

Draft consultation document on the order for and choice of proceedings for the award of spectrum in the 2 GHz and 3.6 GHz bands for mobile/fixed communication networks (MFCN)

- Reference: BK1-17/001 -

The Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen, through the President's Chamber, has invited responses on a draft consultation document on the award of spectrum in the 2 GHz band (1920 – 1980 MHz/2110 – 2170 MHz) and in the 3.6 GHz band (3400 MHz – 3700 MHz) for mobile/fixed communication networks (MFCN). The following draft consultation document makes provision for auctioning nationwide usage rights for spectrum at the above bands on account of the scarcity of spectrum.

The execution of the auction procedure also presupposes that further legally prescribed decisions (on the terms and conditions of the auction and the auction rules) will be made by the President's Chamber in consultation with the Advisory Council of the Bundesnetzagentur.

Owing to the many individual steps involved, the Chamber is aiming to start the procedure in 2018 to ensure the usability of spectrum on a timely basis before the end of assignments to the benefit of consumers. The auction is scheduled to take place in 2018.

Likewise with the initial auctioning-off of spectrum in the 700 MHz, 900 MHz and 1800 MHz bands in 2015, the Bundesnetzagentur ensured that the potential of this spectrum in Germany – particularly for the switch to LTE broadband systems – could be utilised as quickly as possible to the benefit of consumers. The provision of access to rural area spectrum in 2015 served to, above all, encourage LTE rollout in rural areas.

The award of spectrum in the 2 GHz and 3.6 GHz bands aims to build on the success of this. In particular, the nationwide provision of early access to spectrum in the 3.6 GHz band aims to ensure to the greatest possible extent that the potential of this band for 5G or peak data rates in the gigabit range and user data rates with average speeds of several hundred megabits per second (known as enhanced mobile broadband or eMBB) can be fully utilised. The Bundesnetzagentur intends to enable fast, flexible and needs-oriented 5G rollout to this end.

This procedure contributes to achievement of the spectrum management and broadband policy objectives of using the 3.6 GHz band as a pioneer band for 5G (cf RSPG 16-032, "Strategic Roadmap towards 5G for Europe") and for the rollout of digital infrastructures in Germany:

"The Commission has identified the following key elements for the plan:

- Align roadmaps and priorities for a coordinated 5G deployment across all EU Member States, targeting early network introduction by 2018, and moving towards commercial large scale introduction by the end of 2020 at the latest."

(Radio Spectrum Policy Group, "Strategic Roadmap towards 5G for Europe", 9 November 2016; Ref. RSPG16-032 FINAL; http://rspg-spectrum.eu/wp-content/uploads/2013/05/RPSG16-032-Opinion_5G.pdf)

To achieve these objectives, notification of the intention to introduce 5G networks in line with the 5G roadmap of the Radio Spectrum Policy Group (RSPG) must be provided by 2018 to enable large-scale, commercial operations by the end of 2020.

The needs-oriented provision of spectrum for 5G in 2018 is a key milestone of the Federal Ministry of Transport and Digital Infrastructure's 5G strategy. This strategy places

particular emphasis on the important role of spectrum in the 3.6 GHz and 700 MHz bands for the introduction of 5G:

"The 3.4-3.8 GHz frequency range will also play an important role when it comes to the introduction of 5G. In this frequency band, there is a good chance that mobile communications companies will be able to use channel bandwidths of up to 100 MHz so that this area can generally be used for data-intensive and smaller-cell applications, e.g. in urban areas. Moreover, due to their favourable transmission conditions, the frequencies in the 700 MHz band that have already been allocated in Germany provide network operators with the opportunity to develop comprehensive 5G coverage based on their existing network infrastructure early on

(Federal Ministry of Transport and Digital Infrastructure, 5G Strategy for Germany, page 9 and 23; www.bmvi.de.)

With regard to digitisation, the Federal Ministry for Economic Affairs and Energy has also formulated requirements for the rollout of digital infrastructures in its Digital Strategy 2025:

"High-performance broadband networks are the foundation and driver of digitisation and are therefore indispensable for Germany's digital future. Without sufficient information highways, Germany cannot successfully accomplish the process of digitisation that is progressing at an ever increasing speed. For this reason that we must create a viable digital infrastructure that can support the triple requirements of high capacity, broad availability and low latency."

(Federal Ministry for Economic Affairs and Energy, Digital Strategy 2025, page 13; www.bmwi.de)

In a joint initiative for a digital Europe, the federal government and the governments of France, Italy and Spain have set priorities, with a view to fully harnessing the potential of digital technology. A particular priority in this connection is the development of high-performance 5G networks in the coming months. As well as setting an ambitious timetable for world-leading 5G networks in Europe by 2025, the initiative calls for changes to the EU aid rules to enable government subsidies to be used to eliminate the digital gap between urban and rural areas:

"In parallel, we must act proactively in several areas that will allow our economies and societies to make full use of the potential benefits of digital technologies. We refer to five specific priorities for the next months and 2018.

Deployment of high-capacity networks (5G, fibre optics). Communication networks constitute the backbone of the digital world. On the one hand, since high-speed and future-proof infrastructure is key to attain the Gigabit Society, Member States and the EU need to make every effort towards high-speed broadband and 5G expansion, including by establishing ambitious roadmaps to achieve a world-leading optical fibre and 5G network in the EU by 2025. On the other, ensuring that citizens and companies, even in rural areas, have access to information society services multiplies the opportunities for them to flourish in today's environment. The Commission should propose changes in the present regulation, especially regarding state-aid regulation, to foster fight against the "digital divide".

(Joint initiative by France, Germany, Italy and Spain, Europe's digital agenda: Deliverables for the Digital Summit in Tallinn, page 2; www.bundesregierung.de)

The telecommunications ministers of the EU member states have now agreed on joint objectives and a timetable for the rollout of 5G networks. According to this, network rollout is set to begin in 2018. By 2025, 5G should then be available in cities and along major transport routes:

"2018-2025 *Roll-out of 5G infrastructure*
2025 *Gigabit Society (5G in major cities and along major transport routes)"*

(Estonian Presidency of the Council of the European Union, 5G roadmap; https://www.mkm.ee/sites/default/files/8.a_b_aob_5g_roadmap_final.pdf).

In line with the above-mentioned broadband policy objectives of the federal government and the 5G Strategy for Germany, the Bundesnetzagentur's primary goal is to provide planning and investment certainty not only for the future provision of suitable spectrum resources for broadband rollout in Germany, but also for user groups affected by this (including satellite communications, radio astronomy, regional network operators and small and medium-sized enterprises) and their interests.

In respect of the foreseeable availability of spectrum for further broadband rollout in Germany, the Bundesnetzagentur is endeavouring to consider all possible ways of expediting proceedings. This is why spectrum in the bands at 2 GHz and 3.6 GHz, which is well suited for the rollout of high speed telecommunications networks, is being made available for mobile broadband services or 5G at an early stage. The Bundesnetzagentur sees particular potential for expediting proceedings in the reassignment of the 3.6 GHz band, taking account of existing uses, as swiftly as possible before the expiry dates. This is intended to enable future assignment holders to plan or to start network rollout for 5G with the new spectrum packages before the current spectrum assignments expire in 2021/2022, i.e. if possible as early as 2019.

The Chamber expects the 2 GHz and 3.6 GHz bands to offer great social and economic potential for broadband rollout in Germany. The 2 GHz band is already harmonised globally for LTE systems, providing economies of scale in respect of the cost-efficient provision of technical systems and terminal equipment.

The 2 GHz band is expected to become an important frequency band for LTE broadband services in the coming years, like the 1.8 GHz band before it. The Chamber is hence working on the assumption that consumer coverage with mobile broadband services can be stimulated as envisaged in the above-mentioned objectives.

In assessing the great social and economic potential of the 3.6 GHz band for broadband rollout in Germany, the Chamber is also taking account of the significance of satellite communications, radio astronomy and the interests of regional network operators. The Chamber's deliberations consider the resulting differing interests that need to be reconciled.

With regard to the interests of regional network operators, small and medium-sized enterprises and start-ups that will not need spectrum until a later date, the Bundesnetzagentur is establishing an application procedure, parallel to the award procedure, for exclusive regional spectrum assignment in the 3700 MHz – 3800 MHz and 26 GHz bands. To provide all interested enterprises with a complete overview of available frequencies in the 3400 MHz – 3800 MHz band and in the 26 GHz band, notification of the conditions for the application procedure will be provided on a timely basis before the beginning of the qualification procedure for the auction.

The following draft consultation document is intended to encourage discussion on the use of the 2 GHz and 3.6 GHz spectrum to support achievement of the federal government's goals for the gigabit society.

To structure the process at an early stage and to ensure the procedure is transparent, the President's Chamber is inviting responses on the following draft consultation document on

the order for and choice of proceedings for the award of spectrum in the 2 GHz and 3.6 GHz bands.

Interested parties are hereby called upon to present their views on the draft consultation document.

Responses must be submitted in German

by [# 28 February 2018 #]

in written form to
Bundesnetzagentur
Referat 212
Tulpenfeld 4
53113 Bonn
Germany

and

in electronic form in Word (or Word-compatible) or PDF format (copying and printing must be enabled) by email to: referat212@bnetza.de.

Responses will be published in their original form on the Bundesnetzagentur's website. Consent to publish responses must therefore be granted upon submission of comments. If responses contain confidential information pertaining to the enterprises, a redacted version for publication must be submitted additionally, with a list of reasons for any redactions.

Draft consultation document

of the President's Chamber of the Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen of [Date] on the order for and choice of proceedings for the award of spectrum in the 2 GHz and 3.6 GHz bands for mobile/fixed communications networks (MFCN); decision taken under section 55(4), (5) and (10), section 61(1), (2) and section 132(1) and (3) of the Telecommunications Act (TKG)

- Reference: BK1-17/001 -

The Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen, through President's Chamber 1 (President's Chamber), hereby issues the following decisions under section 55(10), section 61(1) and (2) 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 2 GHz and 3.6 GHz:

1. Order for award proceedings

It is hereby ordered under section 55(10) TKG that assignment of spectrum for MFCN in the 1920 – 1980 MHz (lower band), 2110 – 2170 MHz (upper band) and 3400 MHz – 3700 MHz bands is to be preceded by award proceedings as set out in section 61 TKG.

2. Choice of award proceedings

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

Rationale

- 1 The following considerations and grounds have prompted the Chamber to order and choose proceedings for the award of spectrum in the 2 GHz and 3400 – 3700 MHz bands for MFCN.

Steps

"Frequenz-Kompass"

- 2 With its "Frequenz-Kompass" document of 15 July 2016, the Bundesnetzagentur provided an overview of the next steps in the area of spectrum management and identified corresponding fields of activity for the rollout of digital infrastructures (No 1032/2016, Bundesnetzagentur Official Gazette No 14/2016 of 27 July 2016, page 1714ff). Based on the "Frequenz-Kompass", current and future regulatory framework conditions for the rollout of high-speed digital radio infrastructure for society and industry are to be evaluated and geared to future requirements.
- 3 21 responses to the consultation were received. With respect to the introduction of next-generation 5G technology, respondents were interested in spectrum for nationwide mobile radio networks on the one hand, and local or regional mobile radio networks on the other (eg in the offshore segment). Interest was especially high in the 3.4 GHz – 3.8 GHz and 2 GHz bands. Owing to the high level of interest in the spectrum, further bands were proposed for 5G in addition to the bands listed in the "Frequenz-Kompass" document.
- 4 However, interest in the above-mentioned bands was also registered for other radio applications (eg by satellite operators and PMSE operators).
- 5 In respect of the "service providers" and "new market players" fields of activity addressed in the "Frequenz-Kompass", a wide variety of responses were received. Some were in favour of measures to strengthen service and infrastructure competition, while others rejected service provider obligations and measures that stand to benefit new market players.

Points of orientation

- 6 With regard to the responses to the "Frequenz-Kompass", the Bundesnetzagentur on 20 December 2016 launched a public consultation on its document "Points of Orientation for the provision of spectrum for the rollout of digital infrastructures" (No 1703/2016, Bundesnetzagentur Official Gazette No 24/2016 of 21 December 2016, page 4483ff.).
- 7 The points of orientation addressed the frequencies suited to and envisaged for the rollout of 5G infrastructures. In particular, the following frequencies were identified for this purpose: 700 MHz (centre gap), 2 GHz (known as UMTS spectrum), 3.4 – 3.8 GHz, 26 GHz and 28 GHz. They also addressed whether regulations that benefit service providers/MVNOs and new market players could be necessary. 39 responses to the consultation were received.

Key elements and demand identification

- 8 On 27 June 2017, the Bundesnetzagentur published the document "Key Elements for the rollout of digital infrastructures and Identification of Demand for nationwide assignments in the 2 GHz and 3.6 GHz bands" (No 484/2017, Bundesnetzagentur Official Gazette

No 13/2017 of 12 July 2017, page 2726ff.). This paper set out, as the basis for consultation, the initial framework conditions for a procedure for the provision of spectrum.

9 Essentially, the following was said during the course of the consultation:

On key element 1 (Combined provision)

Some respondents welcomed the Bundesnetzagentur's intended early, combined provision of the 2 GHz spectrum.

One respondent rejected the early, combined provision, saying that the inclusion of rights of use set to expire at the end of 2025 was legally inadmissible. Instead of including in this process the spectrum in the 2 GHz band that is set to expire at the end of 2025, this spectrum should be considered jointly with other rights of use that have already been assigned until 2025. However, if the spectrum is to be auctioned off, the respondent believes that either the full amount should be paid when the spectrum becomes available in 2026 or that several instalments should be paid up to that point.

It was also noted that, for the event of spectrum shortage, a spectrum reserve of 2 x 10 MHz each for existing mobile network operators should be provided to safeguard provision for existing customers. After deduction of the spectrum reserve for existing mobile network operators, the remaining spectrum should, in the event of a shortage, be made available by way of a call for tenders.

In respect of the investigation into spectrum distribution, it was stated on the one hand that the massive imbalances in the 2 GHz band up to now and the associated distortion of competition have not been resolved. A prompt and fair decision covering at least the period up to 2020 is required. The joint award of all blocks in the 2 GHz band would give the market the opportunity to achieve a solution for the remaining period up to 2025.

On the other hand, it was stated that there is no reason for reassignment during the existing license periods. The view was put forward that the investigation into spectrum distribution should be ended without interfering with existing spectrum assignments.

As regards the joint provision of 2 GHz spectrum with 3.6 GHz spectrum, it was noted that the bands at 2 GHz and 3.6 GHz are not interchangeable. Separate demand forecasts would therefore have to be prepared for each band. It is conceivable that shortages could occur in one band and not in the other.

Some respondents welcomed the intention to ensure non-discriminatory access to 2 GHz spectrum for all user groups.

Additionally, the following was said:

It is questionable whether the early reassignment of existing spectrum packages alone would offer all interested enterprises the opportunity to purchase a non-discriminatory spectrum package to suit their business model. Although the intention is for new market players to generally be able to take part in this process, the key elements do not state how a holistic market entry concept might look.

To operate a mobile network efficiently and competitively, the option of using all bands is generally required. New market players should therefore have a formal right to additive shared use of existing mobile networks.

On key element 2 (Intended use)

The majority of respondents welcomed the Bundesnetzagentur's intention to provide the 2 GHz spectrum for MFCN. One respondent objected in part to the intended use, arguing that a guard band of 300 kHz for MSS must be provided above 1979.7 MHz and 2169.7 MHz.

Some respondents pointed out that mobile technology and network infrastructure could potentially be used for wireless event and conference technology.

By contrast, one respondent proposed that spectrum in the 2 GHz and 3.6 GHz band be assigned for use by WLAN.

On key element 3 (5 MHz blocks)

The provision of the 2 GHz spectrum in blocks of 5 MHz was welcomed. Suitable block edge masks (BEM) must be defined to this end.

One respondent explicitly welcomed the provision of spectrum without guard bands, as this would enable the typical 5 MHz bands for 3G, 4G and 5G.

By contrast, another respondent favoured the use of guard bands, provided that the technical feasibility of such a reduction has not been proven by CEPT studies. Maintenance of the 300 kHz guard band above 1979.7 MHz and 2169.7 MHz was called for, referencing ECC Decision (06)01 and European Commission Implementing Decision 2012/688/EU.

On key element 4 (Contiguous spectrum)

The assignment of contiguous spectrum was welcomed by all respondents. It was noted that the highest level of efficiency is achieved through the use of contiguous spectrum, as this enables, among other things, the realisation of slightly differing bandwidths.

On key element 5 (Time limit)

Respondents generally welcomed long license durations for spectrum assignment. However, most respondents called for longer spectrum assignment periods.

The proposals included periods of 22 years, but also at least 25 years, in order to provide planning certainty and achieve a return on investment. One respondent agreed with the European Union's proposal for a standardised period up to the end of 2045. Another was in favour of extending license durations to 2050 and beyond. Switching from limited to unlimited assignments would provide greater planning certainty in the context of high capital investments.

One respondent called for a combination of a guaranteed initial usage period with a predefined option of extending for 5-10 years before expiry of the license, depending on the investments and intensity of spectrum use.

On key element 6 (Provision of the 3.6 GHz band)

As regards the joint provision 2 GHz spectrum with 3.6 GHz spectrum, it was noted that the bands at 2 GHz and 3.6 GHz are not interchangeable. Separate demand forecasts would therefore have to be prepared for each band. It is conceivable that shortages could occur in one band and not in the other.

Further issues addressed include the protection of radar, satellite communications, radio astronomy and the Geodetic Observatory Wettzell.

Several respondents were in favour of the intended provision of the 3.6 GHz band. This would enable the advantages of this spectrum for 5G to be harnessed to optimum effect. This approach would also meet the demands of industry. Many 5G applications require a specific quality of service, ie reliability and/or latency. This quality can only be achieved through "licensed" spectrum, as unexpected interference would be eliminated.

It was noted that the early use of the spectrum for 5G is very important – especially given the anticipated availability of terminal equipment before 2020.

However, it was pointed out that, if new market players are to take part in the award procedure, special rules will have to be established. Particularly with regard to the provision of nationwide spectrum, it must be ensured that potential new market players have rights of access to the spectrum beyond the award period, in the sense of an extended interpretation of key element 13.

Some respondents welcomed the fact that, in the 3.4 – 3.8 GHz band, the intention is to offer both nationwide and regional assignments. In particular, reserving spectrum in the 3.7 – 3.8 GHz band for regional assignments would provide the opportunity for dedicated, self-supporting networks. Providing an extended spectrum would encourage the development of solutions for the radio-based communication of automation systems (robots, etc) and for real-time communication requirements. The (wherever possible) free provision of spectrum could help to maintain competitiveness.

Some respondents were also in favour of the approach of reserving spectrum in the upper range for regional use. It is expected that this would have the least impact on satellite communications and would facilitate regional coordination. For the development of digital infrastructure in Germany, no new protection zones for earth stations must be created or expanded in Germany in future. In the long term, the migration of existing satellite services to other bands would be desirable.

For the event of the band being opened up to terrestrial IMT systems, other respondents called for existing and future FSS ground stations to be protected by internal guard bands where necessary. The award procedure for the 3.7 – 3.8 GHz band should be postponed as far as possible, with a view to gaining initial experience in the 3.4 – 3.6 GHz band. This can then be used to protect earth stations and facilitate migration.

In respect of the protection of radar in the band below 3400 MHz, it was noted that it is important to ensure that the spectrum in the 3400 – 3410 MHz band for MFCN can continue to be used for the provision of telecommunication services nationwide.

Several respondents were, at least in some respects, against the approach set out in key element 6. They essentially called for a different approach to the quantitative distribution of spectrum for regional and nationwide assignments.

Some respondents called for the entire 400 MHz band to be provided for nationwide use. Dividing the spectrum up would discriminate against established mobile network operators, constitute unlawful market entry assistance and lead to artificial spectrum scarcity. Other put forward the view that it would be sufficient if only 40 MHz was made available for regional use.

Moreover, it was noted that the proposed approach of reserving 100 MHz for regional assignment could lead to regional assignment holders being allocated more spectrum than nationwide assignment holders. This would have a distorting effect on competition, which would be compounded by the fact that the regional assignments were awarded as part of an application procedure.

In addition, the definition of "regional assignments" is unclear. If a defined region is too large, regional shortages cannot be ruled out. It was also argued that the division into regions does not meet the usage requirements for industrial applications. It was proposed that the term "local assignments" should be used.

It is also unclear whether regional limitations are to apply per operator or whether an operator can, for example, be assigned spectrum in the 30 biggest cities.

If the intention is to realise the reassignment of the 3.6 GHz band, taking account of existing uses, as swiftly as possible before the expiry dates, it was noted that clarification of the term "reassignment" will be needed.

In the case of scarcity, it was noted that a spectrum reserve of 1 x 50 MHz in the 3.6 GHz band should be provided to ensure coverage for existing customers.

By contrast, it was proposed that the 3.4 – 3.8 GHz band be made available for local and regional assignments. All user groups should be given non-discriminatory access to spectrum, especially PMSE users.

It was stated that an unbureaucratic, automated and transparent procedure is required for the award of regional spectrum. In any case, more spectrum must be provided for regional assignments, as many industrial applications depend on this.

The view was also put forward that radar, satellite communications, radio astronomy and the Geodetic Observatory Wettzell should be protected. In terms of the interests of satellite communications, it was argued that, given the importance of satellite communications for Germany's infrastructure, the protection of earth stations plays an important role in safeguarding the interests and investments of Germany and the satellite industry. Satellite communications are a primary user of this frequency band and should therefore be taken into account to the same extent as mobile communications. Instead of reassignment, a more sensible approach would be to develop measures that facilitate the coexistence of mobile and satellite communications. Because this involves dedicated locations for earth stations, regional solutions would be conceivable.

It was noted that many studies on the compatibility of IMT and radio astronomy (RAS) have shown that careful and extensive coordination of mobile radio is required to protect the measurements of the radio telescope in Effelsberg. The radio measurements of the Geodetic Observatory Wettzell must also be protected to the greatest possible extent from wireless access transmissions.

On key element 7 (Alternate shared use as additional capacity)

Alternate shared use was generally welcomed. However, several respondents noted that more information and clarification is needed with regard to the framework conditions.

One respondent rejected the key element due to a lack of clarity. It was proposed that spectrum for shared use must be released immediately upon commencement of use by the actual assignment holders. On the other hand, it was noted that temporary users require investment and planning certainty.

With regard to the shared use of regionally provided spectrum, it was suggested that spectrum assigned regionally should be divided up among locally active nationwide network operators. Shared use of nationwide assignments should end as soon as just one holder of nationwide assignments uses the spectrum at this location.

There were calls for clear pricing rules on the shared use of the spectrum assigned nationwide. The same conditions for the use of regional spectrum should also apply for nationwide and regional users.

In respect of applications for shared use of nationwide spectrum, it was noted that the expansion planning of the nationwide assignment holder in the relevant region must be taken into account.

On the other hand, it was explained that alternate shared use as additional capacity could be helpful for vehicle network access applications and could support the provision of in-vehicle services, provided spectrum use is not limited to wireless access.

Key element 8 (5G coverage in line with demand)

Some respondents were generally in favour of the targets and considerations in this key element. However, there were calls for the key element and/or the necessary framework conditions to be specified in greater detail.

Uncertainty was expressed in several areas, including the question of demand for 5G, which assignment holders would have to meet the obligation in the event of corresponding demand, which frequencies were to be used, delivery quality, and which frameworks should apply in the event of spectrum leasing. Network operators with or without their own radio network infrastructure were not to be included in the group of interested users.

Since 5G made it possible for multiple applications to share a network and thus infrastructure costs, it would be important to ensure that mobile network operators and users and/or stakeholders could enter into partnerships. In conjunction with key element 13, key element 8 created a "use it or lease it" system that should encourage investment in 5G. In order to achieve the economies of scale needed for the development of terminal equipment, the framework conditions for access to 5G spectrum should be harmonised across Europe.

There were calls from some quarters for nationwide providers to commit to providing a minimum level of local coverage in rural areas. Regional or local providers should be able to use and/or be linked to the infrastructure of nationwide providers on fair and non-discriminatory terms. Access to the networks, along with competition between networks, was urgently needed in order to offer rapid access to 5G in line with demand.

By contrast, it was pointed out that the provision in key element 8 must not result in a de facto coverage obligation. The selection of alternatives must rest with the network operator. Neither may the key element be interpreted as a universal service obligation with no compensation mechanism. Uneconomic regions should be tapped primarily using state funding.

Some respondents proposed waiving coverage obligations on new entrants due to their lack of existing infrastructure.

Key element 9 (Intended use)

The majority of respondents were in favour of the plans to award spectrum in the 3.4 to 3.8 GHz range on a technology- and service-neutral basis. Unresolved technical questions would have to be answered before any award could take place.

One respondent called for industrial and infrastructure applications to be given priority over applications in the public domain. Another respondent suggested using 3.6 GHz for WLAN.

Key element 10 (10 MHz blocks)

The majority of respondents were in favour of splitting the 3.6 GHz band into 10 MHz blocks. The 3.6 GHz band was expected to enable bandwidths of 50 to 100 MHz to be realised.

By contrast, other respondents called for 5 MHz blocks, which would require the incorporation of guard distances to be considered.

Yet another respondent suggested employing block edge masks. One respondent highlighted that it may be necessary to apply geographic restrictions on use for the future assignment holders, depending on the level of protection required for earth stations.

Key element 11 (Contiguous spectrum)

The assignment of frequencies in the 3.6 GHz band as contiguous spectrum was welcomed. 5G would need sufficient bandwidth in this range in order to best utilise the benefits of this frequency band.

The respondents expressly supported a reallocation to enable the realisation of contiguous spectrum. One respondent was of the opinion that this could only relate to the shifting of spectrum, which would leave existing spectrum usage rights untouched. By contrast, another respondent felt that the consideration of existing uses could only relate to the actual active operation of radio network infrastructure, but not, however, to existing assignments in general.

Key element 12 (Time limit)

Some respondents were in favour of assigning spectrum for the longest possible durations in order to increase planning and investment certainty. Some suggested setting the time

limits in accordance with the European Commission's proposal of at least 25 years/the close of 2045 or the close of 2050.

Others were in favour of introducing unlimited rights of use on the basis that this would offer comprehensive planning certainty for investments in network infrastructure. There were calls from some quarters for the assignments to include pre-defined extension options.

Some respondents proposed orienting regional and local frequency assignments to a dynamic process with the maximum level of automation. A highly automated "use it or lose it" principle should apply to assignments in order to prevent spectrum from remaining unused for longer periods.

Key element 13 (Shared use of capacity and services)

Some respondents rejected the shared use of capacities and services by service providers/MVNOs. This was in part because there was no legal basis for interpreting service provider obligations. In addition, a personalised obligation would also apply to spectrum that did not comprise part of the current process. This would have an unlawful retroactive knock-on effect. A reciprocal effect with other key elements would also be possible, which could have a disproportionate and discriminatory negative effect on the holders of nationwide assignments. Regional assignment holders would be released from any service provider obligation and thus receive inappropriate preferential treatment.

Furthermore, an obligation was not felt to be necessary in view of the fact that the wholesale market was functioning well. In particular, contracts were already being concluded that went above and beyond the applicable service provider obligation. In any case, to prevent misunderstandings it was important to note that a potential rule must not consist of an access obligation or obligation to contract.

The shared use of capacities and services by service providers/MVNOs was welcomed by the opposite quarter, who expressly advocated the involvement of MVNOs. Detailed regulation was necessary, since service providers were not assured non-discriminatory access to LTE technology despite the requirement currently in place. In addition, respondents made reference to consideration of the concerns of regional and local businesses, in particular with respect to acceptable minimum sales volumes and adequate interface requirements.

With respect to MVNOs, there was still no competition surrounding MVNO access to the mobile communications sector, even though they had the technical capabilities to design their own innovative services and thus encourage competition at the service level. In addition, an obligation to interconnect with the networks of nationwide network operators would enable MVNOs to contribute to network densification. An MVNO obligation would also allow existing service-only providers to climb onto the ladder of investment.

What is more, some respondents were active both as service providers and fixed-network operators. In view of this, it was important to consider that the penetration of convergent service offerings and hybrid technologies had been on the rise for several years.

Some respondents advocated the shared use of capacities and services, including in view of the interests of new entrants. Other user groups, such as users of PMSE or traffic operations, were also in favour.

Key element 14 (700 MHz centre gap)

One section of respondents welcomed the Bundesnetzagentur's decision to exclude the centre gap in the 700 MHz band from the current requirement notification. This was particularly the case in view of the planned use of the 733 to 736 MHz and 753 to 758 MHz ranges – also in the centre gap – for military broadband applications and BOS (BB-PPDR).

Instead, the spectrum should be included in re-award proceedings for the 800 MHz, 1800 MHz and 2.6 GHz bands. It made sense to wait first to see how the situation developed in other countries in Europe. In addition, there was no reason to make further spectrum available for SDL as long as demand in bands already available was not evidenced by market success.

Other respondents favoured making the centre gap in the 700 MHz band available quickly in the upcoming proceedings as there was specific demand.

In connection with the loss of spectrum under the second digital dividend, PMSE users had been given the prospect of access to the 700 MHz centre gap and the guard bands. As with the 800 MHz band, this gap was suited to use for command links and semi-professional applications. As such, it could ease the burden on the 470 to 694 MHz range, which was important, for example, for metropolitan areas.

Automotive manufacturers also welcomed the provision of sub-1 GHz spectrum for vehicle-to-vehicle communication. The bands currently harmonised at 5.9 GHz for ITS in Europe were insufficient for this type of communication and not universally usable. Lower frequencies, such as the 700 MHz centre gap, could increase the reach for these kinds of services.

The duplex gap was a useful addition with respect to additional downlink capacity. 3GPP had specified band 67 for this purpose. However, an ecosystem of chipsets, terminal equipment and infrastructure could only be expected where there were clear prospects of spectrum assignments.

Key element 15 (Spectrum above 24 GHz)

Some respondents felt that spectrum above 24 GHz was needed in order to realise 5G data throughput and capacity targets. The timely provision of 26 GHz band in the application process was thus welcomed by some respondents, since – alongside 3.6 GHz as 5G pioneer band – it was suitable for providing additional 5G coverage in areas with higher and the highest capacity demands. The 26.5 to 27.5 GHz (military) range in particular was used very little and could be made available together with 3.6 GHz band. Applications currently on 26 GHz should be moved to other (significantly higher) frequency bands.

The option of combining the 26 GHz band and the 3.6 GHz band was needed in order to retain spectrum suitable for 5G. The 26 GHz band would allow 5G services to be offered from 2018/2019. This spectrum was particularly suited to use in the access network and to link to base stations due to the dense frequency repeatability. There were also calls for spectrum to be made available on a technology-neutral basis.

In the view of some respondents, the spectrum should be provided for local/regional use in order to be able to implement high terminal equipment density, intrinsic security, extended data security mechanisms and, potentially, high localisation accuracy in a factory environment. Assignments should be awarded transparently and as part of a dynamic process. One respondent suggested that it should also be possible to apply for large bandwidths of up to 1 GHz at least in large contiguous geographical areas.

Some respondents proposed that spectrum at 26 GHz also be used to cover outdoor areas (such as streets, recreation grounds, company sites). Reference was made in this context to the “Characteristics of terrestrial IMT systems for frequency sharing/interference analyses in the frequency range between 24.25 GHz and 86 GHz” report to be published by ITU-R Task Group 5/1.

The opposite quarter proposed retaining the development potential of fixed point-to-point links instead of point-to-multipoint links and extending corresponding spectrum assignments as and when needed. One respondent welcomed the planned protection of existing applications in the military range (26.5 to 27.5 GHz).

By contrast, one respondent felt that making spectrum available in the application process at this early stage was counter-productive not only because specific application scenarios were still in the definition phase, but also because there were concerns that assignments to contiguous geographical areas for use for fixed-network substitution could not be guaranteed.

Yet another respondent called for nationwide assignment holders to undertake a general commitment to giving regional and local companies the use of their infrastructure on fair and non-discriminatory terms or to suitably incorporate/connect regional and local networks in/to their nationwide network infrastructure.

From the satellite communications quarter, reference was made to ongoing studies by CEPT on the protection of existing users and investigations by working group 1 of the Bundesnetzagentur. The proposal to protect satellite communication applications was welcomed; however, there was uncertainty regarding how to safeguard the protection of existing and future earth station sites for earth observation and the space research service, as well as the passive earth observation communication service and radio astronomy. One respondent stated that, under the Radio Regulations, the 25.5 to 27 GHz range was the only assigned band that allowed large data volumes for earth observation purposes to be transmitted from space to Earth in the brief window of contact between satellites and earth stations.

Some respondents advocated making the 28 GHz band available in addition. However, one respondent made reference in this context to the existing fixed-link assignments. Other respondents rejected making the 28 GHz band available, pointing out that this frequency band was of greater importance for mobile satellite communication applications and links to end users and thus the number of mobile and stationary terminals would increase as a result. One respondent called on the Bundesnetzagentur to allow the use of ESIMs on aircraft in the 27.8285 to 28.4445 GHz and 28.9485 to 29.4525 GHz ranges in line with the power flux density thresholds set forth in ECC Decision (13)01, Annex 2(6). Several respondents were also in favour of making the 32 GHz band available, with some referring to the Bundesnetzagentur's consensus with all users in the Bundesnetzagentur's working group 1.

Re "protection of satellite operators and the military"

A portion of respondents expressed concern that there were no plans to incorporate a guard band between the use of 2 GHz for wireless access and the neighbouring MSS (Mobile Satellite Services). They felt that the current 300 kHz guard bandwidth should not be reduced until technical feasibility was proven in CEPT studies.

Several respondents expected that the plans for the 3.6 GHz band would potentially expose radio astronomy to substantial disruptions. There were concerns regarding the allocation of frequency blocks to terrestrial mobile communications networks without the incorporation of any guard bands to neighbouring services.

Other respondents anticipated that the Bundesnetzagentur would take steps to safeguard the co-existence of all wireless services in the frequency bands identified for 5G.

One respondent noted that demand for the 3.4 to 3.8 GHz range would increase in future driven by satellite communications. Satellite communications was a major user and should thus be given equal consideration with mobile communications. It was important to safeguard protection for the operators of earth station sites in the 3.6 to 3.8 GHz band due to the level of investment and sustained global demand for C-band satellite communications services.

One respondent explained how, on the basis of a compatibility study for the Effelsberg site, he had come to the conclusion that an adjacent band emission of maximum -50 dBm/MHz would require a guard distance between the base station and

telescope of a few kilometres. An out-of-band emission of -30 dBm/MHz would result in a guard distance of several dozen kilometres.

Another respondent made reference to the same study, saying that the studies conducted for Effelsberg had come up with comparatively short guard distances that could not be applied to the situation in Wettzell on a like-for-like basis. The repercussions for Wettzell would be significantly worse than for Effelsberg. One respondent called for the development and implementation of suitable protection measures for the Geodetic Observatory Wettzell.

Two respondents called for the award proceedings for 3.7 to 3.8 GHz band to be postponed and for spectrum to be released on a gradual basis.

One respondent called for formal confirmation that the 3.8 to 4.2 GHz frequency block would not be subjected to measures in the future.

The confinement of the consultation to the band at 28.9485 to 29.4525 GHz and the reservation of the remaining elements in the 27.5 to 30 GHz band for satellite services was welcomed.

Some respondents noted that the 28 GHz band should not be approved for IMT services as it was not one of the bands up for review as per WRC19 agenda item 1.13. Initial studies had shown that guard distances of up to several dozen kilometres would already be necessary just for adjacent band emissions. Spectrum should not be awarded until the findings of the studies still pending at CEPT and ITU were available.

There were calls for CEPT to develop harmonised instruments and establish regulatory certainty in order to make it easier for administrative bodies to safeguard a coordinated 5G rollout and to help protect existing (and future) fixed satellite earth stations in the 26 GHz band.

Frequencies at 450 MHz:

Due to the continued market for M2M services, there were calls for the frequencies at 450 MHz to remain dedicated to "mobile/fixed communications networks (MFCN)". These frequencies should be made available as part of objective, transparent and non-discriminatory joint proceedings – in the proceedings under discussion preferably together with 2100 MHz and 3600 MHz, or alternatively in a later set of proceedings.

Expansion in the 1.5 GHz band:

One respondent was in favour of making the extension bands at 1.5 GHz available promptly for wireless access.

Detailed reasoning

Re I. Order for award proceedings

- 10 In accordance with section 55(10), section 61, section 55(4) and (5) and section 2(2) and (3) TKG, the order for award proceedings is made in such a way that the nationwide assignment of spectrum for wireless access in the 2 GHz and 3.6 GHz bands must be preceded by award proceedings.
- 11 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 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. The order as per section 55(10) TKG is made at the discretion of the Bundesnetzagentur.
- 12 The amount of spectrum available for nationwide assignment for wireless access in the 2 GHz and 3.6 GHz bands is insufficient.

Timing of the order

- 13 The Chamber believes it expedient to order award proceedings for spectrum in the 1920 - 1980 MHz (lower band), 2110 - 2170 MHz (upper band) and 3400 - 3700 MHz bands at an early stage.
- 14 The award proceedings will include all the spectrum which the Chamber considers will be available for wireless in the 2 GHz and 3.6 GHz bands in the foreseeable future, to enable the parties requesting assignment to acquire adequately competitive spectrum packages. This includes the spectrum anticipated to be available for later assignment for wireless access 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 a future transfer of frequency usage rights. 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.
- 15 In its key elements paper dated June 2017 (see key elements 1 and 6), the Bundesnetzagentur had announced that the award proceedings for the nationwide provision of spectrum in the 2 GHz and 3.6 GHz bands should, if possible, be concluded in 2018 and thus prior to the expiry of assignments in 2020/2021 in order to safeguard the necessary planning and investment certainty for the companies and other parties involved.
- 16 To ensure spectrum is made available at an early stage, the award proceedings are to be ordered at the present time so as to give both existing network operators and new entrants equal opportunity to access the nationwide spectrum and to ensure that the proceedings for awarding this spectrum are concluded at a reasonable point in time.
- 17 Spectrum totalling around 2 x 40 MHz (paired) is available in the 2 GHz band for assignment from 1 January 2021. The remaining spectrum in the 2 GHz band totalling some 2 x 20 MHz (paired) will be available for assignment from 1 January 2026. The Bundesnetzagentur is making all 2 GHz spectrum with a total of 2 x 60 MHz (paired) available jointly in these proceedings.
- 18 Additionally, further spectrum totalling 300 MHz (unpaired) in the 3400 to 3700 MHz band will be available for nationwide assignment (for further details see margin no. 58 et seq.). Of this, subject to regional restrictions, 174 MHz are already available for re-assignment. Further spectrum totalling 126 MHz is still currently assigned de facto nationwide and will thus become available in principle for re-assignment from 1 January 2022. To uphold the principle of efficient spectrum use and meet the further regulatory objectives in section 2 TKG, the Bundesnetzagentur plans to make spectrum available for new assignment holders potentially as early as 2019.
- 19 The 3.6 GHz spectrum will be made available nationwide in combination with the spectrum in the 2 GHz band for wireless access. The order to award this spectrum in combination is to be given at the present time.
- 20 The decision to award this spectrum jointly is based on the following considerations:
- 21 Part of the 2 GHz spectrum expires on 31 December 2020. A decision is required now on the future use of this spectrum from 2021 to ensure – before expiry – that it can continue to be used efficiently and without disruption. In the Chamber's view, the associated questions are especially complex and the necessary decision is particularly important as it will have significant consequences for the market. To ensure this decision is reached on a suitably solid and stable basis, the Chamber is making the decision at an early stage. According to current estimates, this means that the proceedings should be concluded

prior to the expiry of current assignment periods, which will provide the necessary planning and investment certainty for the companies and other parties involved.

- 22 In making the 2 GHz spectrum available, the Chamber aims to establish early planning certainty for all spectrum use in the 2 GHz band. For this reason, the spectrum totalling 2 x 40 MHz (paired), which expires on 31 December 2020, and the 2 x 20 MHz (paired), for which the usage rights expire on 31 December 2025, will be made available jointly in one set of award proceedings. This offers forward-looking support for effective investments in LTE and next-generation 5G systems in the 2 GHz band, thus providing early planning and investment certainty amongst all network operators for upgrading the current UMTS technology on the spectrum to LTE or innovative 5G systems.
- 23 Making all 2 GHz frequencies available at an early stage in one set of award proceedings is in compliance with the regulatory objectives of the German Telecommunications Act (TKG). This approach serves the regulatory objective of the expedited rollout of high-speed next-generation public telecommunications networks set out in section 2(2) para 5 TKG, upholds the principle of efficient frequency use in accordance with section 2(2) para 7 TKG and protects user and consumer interests in the field of telecommunications pursuant to section 2(2) para 1 TKG. The goal is to reallocate spectrum in a way that gives all assignment holders the option to hold contiguous spectrum.
- 24 The early combined provision of the 2 GHz spectrum allows all 2 GHz spectrum to be awarded in 5 MHz blocks. Even if only the 2 x 40 MHz for which the usage rights expire at the end of 2021 were to be made available, the usage rights limited to 2025 would have to be modified in such a way as to allow efficiency gains to be made using LTE/5G technology. By making the spectrum available in combination, the entire band will be kept up to date with advancements in the technology, giving companies planning and investment certainty over a longer period. The combination of several 5 MHz blocks into one package of contiguous frequency blocks leads to efficiency gains in the use of spectrum.
- 25 The fact that assignment holders are required to predict their frequency requirements from 2026 at this stage is no reason not to make the spectrum available jointly at an early stage. Combined availability can give companies the greatest possible planning and investment certainty, in particular with respect to the rollout of new technologies like 5G. In addition, applicants are required to demonstrate and safeguard efficient frequency use over the entire assignment duration. It is irrelevant whether the point in time at which use begins differs due to varying assignment durations.
- 26 Combined availability is also non-discriminatory, since it does not unfairly disadvantage potential applicants. The fact that a demand forecast for spectrum from 2026 may be required affects all applicants participating in the auction for the spectrum blocks under consideration. Existing assignment holders will not be at a disadvantage as the assignments expiring at the end of 2025 are not affected.
- 27 The provision of 2 GHz spectrum is in line with the principle of equality set forth in Article 3 of the German Basic Law (GG). The principle of equality prohibits the arbitrary unequal treatment of what is basically equal and the arbitrary equal treatment of what is basically unequal. The case in hand relates to spectrum frequencies dedicated to the same scope of use. They are located in the same band and are equal with respect to the technical and physical frequency propagation conditions. In light of this, they are given equal treatment in that they are being made available in one set of award proceedings. The frequencies differ in terms of their expiry dates. This fact is taken into consideration in the award proceedings, meaning that the differentiating characteristic of unequal expiry dates/later usage commencement dates is treated differently, ie unequally, in the context of the award proceedings. The differences relating to the varying expiry dates will need to be taken into account in the award and auction rules.

- 28 The early combined availability of all 2 GHz spectrum serves the above-mentioned objectives of the Federal Ministry of Transport and Digital Infrastructure's 5G Strategy and the European Commission's 5G Action Plan (5G for Europe: An Action Plan dated 14 September 2016, ref. COM(2016) 588 final).
- 29 In addition, together with all of the 2 GHz spectrum, the 3400 to 3700 MHz spectrum will also be awarded nationwide at the present time for wireless access.
- 30 Some usage rights in this band run until 31 December 2021 or 31 December 2022; however, the Bundesnetzagentur plans to make this spectrum available to new assignment holders, potentially as early as 2019, in order to uphold the principle of efficient spectrum use and meet the further regulatory objectives in section 2 TKG. This includes all spectrum that is not being used efficiently by the current assignment holders and for which no successive assignments up to 2040 have been issued. This approach aims to ensure that all spectrum in the 3.6 GHz band can be used for 5G applications without delay after the auction.
- 31 The inclusion of the 3.6 GHz spectrum serves in particular the regulatory objective of the expedited rollout of high-speed telecommunications networks set out in section 2(2) para 5 TKG. The 3.6 GHz band plays a major role in the rollout of 5G, as it is possible to use large contiguous frequency blocks.
- 32 The early availability of this band on new, more flexible terms is to enable the rollout of 5G. This will promote the efficient use of the spectrum and be in the interests of users and consumers. The band offers large bandwidths and its propagation characteristics make it particularly suitable for capacity coverage. Particular importance is attached to the possibility of using the 3.6 GHz band for 5G at an early stage. The Chamber expects terminal equipment to be available even before 2020. The Bundesnetzagentur therefore plans to make this spectrum available to new assignment holders, potentially as early as 2019, in order to uphold the principle of efficient spectrum use and meet the further regulatory objectives in section 2 TKG. This includes all spectrum that is not being used efficiently by the current assignment holders and for which no successive assignments up to 2040 have been issued. This approach aims to ensure that all spectrum in the 3.6 GHz band can be made available for use for 5G applications without delay.
- 33 Making all spectrum available jointly at an early stage is in line with the Federal Ministry of Transport and Digital Infrastructure's 5G Strategy and the European Commission's 5G Action Plan. The 5G Action Plan (loc. cit., pages 5 et seq.) states:
- "The deployment of 5G networks requires the timely availability of a sufficient amount of harmonised spectrum. [...]*
- Member States and the Commission, working together in the Radio Spectrum Policy Group (RSPG), have recognised the importance of the early identification of common EU-wide pioneer spectrum bands to enable 5G take-up as early as in 2018. This is indispensable to give proper guidance to industry and keep the EU on a par with spectrum availability in other regions of the world.*
- This first set of such pioneer bands should include a mix of spectrum with different characteristics to address the versatile 5G requirements. [...]"*
- 34 The early combined availability of all 2 GHz spectrum together with the 3.6 GHz spectrum will take account of these aims. Companies will have the opportunity to acquire spectrum with the characteristics that best suit their business models, in particular in view of the progress of 5G.
- 35 Overall, the inclusion of all 2 GHz and 3.6 GHz spectrum supports the efforts of the regulators to prevent regulatory-induced spectrum shortages. Order 33/2005 dated 4 May 2005 (OG RegTP 8/2005, page 782 et seq.) said the following about this approach:

"(...) the regulatory authority is trying to prevent as far as it possibly can regulatory-induced shortages of frequencies as a result of partial awards.

The regulatory authority established the following key points as a basis for the concept of a frequency award for UMTS mobile communications to be developed. The subject of the key points is the provision – in line with requirements and shared at the earliest possible moment – of frequencies for UMTS/IMT-2000 mobile communications from the frequency bands of the so-called core band and the UMTS extension band".

- 36 The GSM concept also followed these considerations. The GSM concept stated the following (order 88/2005, OG BNetzA 23/2005, page 1852 et seq.):

"In addition to questions to do with the technical aspects of frequency regulation, the competitive aspects must also be taken into account as particular importance can be attached to them when awarding frequencies. Among other things, the amount of spectrum made available or to be made available can influence the question of shortage of frequencies (section 55(9), section 61 TKG), and hence the type of award procedure, and, last but not least, the costs of acquiring the resource called "frequency". On the other hand, radio applications (like GSM and UMTS/IMT-2000 mobile communications for instance) can only be successful in competitive terms if they have enough spectrum and optimum technical framework conditions available. Consequently, those sub-concepts currently being discussed, like those for GSM and UMTS, as well as the future overall concept "Radio based access facilities" are to be developed with the aim of avoiding frequency shortage as much as possible and of facilitating fast, transparent and unbureaucratic procedures on frequency award.

It is planned to carry forward the GSM concept after implementation of the described raft of actions with a view to linking up later with other concepts, like the UMTS concept, in order to achieve in the final analysis a comprehensive confluence of radio markets and their regulatory framework conditions".

- 37 The combined award of all 2 GHz spectrum and 3.6 GHz spectrum is thus in line with the existing award principles practised by the President's Chamber, which are to include the maximum amount of spectrum available in one set of award proceedings.
- 38 In particular, making the spectrum available in combination can prevent the occurrence of an artificial spectrum shortage that could arise if spectrum were to be awarded in isolation. As such, conceptual considerations must be taken into account when awarding spectrum so as to award the maximum available spectrum in one set of proceedings.
- 39 In addition to questions to do with the technical aspects of frequency regulation, when developing its concepts the Bundesnetzagentur thus also takes competitive aspects into account that could be of particular importance when awarding spectrum. Among other things, the amount of spectrum made available can influence the question of spectrum shortages and thus the type of award and, not least, the cost of assigning spectrum. On the other hand, business models using radio applications can then only be successful in competitive terms if they have enough spectrum and optimum technical framework conditions available. Consequently, overall concepts must be developed with the goal of preventing regulatory-induced spectrum shortages where possible and ensuring fast, transparent and unbureaucratic procedures.
- 40 In including additional spectrum, the Chamber has also taken into consideration the fact that a combined award of all 2 GHz spectrum with the 3.6 GHz spectrum may lessen the bidding war somewhat and make access to spectrum easier as it allows bidders to opt for other frequencies during the proceedings. This makes it easier for new entrants in particular to access scarce frequency resources.

- 41 The combined availability of all 2 GHz spectrum and the 3.6 GHz spectrum at an early stage thus reflects the principle of simple, appropriate and prompt administrative procedures, as this approach avoids the need for multiple, lengthy award proceedings, each of which involve numerous individual stages from the opening of proceedings to the award of individual frequency bands.

Availability

- 42 Spectrum is available when it is not encumbered by other usage rights and where the further assignment criteria are met pursuant to section 55(5) TKG.
- 43 The Bundesnetzagentur is making a total of 2 x 60 MHz (paired) in the 2 GHz band available for nationwide assignment. Of this, 2 x 40 MHz (paired) is available for re-assignment from 1 January 2021. The remaining spectrum totalling 2 x 20 MHz (paired) is still assigned until 31 December 2025 and will thus only be available for re-assignment at a later date.
- 44 The 2 GHz spectrum is to be assigned as contiguous spectrum following the auction. If necessary, the usage rights/uses assigned up to 2025 may need to be shifted. This would be in order to achieve defragmentation in the frequency band and promote efficient frequency use.
- 45 The Bundesnetzagentur expressly notes that any shifting of frequency uses will not affect the assignments that are currently valid until 2025. Such steps will thus not result in the earlier-than-expected availability of these assignments.
- 46 In the 3.6 GHz band, the Bundesnetzagentur is making a total of 300 MHz (paired) available for nationwide assignment. Of this, subject to regional restrictions, 174 MHz are already available for re-assignment. Further spectrum totalling 126 MHz is still currently assigned de facto nationwide and will thus become available in principle for re-assignment from 1 January 2022.
- 47 The Bundesnetzagentur plans to make the 3.6 GHz spectrum available for use for 5G systems and/or for re-assignment at an earlier date – from 2019 – in order to uphold the principle of efficient spectrum use and meet the further regulatory objectives in section 2 TKG. The goal is to ensure that contiguous spectrum can be used as early as possible and/or spectrum re-assigned prior to expiry. To this end, the Bundesnetzagentur will open the necessary administrative procedures without delay following the auction and consult with the companies affected on suitable and appropriate steps.
- 48 On the one hand, the measures will affect regional assignments. Existing regional uses in the 3400 to 3700 MHz band are to be shifted to the 3700 to 3800 MHz band where necessary and appropriate in individual cases for specific 5G applications.
- 49 On the other, existing uses of quasi-nationwide assignments are to be shifted to the new band locations before the end of the current assignment periods and adapted to the future spectrum packages produced by the auction. This should enable current assignment holders to use spectrum for 5G nationwide without delay after the auction in the same way as the new assignments until 2040 will allow. At the same time, where no successive assignments have been issued to existing assignment holders up to 2040, the spectrum concerned will be made available early for re-assignment.
- 50 The approach of the Bundesnetzagentur as described above is in line with the objectives of the federal government and the European Union.
- 51 Details of availability:

2 GHz

52 The 2 GHz spectrum is currently assigned as follows:

Paired 2 GHz spectrum	Expires on
1920.3 - 1930.2 MHz / 2110.3 - 2120.2 MHz (2 x 9.9 MHz)	31.12.2020
1930.2 - 1940.1 MHz / 2120.2 - 2130.1 MHz (2 x 9.9 MHz)	31.12.2025
1940.1 - 1950.0 MHz / 2130.1 - 2140.0 MHz (2 x 9.9 MHz)	31.12.2020
1950.0 - 1959.9 MHz / 2140.0 - 2149.9 MHz (2 x 9.9 MHz)	31.12.2025
1959.9 - 1979.7 MHz / 2149.9 - 2169.7 MHz (2 x 19.8 MHz)	31.12.2020

Table 1: Current assignments and expiry dates in the 2 GHz band

- 53 All the 2 GHz spectrum in the band at 1920.0 - 1980.0 MHz / 2110.0 - 2170.0 MHz will be provided in combination; a total of 2 x 60 MHz (paired) will be provided.
- 54 The 2 GHz spectrum comprising 2 x 20 MHz (paired) will be available for new assignments as from 1 January 2026, section 55(5) para 2 TKG. This spectrum will be awarded for the period after 2025 and thus will be available from this point in time. The spectrum is assigned for use by third parties until 31 December 2025.
- 55 Adjacent applications – as for instance satellite services in the upper adjacent MSS band – are to be protected without guard bands being stipulated. This will enable all the spectrum in the band at 1920.0 - 1980.0 MHz / 2110.0 - 2170.0 MHz to be provided. By providing all the spectrum in the band it will be possible to assign complete blocks of 5 MHz.
- 56 Protection at the lower end of the band at 1920 MHz towards adjacent applications will become irrelevant since the spectrum below 1920 MHz is not currently being used and is intended to be designated for another purpose.
- 57 A guard band to protect the adjacent 2 GHz MSS bands at 1980.0 - 1995.0 MHz and 2170.0 - 2185.0 MHz will not be necessary. In the 2 GHz MSS bands, an OFDM-based transmission system is used. Current plans in connection with 5G are to implement a transmission standard for MFCN that will also be based on OFDM.

3.6 GHz

58 In the 3.6 GHz band, spectrum will in principle be available for MFCN in the whole of the band at 3400 - 3800 MHz.

Protection of military radar and radio astronomy

- 59 Adjacent applications are to be protected without guard bands being stipulated. A guard band at 3400 - 3410 MHz will not be necessary since local solutions can be found individually to achieve compatibility with adjacent military radar systems.
- 60 At the lower band edge at 3400 MHz, however, local restrictions may be necessary to protect adjacent military radar and radio astronomy applications. Possible restrictions are to be considered on a case-by-case basis. A general guard band will therefore not be necessary.
- 61 The federal armed forces operate fixed radar systems in the band below 3400 MHz at a single-digit number of locations. It is intended to inform future holders of assignments for the frequency blocks concerned about the geographical location and protection criteria (coordination radii) so as to enable efficient and interference-free use of the frequencies. The military applications are fixed radar systems located in rural areas.
- 62 Protection for radio astronomy concerns the Effelsberg site.

Division of the 3.6 GHz band

- 63 From the whole band at 3400 - 3800 MHz, the Chamber will provide the spectrum from 3400 MHz to 3700 MHz for nationwide assignments. It will thus be possible to provide adequate spectrum for nationwide operators to realise their business models. It will nevertheless also be possible to provide adequate spectrum in the band at 3700 MHz - 3800 MHz for small and medium-sized enterprises to realise local and regional business models.
- 64 In contrast to nationwide assignments, an application procedure for regional assignments will allow best account to be taken also of spectrum requirements emerging in the future. A large number of business models are expected to emerge as the digital revolution and 5G developments advance. The application procedure for regional and local assignments must therefore ensure that the spectrum is used efficiently and emerging spectrum requirements can be met.
- 65 Division into 300 MHz for nationwide assignments and 100 MHz for regional and local assignments is consistent with the regulatory aims set out in the TKG. The intended division serves to expedite the rollout of high-speed next-generation public telecommunications networks, section 2(2) para 5 TKG, and secure the efficient use of frequencies, section 2(2) para 7 TKG.
- 66 The provision of 300 MHz for nationwide assignments will advance regulation of the introduction of high-speed 5G systems and the rollout of high-speed telecommunications networks. It will also ensure that the same frequencies are available throughout the country to the assignment holders, enabling them to roll out 5G networks in line with demand. Provision of the same frequency nationwide will also promote the efficient use of spectrum by avoiding, for instance, the need for coordination with other users. Network planning will also be facilitated.
- 67 Provision of the sub-band 3400 - 3700 MHz for nationwide assignments will deliver planning and investment certainty for nationwide 5G rollout. Large bandwidths for 5G are available in the 3.6 GHz band in particular. This advantage can be exploited to the greatest possible extent if large contiguous bandwidths are available for nationwide use and compliance with separation distances is not required.
- 68 The intended provision of the lower band from 3400 MHz for nationwide assignments is appropriate and promotes the efficient and interference-free use of frequencies. The lower end of the band at 3400 MHz band will, in all probability, be subject to special conditions of use in order to protect radar in the band below 3400 MHz. Potential restrictions cannot be clarified until international harmonisation decisions (in particular regarding out-of-band emission limits) are firmly in place. Efficient use of frequencies is easier if only one (nationwide) assignment holder rather than many regional users has to observe the special conditions of use and coordinates use with the radar systems deployed. Protection for radio astronomy below 3400 MHz must also be ensured.
- 69 The Chamber has also taken account of the fact that the 3400 - 3600 MHz band is the least restrictive for nationwide business models as regards compatibility with other radio services, most notably satellite communications. This ensures, to the greatest possible extent, that the potential of the 3.6 GHz band for 5G can be fully exploited through enabling 5G to be rolled out rapidly, flexibly and in line with demand. Holders of the nationwide assignments will therefore be in a position to meet the demand for 5G applications swiftly, flexibly and in accordance with market demand.
- 70 Provision of the upper sub-band 3700 - 3800 MHz for regional assignments will allow companies to obtain large contiguous spectrum blocks, so that they, too, can fully exploit the advantages of this frequency band for 5G. The provision of 100 MHz for regional assignments will enable, first, the rollout of regional and local 5G networks with channel bandwidths of up to 100 MHz. This will enable regional or local business models on the basis of large channel bandwidths or several business models on the basis of smaller channel bandwidths. The provision of less than 100 MHz would therefore restrict local and

regional providers' business models. The fact that regional assignments of up to 80 MHz already exist was also taken into consideration. In this context, the fact must be taken into consideration that existing regional assignments in the 3.6 GHz band at 3700 - 3800 MHz will be shifted.

- 71 In particular, the fact that demand exists in some business models for frequencies for operators' own autonomous telecommunications networks can then be accommodated too. The provision of spectrum for local and regional applications will also promote the development of solutions for radio-based communications in automation systems and real-time communications.
- 72 In addition, it will be possible to obtain regional assignments at a later date flexibly and in line with demand. Regional business models that have yet to emerge, for instance those of start-ups, will then be able to be implemented at this later time. The Bundesnetzagentur will draw up an application procedure for the regional assignments. The aim is to provide a swift, flexible and transparent assignment procedure.
- 73 In view of this, it would not be justified to provide the whole of the 3.6 GHz band for nationwide assignments. The 300 MHz of spectrum will be provided for nationwide assignments in an open, transparent and non-discriminatory procedure. The provision of 100 MHz for regional assignments does not represent an inadmissible measure to aid market entry that would create an artificial scarcity of spectrum. The intention is to provide spectrum for both nationwide use and regional use and thus ensure that all interested parties obtain access to the spectrum. The intended division of the spectrum therefore serves to secure fair competition and promote sustainable competitive markets. While the nationwide network operators stated their demand for spectrum in the 3.6 GHz band, industry, associations and small and medium-sized enterprises also declared a demand for spectrum for regional and local uses.
- 74 The aim of dividing the spectrum into frequencies for nationwide (300 MHz) and regional (100 MHz) assignments is to reconcile the different interests by enabling a variety of business models to be realised. In dividing up the spectrum, the Chamber is taking account of the interests of small and medium-sized enterprises, section 61(4) first sentence TKG, and the variety of conditions relating to competition and consumers that exist in the various geographic areas within the Federal Republic of Germany, section 2(3) para 5 TKG. Preference for regional applicants is not apparent here. 100 MHz of spectrum will be provided for regional assignments. Applicants must give an account of their spectrum requirements in a frequency usage concept. This will prevent spectrum hoarding.

Current assignments in the 3400 - 3700 MHz band

De facto nationwide assignments

- 75 In the 3400 - 3600 MHz band, consideration is to be given to temporary assignments in the following areas and frequency blocks:

Region	Federal state	Frequency band	
All regions	De facto nationwide	3410 - 3452 MHz / 3510 - 3552 MHz	1st and 2nd BWA packages
All regions	All regions except for Rhineland- Palatinate and Saarland	3452 - 3473 MHz / 3552 - 3573 MHz	3rd BWA package

Ahrweiler	Rhineland-Palatinate	3452 - 3473 MHz / 3552 - 3573 MHz	
Altenkirchen (Westerwald)			
Berncastel-Wittlich			
Bitburg-Prüm			
Cochem-Zell			
Daun			
Frankenthal (Pfalz) (urban)			
Germersheim			
Koblenz (urban)			
Ludwigshafen am Rhein (urban)			
Mainz (urban)			
Mainz-Bingen			
Mayen-Koblenz			
Neuwied			
Rhein-Hunsrück-Kreis			
Rhein-Lahn-Kreis			
Rhein-Pfalz-Kreis			
Speyer (urban)			
Trier (urban)			
Trier-Saarburg			
Westerwaldkreis	Rhineland-Palatinate	3473 - 3494 MHz / 3573 - 3594 MHz	4th BWA package
Alzey-Worms			
Bad Dürkheim			
Bad Kreuznach			
Birkenfeld			
Donnersbergkreis			
Kaiserslautern (rural)			
Kaiserslautern (urban)			
Kusel			
Landau in der Pfalz (urban)			
Neustadt/Weinstraße (urban)			
Pirmasens (urban)			
Südliche Weinstraße			
Südwestpfalz			
Worms (urban)			
Zweibrücken (urban)	Saarland	3473 - 3494 MHz / 3573 - 3594 MHz	Former WLL frequency assignments
All regions	Baden-Württemberg	3470 - 3480 MHz / 3570 - 3580 MHz	
Baden-Baden (urban)			
Heidelberg (urban)			
Mannheim (urban)			
Rastatt			
Rhein-Neckar-Kreis	Bavaria	3470 - 3480 MHz / 3570 - 3580 MHz	
Munich (rural)			
Munich (urban)	Mecklenburg-Western Pomerania	3470 - 3480 MHz / 3570 - 3580 MHz	
Demmin			
Greifswald (urban)			
Western Pomerania (north)			
Western Pomerania (east)			
Rostock (urban)	Saarland	3450 - 3480 MHz /	
Schwerin			
Saarbrücken conurbation			

("Greater Saarbrücken")		3550 - 3580 MHz	
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Table 2: Assignments for wireless access in the 3400 - 3600 MHz band

- 76 The spectrum was auctioned for broadband wireless access (BWA) in 2006 and assigned de facto on a nationwide basis. At present, two assignment holders each hold 42 MHz of spectrum from what is known as the first BWA package for use in all of the original 28 BWA regions and thus nationwide. One assignment holder holds 2 x 21 MHz (paired) of spectrum from the third BWA package for use in 27 of the original 28 BWA regions and 2 x 21 MHz (paired) of spectrum from the fourth BWA package in one further region. This assignment holder also holds regional WLL assignments conferred for flexible use for a limited period.

Local and regional assignments

- 77 In addition, spectrum was assigned in an application procedure for regional and local use. The spectrum is assigned for MFCN in blocks of 5 MHz in accordance with Annex 1 to ECC Decision (11)06. There are currently around 80 regional and local assignments, in particular for rural areas (see Table 3 for details). As a rule, the assignment holders are small and medium-sized enterprises that use the frequencies for residential customers, coverage for business parks, and offshore wind farms, for instance. To ensure compatibility with adjacent radio applications, suitable separation distances have been specified on a case-by-case basis.

Federal state	Assignment area	Frequency band (MHz)	Time limit
Baden-Württemberg	Leonberg	3600-3660	31.12.2022
Baden-Württemberg	Villingen-Schwenningen	3600-3680	31.12.2022
Bavaria	Alzenau	3480-3500 3580-3600	17.07.2022
Bavaria	A9 motorway Munich – Nuremberg	3580-3600	31.12.2022
Bavaria	Herrngiersdorf	3480-3500 3580-3600 3620-3640	28.03.2022
Bavaria	Immenstadt im Allgäu	3600-3640	31.12.2022
Bavaria	Kirchanschöring	3590-3600	31.12.2022
Bavaria	Munich	3580-3600	31.12.2022
Bavaria	Oberallgäu Süd	3600-3620 3640-3660 3680-3700	16.04.2022
Bavaria	Regensburg	3490-3500 3590-3600	14.03.2021
Bavaria	Waltenhofen	3480-3500 3580-3600	31.08.2021
Brandenburg	Groß Pankow	3480-3494	15.07.2022
Brandenburg	Neuzelle	3480-3500 3580-3600	23.12.2021
Brandenburg	Scharmützelsee	3480-3500 3580-3600	14.11.2020
Brandenburg	Schönewalde	3480-3500 3580-3600	19.06.2022

Brandenburg	Seelow	3490-3500 3590-3600	10.01.2021
Brandenburg	Treuenbrietzen	3473-3494	12.07.2022
Brandenburg	Wandlitz	3480-3500 3580-3600	30.11.2020
Brandenburg	Wölsickendorf	3490-3500 3580-3600	25.10.2021
Brandenburg	Wriezen	3480-3490	25.10.2021
Hamburg, Schleswig-Holstein, Lower Saxony	Elbe from Hamburg to estuary	3600-3620	31.12.2022
Hesse	Marburg-Biedenkopf	3600-3640	31.12.2022
Mecklenburg-Western Pomerania	Boizenburg/Elbe	3600-3620	18.12.2021
Mecklenburg-Western Pomerania	Friedland	3480-3500 3580-3600	12.04.2021
Mecklenburg-Western Pomerania	Goldberg	3480-3500 3580-3600	31.07.2021
Mecklenburg-Western Pomerania	Kentzlin	3480-3500 3580-3600	06.12.2021
Mecklenburg-Western Pomerania	Lübz	3590-3600	30.06.2021
Mecklenburg-Western Pomerania	Ludorf	3480-3500 3580-3600	07.04.2021
Mecklenburg-Western Pomerania	Marlow	3480-3500 3580-3600	12.04.2021
Mecklenburg-Western Pomerania	Tessenow	3480-3500 3580-3600	02.12.2021
Mecklenburg-Western Pomerania	Trinwillershagen	3480-3500 3580-3600	07.04.2021
Lower Saxony	Filsum	3600-3620	16.06.2022
Lower Saxony	Friedeburg	3490-3500	31.10.2020
Lower Saxony	Friesoythe	3600-3620	16.06.2022
Lower Saxony	Jübberde	3480-3500 3580-3600	28.03.2022
Lower Saxony	Löningen	3480-3500 3580-3600	21.06.2022
Lower Saxony	Meppen	3600-3660	01.10.2022
Lower Saxony	Norden	3480-3500 3580-3600	28.03.2022
Lower Saxony	Schirum	3480-3500 3580-3600	16.04.2022
Lower Saxony	Stuhr	3600-3620	25.10.2021
Lower Saxony	Tülau	3490-3500 3590-3600	08.03.2022
Lower Saxony	Westoverledingen-Weener	3480-3500 3580-3600	13.09.2021
Lower Saxony	Wittingen	3480-3500 3580-3600	31.05.2012

Lower Saxony	Wittmund	3480-3500 3580-3600	13.09.2021
North Rhine-Westphalia	Aachen	3580-3600	31.12.2022
North Rhine-Westphalia	Ammeloe	3480-3490	31.12.2022
North Rhine-Westphalia	Goch	3490-3500	18.05.2021
North Rhine-Westphalia	Goch	3480-3500 3580-3600	28.02.2022
North Rhine-Westphalia	Marienheide	3490-3500 3590-3600	01.02.2021
Saarland, Rhineland-Palatinate	Saarland/Pfalz	3473-3494 3573-3594	31.12.2021
Saxony	Borna	3600-3700	31.12.2022
Saxony	Diera-Zehren	3600-3640	31.12.2022
Saxony	Ebersbach	3600-3680	31.12.2022
Saxony	Großpösna	3600-3620 3660-3680	15.03.2022
Saxony	Klipphausen	3600-3680	31.12.2022
Saxony	Krensitz	3600-3630	31.07.2021
Saxony	Leipzig-Paunsdorf	3600-3640	15.03.2022
Saxony	Lommatzsch	3600-3680	31.12.2022
Saxony	Nünchritz-Priestewitz	3600-3640	31.12.2022
Saxony	Riesa	3600-3640	18.08.2022
Saxony	Wülknitz	3600-3620	18.08.2022
Saxony-Anhalt	Arneburg	3480-3500 3580-3600	31.05.2021
Saxony-Anhalt	Born	3600-3640	31.12.2022
Saxony-Anhalt	Gardelegen	3480-3500 3580-3600	22.09.2021
Saxony-Anhalt	Genthin	3480-3500	01.09.2021
Saxony-Anhalt	Havelberg	3480-3500 3580-3600	31.05.2021
Saxony-Anhalt	Kuhfelde	3480-3500 3580-3600	23.12.2021
Saxony-Anhalt	Magdeburgerforth	3590-3600	20.04.2021
Saxony-Anhalt	Naumburg	3480-3500 3580-3600	17.09.2021
Saxony-Anhalt	Oebisfelde	3480-3500 3580-3600	28.03.2022
Saxony-Anhalt	Stendal	3480-3500 3580-3600	31.08.2021
Saxony-Anhalt	Stendal	3600-3700	31.12.2022
Saxony-Anhalt	Zerbst	3600-3680	31.12.2022

Schleswig-Holstein	Fehmarn	3490-3500 3590-3640	02.12.2021
Schleswig-Holstein	Grammdorf	3490-3500 3590-3600	30.09.20
Schleswig-Holstein	Kirchnüchel	3490-3500	16.12.2020
Schleswig-Holstein	Köhn	3490-3500	09.12.2020
Thuringia	Saalfeld	3480-3500	31.12.2022
-	North Sea	3480-3500 3580-3600	31.12.2022
-	North Sea	3480-3490	31.12.2022
-	North Sea	3490-3500	31.12.2022
-	North Sea	3480-3500 3580-3600	09.10.2022
-	North Sea	3590-3600	31.12.2022
-	Baltic Sea	3480-3500 3580-3600	22.09.2022

Table 3: Local and regional assignments in the 3400 - 3700 MHz band

- 78 The assignments were provided in an application procedure and therefore expire on different dates, but at the latest on 31 December 2022. The frequencies will therefore be available from different dates up to 1 January 2023. The Bundesnetzagentur is also examining whether the regional assignments are being used efficiently in all the areas. Unused spectrum will have to be returned to the Bundesnetzagentur, otherwise revocation of the frequency assignment will be considered.
- 79 Spectrum at 3700- 3800 MHz will be provided for regional assignments in an application procedure. This will ensure that the spectrum requirements for both current applications and new local and regional business models can be accommodated. To deliver long-term planning certainty for current holders of limited regional assignments at 3400 - 3700 MHz, it is conceivable that the assignments could be shifted to the 3700 - 3800 MHz band before they expire.

WLL assignments

- 80 In the 3.6 GHz band, there are, moreover, 32 unlimited regional assignments in blocks of 7 MHz for wireless local loop (WLL) as point-to-multipoint radio relay (see Administrative Order No 55/1998, RegTP Official Gazette No 11/1998 of 10 June 1998).
- 81 These WLL assignments concern the following areas and frequency blocks:

District	Federal state	Frequency band
Breisgau-Hochschwarzwald	Baden-Württemberg	3480 - 3494 MHz / 3580 - 3594 MHz
Enzkreis		
Freiburg im Breisgau (urban)		
Heidenheim		
Hohenlohekreis		
Karlsruhe (rural)		
Karlsruhe (urban)		
Pforzheim (urban)		
Schwäbisch Hall		
Zollernalbkreis		
Ebersberg	Bavaria	3480 - 3494 MHz / 3580 - 3594 MHz
Erding		

Erlangen-Höchstadt		
Forchheim		
Freising		
Hof (rural)		
Hof (urban)		
Kitzingen		
Neustadt a.d. Aisch-Bad Windsheim		
Passau (rural)		
Passau (urban)		
Rottal-Inn		
Berlin (urban)	Berlin	3480 - 3494 MHz / 3580 - 3594 MHz
Havelland	Brandenburg	3480 - 3494 MHz / 3580 - 3594 MHz
Bremen (urban)	Bremen	3480 - 3494 MHz / 3580 - 3594 MHz
Bremerhaven (urban)		
Delmenhorst (urban)	Lower Saxony	3480 - 3494 MHz / 3580 - 3594 MHz
Hanover		
Oldenburg (urban)		
Oldenburg (rural)		
Osnabrück (rural)		
Osnabrück (urban)		
Bielefeld (urban)	North Rhine-Westphalia	3480 - 3494 MHz / 3580 - 3594 MHz
Düsseldorf (urban)		
Essen (urban)		
Herford		
Lippe		
Mettmann		
Minden-Lübbecke		
Mönchengladbach (urban)		
Mülheim a. d. Ruhr (urban)		
Münster (urban)		
Neuss		
Oberhausen (urban)		
Remscheid (urban)		
Solingen (urban)		
Wuppertal (urban)		
Kaiserslautern (rural)	Rhineland-Palatinate	3459 - 3473 MHz / 3559 - 3573 MHz
Kaiserslautern (urban)		
Dresden	Saxony	3480 - 3494 MHz / 3580 - 3594 MHz
Leipzig (urban)		
Leipziger Land		
Zwickau (urban)		
Zwickauer Land		
Dessau (urban)	Saxony-Anhalt	3480 - 3494 MHz / 3580 - 3594 MHz
Magdeburg		
Flensburg (urban)	Schleswig-Holstein	3480 - 3494 MHz / 3580 - 3594 MHz
Herzogtum Lauenburg		
Kiel (urban)		
Lübeck (urban)		
Neumünster (urban)		

Pinneberg		
Schleswig-Flensburg		
Segeberg		
Stormarn		
Erfurt	Thuringia	3480 - 3494 MHz / 3580 - 3594 MHz

Table 4: Regional WLL assignments in the 3400 - 3600 MHz band

- 82 The WLL assignments currently apply for an unlimited period. The Bundesnetzagentur is currently looking at whether the regional assignments will be used efficiently in all the areas and at the conditions for shifting the assignments to the 3700 - 3800 MHz band.

Satellite communications in the 3.6 GHz band

- 83 The interests of the satellite services are to be taken into consideration in providing the 3.6 GHz band. To ensure compatibility between mobile and satellite communications, the following procedure is planned:
- 84 Protection requirements will be determined for each specific case within a coordination zone. In setting the site-related frequency usage parameters for mobile communications, consideration is to be given in particular to Report ITU-R M.2109 (2007), Report ITU-R S.2368-0 (06/2015), ECC Report 203 (on 4G/LTE), the forthcoming ECC report on 5G, and the local conditions. In this context, the topography (terrain obstacles) and morphology (shielding, for instance in dense urban areas) can have a positive effect on compatibility. The mitigation techniques and measures required for MFCN to achieve compatibility with satellite communications may therefore vary in each case (eg reduction in transmitter power, reduction in antenna height, disabling of antenna sectors pointing towards earth stations, separation of more than 50 degrees between the direction of radiation of the mobile base station and the earth station, indoor use).
- 85 Given the topography and morphology, restrictions for mobile communications should, as a rule, only apply within a radius of 20 km from the main lobes and 5 km from the side lobes of the earth station antennas.

Earth stations in the 3400 - 3600 MHz band

- 86 In the Frequency Plan, the 3400 - 3600 MHz band is allocated to the fixed-satellite service (space-to-earth) but is not designated for a specific application (see Frequency Plan, April 2016, entry nos 315003 and 316002). In light of this, the reception of satellite communications in the 3400 - 3600 MHz band is in principle possible, but no protection from interference can be claimed.
- 87 The Bundesnetzagentur is aware of around ten existing earth stations, some of which are used for security-related communications or are of considerable economic importance. The Bundesnetzagentur is assuming that the earth station operators and MFCN assignment holders will cooperate during network rollout to avoid harmful interference. In the event of harmful interference to earth station reception in the 3400 - 3600 MHz band, the Bundesnetzagentur will advocate a mutually acceptable solution taking account of the legal and economic aspects. In this case, the Bundesnetzagentur would expect the MFCN assignment holders to show the willingness to work out acceptable solutions with the earth station operators.
- 88 The earth station in Leeheim is the Bundesnetzagentur's satellite monitoring station. The reception of satellite communications in the 3400 - 3600 MHz band by the earth station has been coordinated and must be protected. It is intended to apply a coordination radius of 20 km for terrestrial spectrum use. The technical parameters for mobile base stations within this radius will be set on a case-by-case basis taking account of the topography and usage parameters.

Earth stations in the 3600 - 3700 MHz band

- 89 According to the Frequency Plan, no interference may be caused to existing coordinated receiving stations of the fixed-satellite service in the sub-band 3600 - 3800 MHz (see Frequency Plan, April 2016, entry no 317003). In the 3600 - 3700 MHz band, consideration must therefore be given to the following stations:

Earth station	Frequency band (10 MHz blocks concerned)
Ruppichteroth	3600 - 3640 MHz
Fuchsstadt	3600 - 3700 MHz
Backnang-Waldrems	3620 - 3700 MHz
Berlin-Wannsee	3650 - 3700 MHz
Landstuhl	3600 - 3700 MHz
Ottobrunn	3600 - 3690 MHz
Raisting	3630 - 3700 MHz
Weßling	3630 - 3700 MHz
Wiesbaden-Erbenheim	3650 - 3700 MHz
Leeheim (Bundesnetzagentur)	3600 - 3700 MHz

Table 5: Current frequency coordination for satellite reception in the 3600 - 3700 MHz band

- 90 In addition to these earth stations, a single-digit number of earth stations used for security-related communications are also to be given consideration. In light of this, the assignment holders will only be informed of the locations bilaterally when the site-related frequency parameters are set.
- 91 Furthermore, the Frequency Plan provides scope for development in use at the above-mentioned earth station sites in individual cases (see Frequency Plan, April 2016, entry no 317002):
- "The sub-band 3600 - 3800 MHz will only continue to be available to the fixed-satellite service with restrictions following the introduction of MFCN applications. Existing coordinated receiving stations of the fixed-satellite service shall be protected; new uses will be possible in individual cases, in particular at existing sites."*
- 92 Attention is drawn to the following with respect to the scope for development in individual cases at existing coordinated sites:
- 93 Operators of existing coordinated earth stations can apply for coordination for reception in the 3600 - 3700 MHz band. The application must include a frequency usage concept giving an account of why the 3800 - 4200 MHz band is not sufficient in the specific case. If the account is conclusive and the mobile assignment holder is not using the frequencies and agrees to use by the earth station, use will be coordinated. If the mobile operator is already using the frequencies, agreement between the earth station operator and the mobile operator will be required to enable coordination in the individual case.
- 94 Here, consideration is to be given to the mobile operator's specific rollout plans. The mobile operator may be required to present the plans to the Bundesnetzagentur. In the event that frequencies are leased or provided for temporary use, the involvement of each specific frequency user will be required.
- 95 Reception in the 3600 - 3700 MHz band at new earth station sites will therefore not be protected.
- 96 The earth station in Leeheim is the Bundesnetzagentur's satellite monitoring station. The reception of satellite communications in the 3600 - 3700 MHz band by the earth station has been coordinated and must be protected. It is intended to apply a coordination radius of 20 km for terrestrial spectrum use. The technical parameters for mobile base stations

within this radius will be set on a case-by-case basis taking account of the topography and usage parameters.

Consideration of the Geodetic Observatory Wettzell

- 97 In connection with the availability of the 3.6 GHz band, consideration is to be given to protection for the Geodetic Observatory Wettzell (GOW) operated by the Federal Agency for Cartography and Geodesy (Bundesamt für Kartographie und Geodäsie – BKG). Measurements are carried out at the observatory as part of the BKG's statutory tasks. The observatory receives signals from space over a large number of frequency bands.
- 98 The BKG has pointed out that provision of the spectrum may compromise the measurements and thus fulfilment of its tasks. It has also highlighted the particular importance of the 3.6 GHz band for the measurements. Yet the 3.6 GHz band has also been identified as a pioneer band for 5G rollout. The Bundesnetzagentur has therefore opened a dialogue with the BKG. The aim is to achieve a proportionate balance between the tasks of the BKG and those of the Bundesnetzagentur.
- 99 It is true that the 3.6 GHz band is in principle available for assignments in the vicinity of the observatory as it is not used for other applications. The measurements at the observatory do not require signals to be transmitted and therefore do not constitute frequency usage (section 3 para 9 TKG). However, depending on the conditions for protecting the observatory, there could be considerable restrictions on the use of the 3.6 GHz band for mobile communications in some areas.
- 100 It is intended to find an appropriate balance of interests. Here, it seems appropriate to apply the principles of compatibility between different radio applications. It is not feasible to require either one or the other party alone to ensure the efficient and interference-free use of frequencies. If, for instance, the observatory were to be afforded absolute protection, then in some areas of Bavaria the rollout of 5G networks on the basis of the pioneer band at 3.6 GHz would, in all probability, only be possible to a limited extent. Rather, both parties would need to look at which measures they can take to protect the other party's interests. The aim is to minimise potential restrictions and thus to avoid unacceptable degradation to the reception of signals at the observatory and to mobile communications.
- 101 Mobile base stations could be coordinated individually when the site-related frequency parameters are set. Base station sites within the coordination zone to be defined around the observatory would need to be assessed on a case-by-case basis. Mobile operators could take various measures at their individual sites to minimise restrictions on the observatory, such as
- restricting the transmitter power,
 - reducing the antenna height,
 - adjusting the antenna elevation angle,
 - adjusting the direction of the antenna (away from Wettzell), and
 - restricting use to urban areas (shielding offered by buildings).
- 102 The closer a mobile base station is to the observatory, the more mitigation measures are likely to be needed. The size of a coordination zone and the scope of the mitigation measures required depend on which protection measures can be taken at the observatory itself.
- 103 In this context, arrangements can in principle be agreed between the operators themselves, as for instance between mobile and train radio network operators.

Scarcity

- 104 Based on the qualified notified demand of 30 September 2017 and taking account of the submissions made by interested parties and other parties affected on 20 December 2016 (Points of Orientation; cf procedure above), the Chamber is convinced that demand for frequencies in the 2 GHz and 3400 - 3700 MHz bands referred to above exceeds the available spectrum and that these frequencies are therefore scarce resources within the meaning of section 55(10) first sentence, first alternative TKG.
- 105 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 based on conditions according to section 61 TKG as determined by the Chamber, when spectrum is scarce. The scarcity posited 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) or the forecast of an insufficient number of frequencies being available (section 55(10) first sentence, first alternative).
- 106 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 a greater number of applications being made than frequencies are available at the time of assignment. This forecast is based on the Chamber's determination that the demand for spectrum exceeds supply.
- 107 To identify the demand, a tried and tested, informative, multi-stage procedure is available in the shape of demand identification proceedings. The procedure takes proper account of the criteria of objectivity, transparency and non-discrimination and grants applicants equal opportunity to spectrum. With the demand identification proceedings the Chamber is making 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.
- 108 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 Ruling 6 C 3.10, margin no 25). Scarcity is therefore not exclusively established and determined by the demand notified.
- 109 The Chamber held that it is appropriate and efficient to initiate, by its key elements of 27 June 2017, demand identification proceedings to determine spectrum demand in the 2 GHz and 3.6 GHz bands in order to ensure that frequencies are assigned in open, objective, transparent and non-discriminatory proceedings (for details see key elements paper of 27 June 2017, loc cit).
- 110 In total, the qualified demand exceeds the supply of available frequencies in both the 2 GHz and the 3400 - 3700 MHz band. Several companies notified their qualified demand in the demand identification proceedings.
- 111 In assessing frequency demand for MFCN, the Chamber took those requirements into account where the interested companies 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 companies 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 capability and specialist knowledge and the presentation of a convincing concept for intended use of the frequencies for assignment. Mere declarations of interest or the announcement of requirements are not sufficient for inclusion when demand is identified.

112 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 serious. 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 following was stated in the considerations of the key elements of 27 June 2017 (see key elements, loc cit, page 24):

"Particularly convincing, in line with the purpose of identifying demand, are notified requirements that also cover the objective and subjective criteria for future frequency assignment (section 55 subsections (3), (4) and (5) TKG) in setting out interest in a particular use. (...) This clear and conclusive account must cover both the subjective requirements of reliability, financial capability and specialist knowledge and the presentation of a convincing concept for intended use of the frequencies for assignment (...)."

- 113 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 on account of the cost of providing such evidence.
- 114 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 and in non-discriminatory manner on the basis of transparent and objective procedures. 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 companies. 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.
- 115 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 declaring their substantiated interest in specific use of the frequencies in the bands at 2 GHz and 3400 - 3700 MHz at the stage of the demand identification proceedings already 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, section 61(4) fifth sentence TKG.
- 116 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 2 GHz and 3.6 GHz bands (cf section 55(10) first sentence, first alternative TKG).
- 117 The interested companies have presented clear and conclusive concepts in accordance with the demand identification proceedings (see key elements paper of 27 June 2017, loc cit).
- 118 After examining the notified requirements, the Chamber has reached the conclusion that total notified requirements exceed the frequencies available in the 2 GHz and 3400 - 3700 MHz bands.
- 119 The Chamber's forecast decision has taken the qualified requirements that have been notified and the resulting excess demand as a sufficiently sound 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,

first alternative TKG on all the circumstances that are relevant for clarifying the availability of sufficient spectrum at the time of award.

- 120 Besides the demand identification proceedings, the President's Chamber has based its forecast of a potential excess demand for spectrum on other facts as well. These facts as set out below relate to the competitive environment, the expected increase in frequency usages, and the technical developments.
- 121 In a competitive environment, as in the case of MFCN as the basis for public mobile services, the assumption is that there is a high demand for spectrum resources. It must be assumed that mobile operators, when considering their spectrum requirements, do not only take account of technical aspects with respect to providing services for their customers. An operator's spectrum requirements are derived not only in absolute terms from the capacity requirements in the operator's own network, but also in relative terms by comparison with other market players' spectrum holdings. A better spectrum holding can result in a competitive advantage vis-à-vis other providers.
- 122 The capability of a mobile network is determined in particular by the spectrum holding as well as by the scope of the network build and the technology used. In light in particular of the development of the demand for mobile data services, each additional frequency block offers added value to the network operator, since the operator can use the additional spectrum either to offer additional services or to improve the quality of a data service, for instance by increasing the data rate.
- 123 On account also of the rapid increase in capacity requirements, it can be assumed that there will be demand for additional spectrum. While the total spectrum available increased by around 20% in the period from 2010 to 2017, the volume of data traffic transported via mobile networks in the same period rose by more than 2000% from 65m gigabytes to 1,470m gigabytes (cf Bundesnetzagentur's Telecommunications Activity Report 2016/2017, page 40).
- 124 The demand for mobile data services with increasingly larger bandwidths will continue to rise in the future both worldwide and in Europe and Germany. Studies forecast a growth rate of around 45% for Europe in the subsequent years up to 2022 (cf Ericsson Mobility Report and Cisco Visual Networking Index). Simply increasing network density or using more efficient technology is not likely to be sufficient to provide the additional capacity for this demand for data services. Thus a high demand for spectrum in the 2 GHz and 3.6 GHz bands is also likely on account of the higher capacity requirements.
- 125 The fact must also be taken into account that the 3.6 GHz band has been identified in Europe as a pioneer band for 5G applications. This is a key driver for the development of a standard needed for the provision of technology. In light of this, use of the band for broadband 5G applications in the near future is likely. The 3.6 GHz band has the advantage, compared to lower frequencies used for MFCN, of large, contiguous frequency blocks and is therefore especially suited to broadband radio applications. For this reason, a high demand for spectrum in this band is expected.
- 126 The 2 GHz band is currently used for UMTS and increasingly also for LTE systems. In the medium term, this spectrum will also be needed for future 5G applications. Thus both intensive UMTS usage and LTE usage via existing infrastructure and a corresponding future interest in the frequencies in the 2 GHz band can be expected.
- 127 Thus not only the specific results of the demand identification proceedings, but also abstract technical and economic developments indicate that the demand for frequencies in the 2 GHz and 3400 - 3700 MHz bands exceeds the available spectrum and that these frequencies are therefore scarce resources within the meaning of section 55(10) first sentence, first alternative TKG.

Order for award proceedings

- 128 The order for award proceedings is made in accordance with section 55(10), section 61, section 2(2) and (3) and section 55(4) and (5) TKG in such a way that the assignment of spectrum for MFCN in the 2 GHz and 3400 - 3700 MHz bands must be preceded by award proceedings.
- 129 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. The law makes provision for award proceedings to be ordered in the event of scarcity of spectrum.
- 130 The spectrum available for assignment in the 2 GHz and 3400 – 3700 MHz bands is insufficient (cf margin no 104ff). On account of the scarcity identified in these bands, the law makes provision in section 55(10) TKG for award proceedings to be ordered.
- 131 Award proceedings are suited to ensuring fulfilment of the Bundesnetzagentur's statutory task. Extending the frequency usage rights would not be equally suited to securing the regulatory aims as set out in section 2(2) TKG.
- 132 Conducting award proceedings essentially meets the regulatory aims according to section 2(2) paras 1 and 2 TKG of safeguarding consumer interests with regard to the 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 expansion of broadband infrastructure and the introduction of innovative 5G applications 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 frequency usage rights would not be as effective in ensuring swift broadband expansion. Refarming the 2 GHz and 3.6 GHz bands is appropriate from a regulatory viewpoint so as to create, at the earliest possible opportunity, potential for innovation that would not be ensured should individual assignments be extended.
- 133 Award proceedings contribute to achieving the fundamental regulatory aim of securing fair competition and promoting 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 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.
- 134 To promote sustainable competitive markets, the framework and procedural conditions – when providing spectrum to competitors as well – must be 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 packages. Unlike the option of extending frequency usage rights, award proceedings will enable existing network operators to adapt their spectrum packages in response to the changing market conditions and in line with their business models.
- 135 Award proceedings accommodate the regulatory aim of expediting the rollout of high-speed next-generation public 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 high-speed next-generation public 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 2 GHz spectrum be extended.

- 136 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.

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

- 137 The Chamber is ordering that assignment of the spectrum in the 2 GHz and 3400 - 3700 MHz bands be preceded by auction proceedings, section 61(1) and (2) TKG.
- 138 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, as a general rule auction proceedings as laid down in section 61(5) TKG are to be conducted except where an auction is not likely to secure the regulatory aims as set out in section 2(2) TKG. Thus there remains no scope for discretion as far as the legal consequences are concerned. On this the Federal Administrative Court has stated the following (cf Federal Administrative Court Ruling 6 C 13/11 of 10 October 2012, 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."

- 139 Under the regime framed by the statutory regulations, section 61(2) first sentence TKG establishes auction proceedings as the rule to which exceptions may be made. The wording of the law expressly states that "as a general rule" auction proceedings are to be conducted, except where such proceedings are not likely to secure the regulatory aims according to section 2(2) TKG. Auction proceedings can achieve the statutory aim of award proceedings, namely to select those bidders who are best placed to use the spectrum efficiently. The explanatory notes to section 61(4) TKG (section 59(5) of the government draft of 2004, Bundesrat printed paper 755/03, page 109) state the following in this context:

"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."

- 140 Auction proceedings are suited to promoting economical and optimal use of spectrum resources. They 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. Also it is not apparent that auction proceedings will lead to any disadvantages for broadband rollout by taking funding needed for network rollout. This assertion is contradicted for instance by the swift broadband rollout that has taken place following the auction proceedings since 2010.
- 141 According to section 61(2) second sentence TKG, auction proceedings may not be suited to securing the regulatory aims where spectrum has already been assigned without auction proceedings for the usage designated in the Frequency Plan or where an

applicant can demonstrate a preference on the basis of statutory provisions for the spectrum to be assigned. While the two cases given as examples are not exhaustive ("in particular"), they are also not obligatory ("may"). Their occurrence may generally mean that auction proceedings may not be suited, but by no means necessarily lead to the inadmissibility of auction proceedings. Given particular reasons, the decision in favour of auction proceedings can nevertheless be justified.

- 142 All the spectrum made available for award for mobile broadband has so far been awarded in auction proceedings. A preference on the basis of statutory provisions as referred to in section 61(2) second sentence TKG is also not apparent here.
- 143 Auction proceedings are also suited to securing the regulatory aims as set out in section 2(2) TKG.
- 144 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.
- 145 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. 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.
- 146 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 for all bidders in respect of the value and usage interdependencies between the various bands at 2 GHz and 3400 - 3700 MHz.
- 147 Auction proceedings are in particular suited to securing fair competition and promoting sustainable competitive markets. Auction proceedings provide both existing mobile operators and new entrants with non-discriminatory access to the spectrum resources.
- 148 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.
- 149 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 resources in a competitive environment.

Information on legal remedies

Actions against this notice may be filed in writing with the administrative court in Cologne, Appellohofplatz, 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, [#Datum]

Dr Wilhelm Eschweiler

Jochen Homann

Peter Franke

Vice Chair

Chair

Vice Chair

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