Elektrizität, Gas,

Telekommunikation, Post und Eisenbahnen

The President's Chamber Bonn, 28 January 2015

Dr Wilhelm Eschweiler	Jochen Homann	Peter Franke
Vice Chair	Chair	Vice Chair

* In case of divergent interpretation of the German and English text, the German text shall prevail.

Annex 1 – Qualification requirements to take part in the auction

Applications to qualify to take part should be made in writing, in German, in one original and six copies, and electronically in Word or PDF format, to

Bundesnetzagentur
Referat 212
"Versteigerungsverfahren"
Tulpenfeld 4
53113 Bonn

The closing date for applications is 15:00 hours on 6 March 2015.

Applications must be structured as follows:

A. Information on applicant

Applicants must start by providing the following data on themselves and their authorised agents:

1. Name and address of applicant
2. Legal form of applicant
3. Applicant's registered office
4. Extract from the Commercial Register
5. Designation of a contact partner authorised to represent the applicant, including telephone and fax number and email address
6. Designation of a person authorised to take delivery, including an address enabling correct delivery (street, house number, place)

B. Applicant's shareholding structure

The applicant must set out the ownership structure – including indirect ownership – of his undertaking. This applies particularly to the shareholding structure and any voting rights held by an undertaking with controlling influence over the applicant. If the application is by a consortium, the foregoing requirement applies to all its members, with an addendum showing their share of the consortium.

C. Reliability

The applicant must state whether

- he had had a spectrum allocation withdrawn in the past,
- special conditions have been imposed on him due to breach of obligations related to a licence or an assignment of spectrum,
- he has been charged with violation of telecommunications or data protection law, or
- proceedings against him are pending in the aforesaid cases and if so with which public authority.

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D. Financial capacity

The applicant must provide information and evidence that he has access to sufficient funds for acquiring spectrum at auction.

He must also provide information and evidence that he will have long term access to sufficient funds to cover investment, as planned in the frequency usage concept, in the establishment, expansion and operation of a radio network and he must provide details of the intended financing.

Evidence that the financing has been secured must be submitted in the form of supporting documents, such as written financing declarations by the parent company, by the other affiliated undertakings or by banks. Simple letters of intent or commitments to general support will not be accepted as evidence in the above sense. Where financing commitments are supplied by parent companies or other affiliated undertakings, they must be in the form of "hard letters of comfort". Such letters of comfort must in particular contain declarations by the parent company that it accepts an unlimited obligation to ensure that the applicant is capitalised to the extent that it

- has access to all the funds needed to pay the amount of bids submitted with a view to acquiring spectrum at auction;
- will have long term access to all the funds necessary to cover the investments implied by the application to qualify for taking part in the auction and to pay for the establishment, expansion and operation of a radio network.

The presentation of a balance sheet will not release the applicant from his obligation to supply information. He must demonstrate, conclusively and coherently, his capacity to implement his network project, setting out his medium-term business planning. The evidence of access to the funds necessary to set up the network must be orientated to planning and set-up costs on the basis of the coverage obligation, its time frame and the cost of ongoing operations.

Other points to be stressed:

Qualified applicants must, not later than 14 days before the auction begins, pay a deposit to an account to be specified by the Bundesnetzagentur. The security is €18,750,000 per lot rating. The total is derived from the eligibility determined.

The security can also take the form of an unconditional, continuing, irrevocable, absolute bank guarantee for the amount of the security payable, issued by a domestic (ie German) financial institution or a financial institution authorised as a customs and tax guarantor.

E. Specialised knowledge

Evidence must be provided that the persons carrying out the set-up and operation of the network have the necessary knowledge, experience and skills. The applicant must demonstrate the existence of this expertise in conclusive and coherent form.

This can be done by submitting CVs with testimonials and final examination certificates or references detailing work done in the past in the field of telecommunications. In relation to the planned technology the applicant must detail the knowledge, experience and skills possessed by the persons earmarked for the operation of the transmission lines.

If the application is made by a consortium, the same kind of information must be provided on the expertise of its members. There must also be an explanation of how the consortium member's expertise is transferred to the applicant.

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E.1. Specialised knowledge of radio technology

The applicant must set out which knowledge, experience and skills relevant to the setting up and operation of a radio network and the marketing of the related services are necessary or of advantage and which will qualify him to exercise frequency usage rights.

E.2. Other specialised knowledge of telecommunications

This is where experience in the planning and setting up of networks and services in other areas of telecommunications should be stated.

F. Frequency usage concept

The applicant must set out how he intends to ensure efficient use of spectrum in the form of a frequency usage concept. He must in particular define the degree of coverage of the population he proposes to achieve.
The frequency usage concept must be conclusive and coherent. Assumptions and forecasts must be based on verifiable facts.

F.1. Procedure for technical planning

The information on technical planning must make it clear that the applicant has a command of the planned procedure and is capable of employing the planning instruments at his disposal. Here he must provide information

- on the specific course of action (eg system concept, network structure)
- on the planning instruments (separate explanation of the network expansion planning, time frame for the network set-up)
- on coverage of areas and population
- on optimising the network
- on subscriber and traffic forecasts
- on the operating and maintenance plan (eg network performance capacity, failure safety, network and error management).

The assumptions on which the technical planning is based must be conclusive and coherent.

The applicant must in addition specify the planned coverage priorities. The minimum degrees of population coverage to be attained in the periods laid down for the purpose are those stipulated in the procedural rules regarding the award of spectrum for MFCN.

The forecast of subscriber trends must be presented in the form of a projection of various periods in the next five years. The traffic forecast needs to set out the relevant theoretical traffic assumptions and the planned routing of traffic.

F.2. Presentation of spectrum requirements in relation to business model

In their applications the applicants must make it clear that they will use the spectrum applied for efficiently on the basis of their business models. This applies particularly to cases where applicants already have suitable spectrum. Applicants must set out how the intended frequency usage relates to the planned technology.

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F.4. Planned services concept

The applicant must show what type of services he plans to offer on the basis of the technology he has selected and within what period of time he proposes to actually offer the services.

F.5. Business planning and its implementation

The business planning must be mapped out in an investment plan covering the next five years. The applicant should state which target group and what market potential he expects for the radio networks open to competition.

F.6. Individual minimum spectrum requirements

Applicants are entitled to specify an individual minimum spectrum requirement which they regard as an absolute minimum package for their business model on the criteria of business management and spectrum economy (the so-called minimum essential spectrum package).

If such package is specified, it must be set out conclusively and coherently in the frequency usage concept in accordance with points F.1. to F.5., above.

G. Consent to publication

In their application applicants must also declare their consent to the public announcement of their qualification for participation in the auction and to the publication of any award that may be made in their favour.

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Annex 2 – Conditions of use in the frequency bands 900 MHz and 1800 MHz

The conditions of use in this Annex have been drawn up to ensure the interference-free co-existence of different applications in the bands listed below and in the adjacent bands. To ensure such co-existence, the spectrum emission masks and block edge masks (BEM) set out in section 1 of this Annex need to be adhered to. The masks are based on the broadband radio applications currently under discussion for these bands. Where applications with a smaller channel bandwidth are to be deployed, it may be necessary to deviate from the masks' parameters. Furthermore, special requirements to ensure co-existence with existing GSM, UMTS/IMT-2000 and LTE applications and to safeguard their rights apply in the 880 MHz - 915 MHz, 925 MHz - 960 MHz, 1710 MHz - 1785 MHz and 1805 MHz - 1880 MHz bands (see section 2 of this Annex). The arrangements described may be modified in separate agreements between affected frequency users for the duration of the operator agreements. Agreements which diverge from the arrangements made in the course of border coordination must be approved by the regulatory authorities concerned.

1. Frequency bands

The spectrum available for award for MFCN is as follows:

Band	Spectrum available	For award
900 MHz	880-915 MHz and 925-960 MHz	7 blocks of 2 x 5 MHz (paired)
1800 MHz	1725-1785 MHz and 1820-1880 MHz (minus 2 x 10 MHz (paired))	10 blocks of 2 x 5 MHz (paired)

The use of these frequencies for MFCN is subject to the rules set out below and in the relevant channelling arrangements. The channelling arrangements are in conformity with the appropriate decisions of the European Commission and the ECC (in case of divergencies between the decisions of these two bodies, those of the European Commission shall prevail) and are designed to ensure efficient spectrum use. Different radio systems and access modes may be used, provided that the channelling arrangement and associated conditions of use are complied with.

The general conditions in the EC and ECC Decisions establish the necessary framework for efficient spectrum use, across borders as well. The goal is a uniform European strategy ensuring user-friendly Europe-wide availability of spectrum for MFCN based on harmonised conditions.

2. Channelling arrangements for the two bands

The channelling arrangements for the 900 MHz and the 1800 MHz band are set out in Annex 5.

3. Explanatory notes on the channelling arrangements

900 MHz:

Further measures are necessary in the two lower blocks (880 MHz - 890 MHz and 925 MHz - 935 MHz) to protect the radio applications of public railway undertakings (GSM-R) along railway tracks in the bands 873 MHz - 880 MHz and 918 MHz - 925 MHz.

1800 MHz:

Further measures are necessary to protect cordless telephones (DECT) in the adjacent band (1880 MHz - 1900 MHz). As part of the frequency assignment procedure the assignee will have to explain how the DECT applications will be protected and will have to provide

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evidence. This also means that the assignee will have to provide relevant details when applying for site-specific usage parameters.

4. Additional conditions of use

4.1 Permitted out-of-block emissions

The rules laid down in section 1 of this Annex (spectrum emission masks and BEM) also apply to the out-of-block emissions when the spectrum is used by frequency division duplex (FDD) terminals and base stations. Any deviations from these rules must be agreed upon by the affected users on a bi- or multilateral basis. Such agreements must be notified to the Bundesnetzagentur prior to entry into force.

4.2 Coordination of frequencies for stations in border areas

In border areas and certain other regions in Germany the availability of spectrum for MFCN is limited due to the need for frequency coordination with neighbouring countries.

The restrictions in spectrum volume and frequencies will vary from one region to another, depending on the number of countries that need to be consulted (one, two, three or even four). Restrictions may also be imposed by the transmission modes used on either side of the border.

4.3 Protection of the Bundesnetzagentur's radio monitoring and inspection service's fixed stations

The site-specific technical parameters defined at frequency allocation will be based on a concept[2] designed to protect the Bundesnetzagentur's receiving installations against desensitisation effects and overload saturation.

- To protect the radio monitoring and inspection service's existing and planned receiving installations, the field strengths of the signals transmitted in the band above 790 MHz may not exceed a maximum of 90 dBµV/m at the installations' locations.
- This applies especially at those Bundesnetzagentur antenna sites which are to be shared with the frequency users.

[2] Communication 613/2012, Bundesnetzagentur Official Gazette 17/2012, page 3161

Section 1

Conditions of use for FDD base stations and terminals

A. Conditions of use for FDD base stations in the bands 925-960 MHz and 1805-1880 MHz (Bands III and VIII):

The conditions of use described here particularly take into account the requirements of broadband radio applications (≥5 MHz). If GSM technology (200 kHz) is to be deployed, the parameters set out in the relevant harmonised GSM standards must be complied with.

A.1 For base stations' in-block emissions

The studies carried out by the CEPT's ECC (especially those described in CEPT Reports 40 and 41) are based on assumed EIRP limits around 43 dBm (which corresponds to 20 W) relative to 5 MHz wide blocks. The power limit (EIRPmax) for a base station will depend on site-specific aspects such as those arising from coordination with other stations (possibly in other countries). This implies that EIRP limits higher than those indicated above may be permitted in certain cases.

A.2 For base stations' out-of-block emissions

Spectrum mask for FDD base stations:

For channel bandwidths of 5, 10, 15 and 20 MHz:

Frequency offset of the -3dB point of the measurement filter, Δf	Frequency offset of the measurement filter's centre frequency, f_offset	Minimum requirement Bands III, VIII	Measurement bandwidth (see note 2)
0 MHz ≤ Δf < 0.2 MHz	0.015MHz ≤ f_offset < 0.215MHz	-14 dBm	30 kHz
0.2 MHz ≤ Δf < 1 MHz	0.215MHz ≤ f_offset < 1.015MHz	$-14dBm - 15 \cdot \left(\frac{f\_offset}{MHz} - 0.215 \right) dB$	30 kHz
(see note 1)	1.015MHz ≤ f_offset < 1.5 MHz	-26 dBm	30 kHz
1 MHz ≤ Δf ≤ 10 MHz	1.5 MHz ≤ f_offset < 10.5 MHz	-13 dBm	1 MHz
10 MHz ≤ Δf ≤ Δfmax	10.5 MHz ≤ f_offset < f_offsetmax	-15 dBm	1 MHz

1. Δf is the distance between the edge of the block and the nominal -3dB point of the measurement filter with the shortest distance to the carrier frequency.
2. f_offset is the distance between the edge of the block and the centre of the measurement filter.
3. f_offset_{max} is the distance to the frequency 10 MHz beyond the specified transmit (Tx) band.
4. Δf_{max} is equal to f_offset_{max} minus half the bandwidth of the measurement filter.

NOTE 1: This band guarantees a continuous sequence of the f_offset values.

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NOTE 2: In general, the resolution bandwidth of the measuring equipment should correspond to the measurement bandwidth. However, to improve the accuracy, sensitivity and efficiency of measurements, the resolution bandwidth may be smaller than the measurement bandwidth. In this case the result must be integrated over the measurement bandwidth to obtain the equivalent noise bandwidth of the measurement bandwidth.

B. Conditions of use for FDD terminals in the bands 880-915 MHz und 1710-1785 MHz (Bands III und VIII):

The conditions of use described here particularly take into account the requirements of broadband radio applications (≥5 MHz). If GSM technology (200 kHz) is to be deployed, the parameters set out in the relevant harmonised GSM standards must be complied with.

B.1 For terminals stations' and terminals' in-block emissions

Duplex mode terminal station	**Band**	**Max. permissible EIRP (uplink) relative to a channel**
FDD	880 - 915 MHz	25 dBm
FDD	1710 - 1785 MHz	25 dBm

The limits are based on typical mobile terminal antenna gains. Depending on the antenna configuration and bearing co-existence with adjacent frequency usages in mind, higher power levels may be possible. If a channel bandwidth smaller than 1 MHz is used, the maximum permissible EIRP level is 30 dBm.

B.2 For terminal stations' and terminals' out-of-block emissions

Spectrum mask for FDD terminals:

Spectrum mask requirement (in dBm) for emissions:

Δf_{OOB} (MHz)	**Channel bandwidth**				**Measure-ment bandwidth**
	5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	
± 0-1	-15	-18	-20	-21	30 kHz
± 1-2,5	-10	-10	-10	-10	1 MHz
± 2,5-2,8	-10	-10	-10	-10	1 MHz
± 2,8-5	-10	-10	-10	-10	1 MHz
± 5-6	-13	-13	-13	-13	1 MHz
± 6-10	-25	-13	-13	-13	1 MHz
± 10-15		-25	-13	-13	1 MHz
± 15-20			-25	-13	1 MHz
± 20-25				-25	1 MHz

* In case of divergent interpretation of the German and English text, the German text shall prevail.

Section 2

Protecting frequency usages in the bands 880-915 MHz/925-960 MHz and 1710-1785 MHz/1805-1880 MHz

The transmission mode (access mode) to be used by the assignee is not specified. However, as a minimum requirement the spectrum emission masks and BEM set out in section 1 of this Annex must be complied with to ensure interference-free co-existence.

The principle should also be borne in mind that in the bands 1710 MHz - 1785 MHz and 1805 MHz - 1880 MHz the protection of older usages has priority over the right to introduce new usages.

If GSM technology is to be used concurrently with older GSM applications, a GSM channel must be left unused as an operational channel between the blocks of the different mobile networks. Such channels may be used for measurement purposes.

Where GSM and UMTS (FDD) are combined, it should also be borne in mind that in uncoordinated cases (use of different sites for the base stations) interference-free operation will only be possible if a 200 kHz (one GSM channel) guard band (carrier spacing: 2.8 MHz) is inserted on the sides adjacent to the GSM application in addition to the 5 MHz provided for UMTS. In coordinated cases no additional channel needs to be inserted for protection purposes (carrier spacing: 2.6 MHz).

Where GSM and LTE (FDD) are combined, it should also be borne in mind that in uncoordinated cases (use of different sites for the base stations) interference-free operation will only be possible if a 200 kHz (one GSM channel) guard band is inserted on both sides of the LTE channel in addition to the bandwidth provided for LTE. In coordinated cases no additional channel needs to be inserted for protection purposes.

Where GSM and WiMAX (FDD) are combined, the same rules apply as in the case of the combined use of GSM and LTE (FDD).

No additional guard bands are necessary in the combinations UMTS/LTE and UMTS/WiMAX.

For all other transmission modes (access modes), additional studies need to be carried out to determine the ideal parameters for ensuring the protection of existing applications.

Annex 3 – Conditions of use in the 700 MHz band

The conditions of use in this Annex have been drawn up to ensure the interference-free co-existence of the different MFCN in the 694 - 790 MHz band and the co-existence of these networks with the radio applications in the adjacent bands. Special attention has been paid to the television broadcast applications in the band below 694 MHz. The channelling arrangement, block edge masks (BEM) and other conditions set out below must be adhered to. Due account has been taken in the conditions of use of the broadband radio applications based on 5 MHz blocks and currently under discussion in connection with MFCN in the 700 MHz band. Where applications with other channel bandwidths are to be deployed, it may be necessary to deviate from the parameters set out below. The arrangements may also be modified in separate agreements between affected users (of MFCN and TV broadcasts) for the duration of the operator agreements. Such agreements must be notified to the Bundesnetzagentur prior to entry into force. Agreements which diverge from the arrangements made in the course of border coordination must be approved by the regulatory authorities concerned.

The conditions of use described in this Annex also take current discussions within CEPT/ECC into account, specially CEPT Report 53 „*Report A from CEPT to the European Commission in response to the Mandate „To develop harmonised technical conditions for the 694 - 790 MHz ('700 MHz') frequency band in the EU for the provision of wireless broadband and other uses in support of EU spectrum policy objectives*““. In its mandate the European Commission also called for an update of Report 53 (Report B) should any adjustments be necessary as a result of the World Radiocommunications Conference 2015.

At its 38th meeting in November 2014 the ECC approved the ECC Decision „*Harmonised technical conditions for mobile/fixed communications networks (MFCN) in the band 694-790 MHz including a paired frequency arrangement (FDD 2x30 MHz) and an optional unpaired frequency arrangement (SDL)*“, which is based on CEPT Report 53, for public consultation. Final approval of the ECC Decision is expected at the committee's 39th meeting in March 2015. It is also assumed that the European Commission will publish a Commission Decision with comparable contents based on CEPT Report 53 (Report A) and the potential update (Report B) at the beginning of 2016.

A stable policy position has been provided by the approval in November 2014 of the ECC work results but adjustments of the conditions of use set out below may be necessary in the wake of the ECC Decision's public consultation and the anticipated Commission Decision.

Extra measures may also be required locally or regionally. These may arise from border coordination (see subsection 4 below) or may be necessary for protecting TV broadcasting. The extra measures will have to be borne in mind in particular when the site-specific technical parameters of MFCN base stations are being specified. The mitigation techniques described in CEPT Report 30 will be applied where appropriate.

1. Frequency band

The following spectrum is available for MFCN in the 694 - 790 MHz band:

703 - 733 MHz and 758 - 788 MHz, ie 2 x 30 MHz or 6 blocks of 2 x 5 MHz paired.

The duplex gap (733 - 758 MHz) does not form part of the spectrum available for MFCN. Instead, in the light of relevant decisions at European and national level the spectrum is available, in principle, for other applications. The terms which may apply when the duplex gap is used are not covered by the conditions of use described here and will be defined in

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conjunction with the provisions for wireless radio microphones and possibly other radio applications that may be affected, with due consideration being given to CEPT Report 53.

2. Channelling arrangement

The following band plan for FDD (Frequency Division Duplex) is applicable:

694-703	703-708	708-713	713-718	718-723	723-728	728-733	733-758	758-763	763-768	768-773	773-778	778-783	783-788	788-791
guard band	Tx band TS (uplink)						duplex gap	Tx band BS (downlink)						guard band
9 MHz	30 MHz (6 blocks of 5 MHz)						25 MHz	30 MHz (6 blocks of 5 MHz)						3 MHz

Notes:

The first row indicates the cut-off frequencies of the blocks, duplex gap and guard bands (in MHz).

The second and third rows indicate the transmit bands of the terminal stations (uplink) and base stations (downlink) and the duplex gap and guard bands.

BS: base station;
TS: terminal station (terminal).

3. Conditions of use for FDD operation (Frequency Division Duplex)

These conditions of use are minimum requirements. More detailed conditions of use will be specified when the site-specific technical parameters of the base stations are being defined. Due consideration will be given to mitigation techniques.

The BEM parameters need to be complied with in order to protect broadcasting below 694 MHz and to ensure co-existence of the various MFCN operators. These parameters cover the conditions both in and out of the blocks. The out-of-block requirements include both baseline and specific requirements. All relevant BEM need to be combined to obtain the limits. Apart from the requirements arising from the BEM, to protect portable indoor (DVB-T/DVB-T2) reception, the mobile communications' maximum radiated power level of -57 dBm/8 MHz into the broadcasting channels below 694 MHz actually in operation for the implementation of coverage requirements for terrestrial TV broadcasts at the site under consideration has to be adhered to. Where bursts are used, the EIRP limits apply to the value averaged over the relevant burst. Unless specified otherwise, the radiocommunication station as such is the criterion, ie the number of antennas at the station is of no consequence.

3.1 General parameters

a) The blocks are awarded in multiples of 5 MHz.

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b) Within the 703 - 788 MHz band, the duplex spacing FDD is 55 MHz with terminal station transmission (uplink) located in the lower part of the band starting at 703 MHz and finishing at 733 MHz and base station transmission (downlink) located in the upper part of the band starting at 758 MHz and finishing at 788 MHz.

3.2 Limits and block edge mask(s) (BEM) for base stations

3.2.1 For base stations' in-block emissions

The studies carried out by the ECC (especially those described in CEPT Report 53) are based on assumed EIRP limits around 64 dBm (which corresponds to 2500 W) relative to blocks of 5 MHz. The power limit (EIRP) for a specific base station will be based on site-related aspects resulting, for example, from the coordination with other stations which may be located in other countries. Hence in certain cases higher values than those stated above may be possible.

3.2.2 For base stations' out-of-block emissions

Tables 1 to 4 set out the requirements applicable to the out-of-block emissions of MFCN base stations.

Table 1:
Baseline requirements (BEM for the out-of-block emissions of base stations)

Band in which out-of-block emissions fall	**Maximum mean permissible EIRP (EIRPmax)**	**relative to**
703-733 MHz	-50 dBm per cell (1)	5 MHz
832-862 MHz (uplink in the 800 MHz band)	-49 dBm per cell (1)	5 MHz
758-788 MHz and 791-821 MHz (downlink in the 800 MHz band)	16 dBm per antenna	5 MHz
For digital terrestrial TV frequencies in which broadcasting is protected	-23 dBm per cell	8 MHz

(1) In the case of a multi-sector site, „cell" relates to one of the sectors.

Depending on the future primary use of parts of the middle gap and of the guard bands, adjustments may be necessary with regard to the unwanted emissions of the base stations. The adjustments for the lower guard band and the adjacent band above 733 MHz are likely to correspond to those in the 703-733 MHz band and the adjustments for the adjacent band below 758 MHz and the upper guard band are likely to correspond to those in the 758-788 MHz band.

Table 2:
Specific requirements (BEM for the out-of-block emissions of base stations) below the upper band edge of the downlink (in the band 733 – 788 MHz) relative to the antenna

Offset from the edge of the block affected (relative to the lower/upper edge of the block)	**Maximum mean permissible EIRP (EIRPmax)**	**relative to**

* In case of divergent interpretation of the German and English text, the German text shall prevail.

-10 to -5 MHz (lower block edge)	18 dBm	5 MHz
-5 to 0 MHz (lower block edge)	22 dBm	5 MHz
0 to +5 MHz (upper block edge)	22 dBm	5 MHz
+5 to +10 MHz (upper block edge)	18 dBm	5 MHz

Table 3:
Specific requirements (BEM for out-of-block emissions of base stations) above the upper band edge of the downlink (within 788 - 801 MHz) relative to the antenna

Band	**Maximum mean permissible EIRP (EIRPmax)**	**relative to**
788-791 MHz for upper block edge at 788 MHz	21 dBm	3 MHz
788-791 MHz for upper block edge at 783 MHz	16 dBm	3 MHz
791-796 MHz for upper block edge at 788 MHz	19 dBm	5 MHz
791-796 MHz for upper block edge at 783 MHz	17 dBm	5 MHz
796-801 MHz for upper block edge at 788 MHz	17 dBm	5 MHz

Table 4:
Specific requirements (BEM for out-of-block emissions of base stations) for the guard bands and the duplex gap

Band	**Maximum mean permissible EIRP (EIRPmax)**	**relative to**
-10 to 0 MHz offset from the lower band edge of the downlink but above the upper band edge of the uplink	16 dBm per antenna	5 MHz
More than 10 MHz offset from the lower band edge of the downlink but above the upper band edge of the uplink	-4 dBm per antenna	5 MHz
Spectrum between the broadcasting band edge and the lower band edge of the FDD uplink	-32 dBm per cell (1)	1 MHz
Spectrum between the upper band edge of the downlink and 791 MHz	14 dBm per antenna	3 MHz

(1) In the case of a multi-sector site, „cell“ relates to one of the sectors.

3.3 Limits and BEM(s) for terminal stations and terminals

3.3.1 For terminal stations’ and terminals’ in-block emissions

The studies carried out by the ECC (especially those described in CEPT Report 53) were based on assumed EIRP limits around 25 dBm (the values for the terminal stations correspond to the highest value at which power control is possible). Depending on the antenna configuration, higher power levels may be possible. Particularly in the case of terminal stations with fixed antennas with typically higher antenna gains significantly higher power levels may be possible whilst bearing in mind co-existence with other affected frequency usages. In certain cases Bundesnetzagentur approval may be required.

3.3.2 For terminal stations’ and terminals’ out-of-block emissions

Tables 5 and 6 set out the requirements applicable to the out-of-block emissions of MFCN terminal stations (terminals) based on an EIRP of 25 dBm for emissions in the block.

Table 5:
Specific requirements (BEM for the out-of-block emissions of terminal stations) for the guard bands

Offset from the band edge of the uplink (relative to lower/upper edge)	Maximum mean permissible EIRP (EIRPmax)	relative to
More than -5 MHz (lower edge)	-7 dBm	4 MHz
-5 to 0 MHz (lower edge)	2 dBm	5 MHz
0 to 5 MHz (upper edge) (duplex gap)	2 dBm	5 MHz
5 to 20 MHz (upper edge) (duplex gap)	-6 dBm	5 MHz
More than 20 MHz (upper edge) (duplex gap)	-18 dBm	5 MHz

Table 6:
Requirements (BEM for the out-of-block emissions of terminal stations) below 694 MHz for protecting digital television relative to the TV channels actually in operation for the implementation of coverage requirements for terrestrial TV broadcasts at the site under consideration

Band	Maximum mean permissible EIRP (EIRPmax)	relative to
470 - 694 MHz in general	-42 dBm	8 MHz
470 - 694 MHz for portable indoor	-57 dBm	8 MHz

4. Station coordination in border areas

In border areas and certain other regions in Germany the availability of spectrum for MFCN is limited due to the need for frequency coordination with neighbouring countries.

The restrictions in spectrum volume and frequencies will vary from one region to another, depending on the number of countries that need to be consulted (one, two, three or even four). Restrictions may also be imposed by the radio applications and transmission modes used on either side of the border.

Any coordination that may be necessary will be based on the agreements signed between the Federal Republic of Germany and its neighbouring countries.

The final coordination procedures for MFCN applications (5 MHz blocks) and television broadcasting (8 MHz channels) in the 694 - 790 MHz band will be agreed on a bi- and multilateral basis with due account being given to the Geneva Agreement 2006 (GE-06).

In No. 5.312 of the Radio Regulations (ITU, 2012) the band 645 - 862 MHz is also allocated to the aeronautical radionavigation service on a primary basis in the countries listed in that Article. The final arrangements for border coordination of MFCN and applications of the

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aeronautical radionavigation service will also be agreed on a bi- and multilateral basis with due consideration being given to the Geneva Agreement 2006 (GE-06).

5. Coordination within Germany

When defining the site-specific parameters of the base stations, both adjacent MFCN in the band 703 - 788 MHz and the television broadcast applications below 694 MHz need to be taken into account.

6. Protection of the Bundesnetzagentur's radio monitoring and inspection service's stations

The site-specific technical parameters defined at frequency allocation will be based on a concept[3] designed to protect the Bundesnetzagentur's receiving installations against desensitisation effects and overload saturation.

- To protect the radio monitoring and inspection service's existing and planned receiving installations, the field strengths of the signals transmitted in the 9 kHz - 790 MHz band may not exceed a maximum of 80 dBµV/m at the installations' locations.
- This applies especially at those Bundesnetzagentur antenna sites which are to be shared with the frequency users.

The level of the limit laid down in Official Gazette Communication 613/2012 for protecting monitoring stations at 790 MHz is based on the bands hitherto used by public mobile communications services. Since the band will be extended for mobile communications by the forthcoming frequency award proceedings, it is necessary to adjust this level as well. To protect its monitoring stations, the Bundesnetzagentur intends to increase the field strength to 90 dBµV/m in the band 694 – 790 MHz in an Official Gazette Order to be published in the course of this year.

[3] Communication 613/2012, Bundesnetzagentur Official Gazette 17/2012, page 3161

Annex 4 – Conditions of use in the 1.5 GHz band

The condition of use in this Annex have been drawn up to ensure the interference-free co-existence of different applications in the bands listed below and in the adjacent bands. To ensure such co-existence, the spectrum emission masks and block edge masks (BEM) set out in this Annex need to be adhered to. The masks are based on the broadband radio applications currently under discussion for these bands. Where applications with a smaller channel bandwidth are to be deployed, it may be necessary to deviate from the masks' parameters. The arrangements set out below may also be modified in separate agreements between affected frequency users for the duration of the operator agreements. Agreements which diverge from the arrangements made in the course of border coordination must be approved by the regulatory authorities concerned.

1. Frequency bands

The entire volume of spectrum in the band 1452 MHz - 1492 MHz is available for MFCN, ie this yields 1 x 40 MHz or 8 blocks of 5 MHz unpaired (SDL).

This band represents additional downlink spectrum (SDL) for MFCN that may be used in combination with paired (FDD) or unpaired (TDD) MFCN spectrum to extend the capacity on the downlink. A constellation without additional MFCN spectrum but also providing an uplink is not possible.

The use of these frequencies for MFCN is subject to the rules and channelling arrangement set out below. The channelling arrangement is in conformity with ECC Decision (13)03. The conditions of use described in this Annex also take CEPT Report 54 „*Report from CEPT to the European Commission in response to the Mandate "To develop harmonised technical conditions in the 1452-1492 MHz frequency band for wireless broadband electronic communications services in the EU"* into account.

A stable policy position has been provided by the final approval in November 2014 of the ECC work results but adjustments of the conditions of use set out below may be necessary in the wake of the anticipated Commission Implementing Decision.

Extra measures may also be required locally or regionally arising from the need for coordination with other services or border coordination (see subsection 4 below). The extra measures will have to be borne in mind in particular when the site-specific technical parameters of MFCN base stations are being specified.

Use of different radio systems and access modes will be possible, provided the channelling arrangement and associated conditions of use are complied with.

2. Channelling arrangement

The following band plan for downlink (SDL) is applicable:

1452-1457	1457-1462	1462-1467	1467-1472	1472-1477	1477-1482	1482-1487	1487-1492
Tx band BS (downlink)							
40 MHz (8 blocks of 5 MHz)							

Notes:
The first row indicates the cut-off frequencies of the blocks (in MHz).
The second and third rows indicate the base stations (downlink).
BS: base station

* In case of divergent interpretation of the German and English text, the German text shall prevail.

3. Conditions of use

These conditions of use are minimum requirements. More detailed conditions of use will be specified when the site-specific technical parameters of the base stations are being defined, with due consideration being given to mitigation techniques.

The BEM parameters need to be complied with in order to ensure co-existence of the various MFCN operators and of adjacent applications. These parameters cover the conditions both in and out of the blocks. The out-of-block requirements include both baseline and specific requirements. All relevant BEM need to be combined to determine the limits. Apart from the requirements arising from the BEM, further requirements, eg at the border, may need to be considered. Unless specified otherwise, the radiocommunication station as such is the criterion, ie the number of antennas at the station is of no consequence.

3.1 General parameters

a) The blocks are awarded in multiples of 5 MHz.

b) The frequencies may only be used with other MFCN frequencies and serve to extend the downlink capacity in these bands (SDL). They may be combined at random.

3.2 Limits and BEM(s) for base stations

Adherence to the following rules (spectrum emission masks and BEM) is also mandatory for the out-of-block emissions when the spectrum is used by SDL base stations. Any deviations from these rules must be agreed upon by affected users on a bi- or multilateral basis. Such agreements must be notified to the Bundesnetzagentur prior to entry into force.

3.2.1 For base stations' in-block emissions

The studies carried out by the ECC (especially those described in CEPT Report 54) are based on assumed EIRP limits around 68 dBm (which corresponds to 6310 W) relative to blocks of 5 MHz. The power limit (EIRP) for a specific base station will be based on site-related aspects resulting, for example, from the coordination with other stations which may be located in other countries. Hence in certain cases higher values than those stated above may be possible.

3.2.2 For base stations' out-of-block emissions

Tables 1 to 4 set out the requirements applicable to the out-of-block emissions of MFCN base stations.

Table 1:
Baseline requirements (BEM for the out-of-block emissions of base stations) relative to the antenna

Offset from the edge of the block affected (relative to the lower/upper edge of the block)	**Maximum mean permissible EIRP (EIRPmax)**	**relative to**
–10 to –5 MHz (lower block edge)	11 dBm	5 MHz
–5 to 0 MHz (lower block edge)	16.3 dBm	5 MHz
0 to +5 MHz (upper block edge)	16.3 dBm	5 MHz
+5 to +10 MHz (upper block edge)	11 dBm	5 MHz
Remaining MFCN SDL frequencies	9 dBm	5 MHz

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Table 2:
Baseline requirements (BEM for the out-of-block emissions of base stations) outside the band 1452-1492 MHz

Band	Maximum mean permissible EIRP (EIRPmax)	relative to
Below 1440 MHz	-38.5 dBm	1 MHz
1440 – 1449 MHz	-20 dBm	1 MHz
1449-1452 MHz	14 dBm	3 MHz
1492-1495 MHz	14 dBm	3 MHz
1495 – 1504 MHz	-20 dBm	1 MHz
Above 1504 MHz	-38.5 dBm	1 MHz

4. Station coordination in border areas

In border areas and certain other regions in Germany the availability of spectrum for MFCN is limited due to the need for frequency coordination with neighbouring countries.

The restrictions in spectrum volume and frequencies will vary from one region to another, depending on the number of countries that need to be consulted (one, two, three or even four). Restrictions may also be imposed by the radio applications and transmission modes used on either side of the border.

Any coordination that may be necessary will be based on the agreements signed between the Federal Republic of Germany and its neighbouring countries and on ECC Decision (15)01 “Cross-border coordination for mobile/fixed communications networks (MFCN) in the frequency bands 1452-1492 MHz, 3400-3600 MHz and 3600-3800 MHz” which is expected to be finally approved at the next meeting of ECC’s Working Group FM at the beginning of February 2015.

5. Coordination within Germany

When defining the site-specific parameters of the base stations, both adjacent MFCN in the band 1452-1492 MHz and adjacent usages above and below this band need to be taken into account.

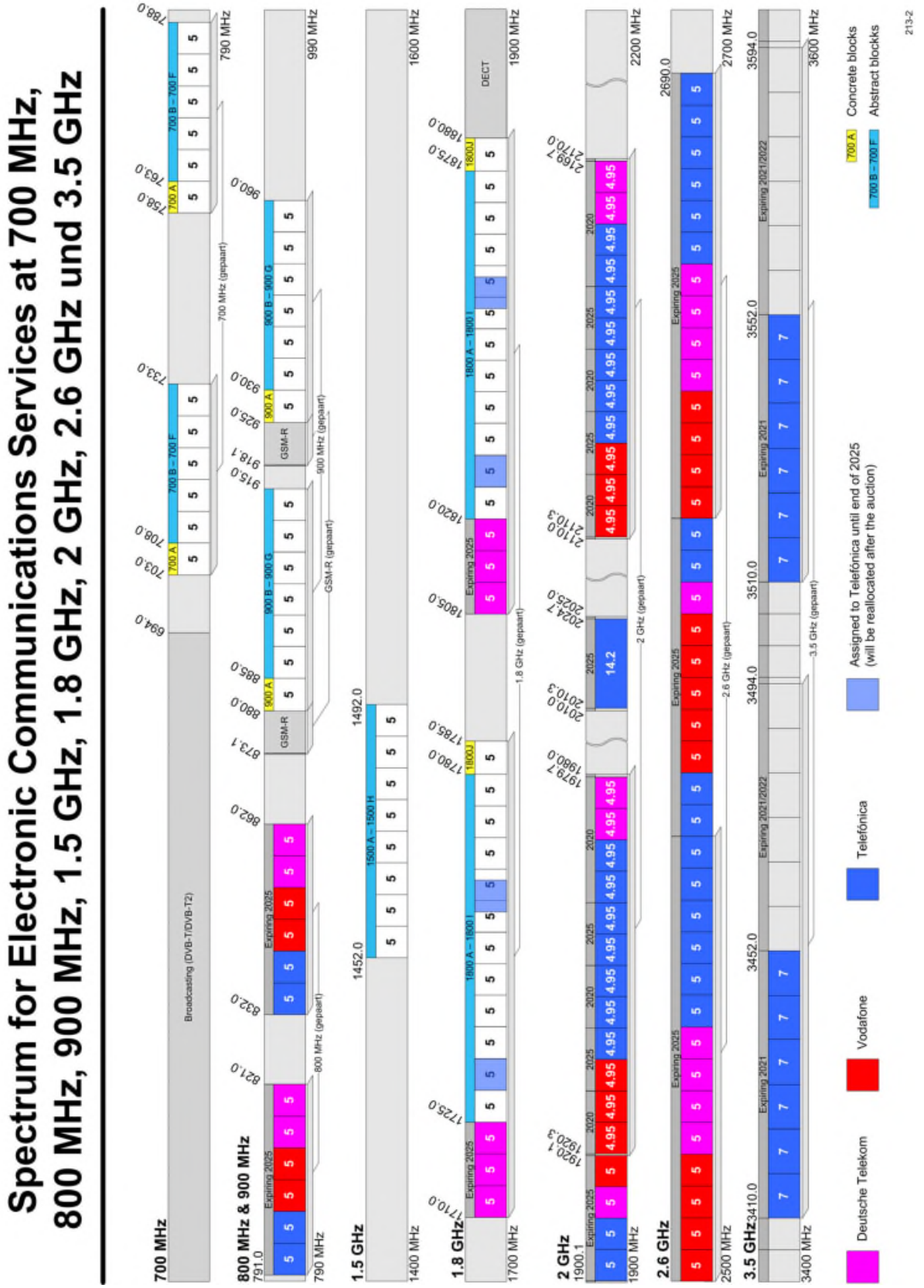
6. Protection of the Bundesnetzagentur’s radio monitoring and inspection service’s fixed stations

The site-specific technical parameters defined at frequency allocation will be based on a concept[4] designed to protect the Bundesnetzagentur’s receiving installations against desensitisation effects and overload saturation.

- To protect the radio monitoring and inspection service’s existing and planned receiving installations, the field strengths of the signals transmitted in the band above 790 MHz may not exceed a maximum of 90 dBµV/m at the installations’ locations.
- This applies especially at those Bundesnetzagentur antenna sites which are to be shared with the frequency users.

[4] Communication 613/2012, Bundesnetzagentur Official Gazette 17/2012, page 3161

Annex 5 – Mobile spectrum



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Annex 6 – Items up for bid

Band	Block designation	Capacity	Award mode	Spectrum or frequencies available	Minimum bid in EURO (€)	Lot rating
700 MHz (paired)	700 A	2 x 5 MHz	concrete	703 – 708 MHz / 758 – 763 MHz	75,000,000	2
	700 B	2 x 5 MHz	abstract	708 – 733 MHz / 763 – 788 MHz	75,000,000	2
	700 C	2 x 5 MHz			75,000,000	2
	700 D	2 x 5 MHz			75,000,000	2
	700 E	2 x 5 MHz			75,000,000	2
	700 F	2 x 5 MHz			75,000,000	2
900 MHz (paired)	900 A	2 x 5 MHz	concrete	880 – 885 MHz / 925 – 930 MHz	75,000,000	2
	900 B	2 x 5 MHz	abstract	885 – 915 MHz / 930 – 960 MHz	75,000,000	2
	900 C	2 x 5 MHz			75,000,000	2
	900 D	2 x 5 MHz			75,000,000	2
	900 E	2 x 5 MHz			75,000,000	2
	900 F	2 x 5 MHz			75,000,000	2
	900 G	2 x 5 MHz			75,000,000	2

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Bands	Block designation	Capacity	Award mode	Spectrum or frequencies available	Minimum bid in EURO (€)	Lot rating
1.5 GHz (unpaired)	1500 A	1 x 5 MHz	abstract	1452 – 1492 MHz	18,750,000	1
	1500 B	1 x 5 MHz			18,750,000	1
	1500 C	1 x 5 MHz			18,750,000	1
	1500 D	1 x 5 MHz			18,750,000	1
	1500 E	1 x 5 MHz			18,750,000	1
	1500 F	1 x 5 MHz			18,750,000	1
	1500 G	1 x 5 MHz			18,750,000	1
	1500 H	1 x 5 MHz			18,750,000	1
1.8 GHz (paired)	1800 A	2 x 5 MHz	abstract	1725 – 1780 MHz / 1820 – 1875 MHz	37,500,000	2
	1800 B	2 x 5 MHz			37,500,000	2
	1800 C	2 x 5 MHz			37,500,000	2
	1800 D	2 x 5 MHz			37,500,000	2
	1800 E	2 x 5 MHz			37,500,000	2
	1800 F	2 x 5 MHz			37,500,000	2
	1800 G	2 x 5 MHz			37,500,000	2
	1800 H	2 x 5 MHz			37,500,000	2
	1800 I	2 x 5 MHz			37,500,000	2
	1800 J	2 x 5 MHz	concrete	1780 – 11785 MHz / 1875 – 1880 MHz		

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