Consultation on the 3.4-3.8 GHz Award Procedure

NON-BINDING TRANSLATION

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Table of Contents

1 Introduction

On 11 January 2016 the Telekom-Control-Kommission (hereafter 'TKK') tasked RTR with beginning preparations for the award of rights to use frequencies including the 3.4 to 3.6 GHz range (award following the remaining term lasting until the end of 2019). In addition, the TKK initiated an award procedure on 26 September 2016 in response to an application for the award of frequency usage rights for the 3.6 to 3.8 GHz range that had been submitted on 23 August 2016. With reference to the corresponding statements put forth in the course of the frequency consultation jointly conducted in 2016 by the Federal Ministry of Transport, Innovation and Technology (BMVIT) and by RTR, the regulatory authority recognises the expediency of awarding the entire 3.4 to 3.8 GHz range within the framework of a joint auction. The TKK has consequently resolved to merge the two bands, i.e. 3.4 to 3.6 GHz and 3.6 to 3.8 GHz, in a joint award procedure and to begin preparations for a joint auction.

The TKK currently assumes that the technical terms and conditions of use, which are a prerequisite for putting the two bands out to tender in an auction, will be available in late 2017, making an invitation to tender at the end of 2017 or the beginning of 2018 appear realistic. The auction would then be planned to take place in (and not before) mid-2018 (in accordance with the Spectrum Release Plan disclosed by the regulatory authority in December 2016, i.e. "beginning with and not before Q2 2018"). The 3.6 to 3.8 GHz frequency range could then be used immediately on assignment with legal effect and the 3.4 to 3.6 GHz range as of 1 January 2020 (once the current usage rights expire). Nonetheless, in view of a number of uncertainties, the regulatory authority reserves the right to deviate from the plan; uncertainties include: when conditions of use become available, any use in neighbouring countries, or changes to the legal framework (at the European or national level) that might oppose the plan.

In the following RTR consults with stakeholders on the key terms of the award procedure.

Statements (in German or English) must be emailed by **15 September 2017** to tkfreq@rtr.at. Please use the predefined cover sheet (Appendix 1). The regulatory authority will publish a summary (without naming organisations or individuals) of all the statements received. Additionally, a list of the organisations/individuals that submitted statements for the consultation and consented to disclosure of the organisation/individual will be published. If requested, the complete individual statements will be published as well.

2 Award goals

The TKK is focusing the award procedure on the goals listed below:

- Goal 1: legal certainty
- Goal 2: ensure efficient utilisation of frequencies
- Goal 3: ensure/encourage effective competition
- Goal 4: encourage innovation
- Goal 5: greater connectivity and expanded coverage

Maximising auction income is expressly ruled out as a goal in awarding the frequencies, as is actively supporting new market entrants through actions such as reserving spectrum. To the extent relevant and feasible, the regulatory authority will base key design decisions on the goals listed above.

Efficient frequency use is ensured where bidders are able to acquire spectrum to meet their individual needs and where a frequency lot is assigned to the bidder who puts the highest value on that lot and submits the highest bid for it.[1] This requires a *product design* that matches the demands of potential users, ensures fair and equal participation of all users and allows competition for incremental spectrum. This needs to be complemented by an *auction design* suited to identifying the bidder with the highest valuation. The award procedure also needs to be designed so as to largely avoid any *unnecessary fragmentation* of spectrum within a single band, as well as, where frequencies are packaged by region, the assignment of different individual spectra to different regions. *Aggregation and substitution risks* are to be minimised in the auction by using a suitable design. For example, bidders should be allowed to acquire within one of the two bands a large frequency block for 5G in all regions. Such an option should not be impaired by switching barriers or aggregation risks. The regulatory authority also wishes to minimise the *quantity of* (implicitly or explicitly) *protected blocks*, for instance by encouraging synchronous operation or through suitable arrangement of compatible users within the band, while at the same time achieving a certain degree of *flexibility allowing differing business models*.

In line with the goal of efficient frequency usage, as well as to pursue Goal 5, the TKK is considering imposing *appropriate coverage requirements*. This would be firstly to ensure that the spectrum is in fact used and not hoarded for strategy reasons. Secondly, the TKK is considering requirements that would ensure the speedy introduction and propagation of 5G services.

To achieve the second award goal, the TKK will define appropriate spectrum caps to avoid any disproportionate concentration of usage rights with any one provider and to ensure that effective competition is preserved in the related downstream markets after the auction.

[1] Cf. Art. 55 Telecommunications Act (TKG 2003) and ruling 2013/03/0149 of 4 December 2014 by the Austrian Administrative Court (complaint of a mobile network operator against the TKK decision of 19 November 2013, F 1/11-283).

The TKK views the award of this frequency band as a significant contribution to introducing 5G in Austria. Through timely spectrum award and a design that allows low-risk aggregation of a wide frequency block in one of the two bands (across regions), the regulatory authority is laying the groundwork for innovative efforts in the area of 5G.

3 Spectra

The planned award procedure encompasses the 3410 to 3800 MHz frequency range. The number of frequencies in this range is limited, hence the regulatory authority is responsible for the frequency award.[2]

Although the spectrum is continuous, for reasons set in the past the band is divided in two sub-bands, one above and the other below 3600 MHz. Even though many aspects of the two sub-bands are similar, various details (for instance the licence period) require them to be treated separately. Compared internationally, we can expect the two sub-bands to develop at differing degrees and speeds towards use for mobile telecommunications. Separate consideration also appears appropriate for this reason, that is, economies of scale.

3.1 3410-3600 MHz band

Apart from satellite use, the 3410-3600 MHz band (part of the LTE band 42[3]) was previously used for microwave radio and, since 2004, for wireless regional broadband services plus, for a limited term, for wireless cameras. Currently valid licences for regional wireless broadband services expire on 31 December 2019.

The spectrum is depicted in the following chart:

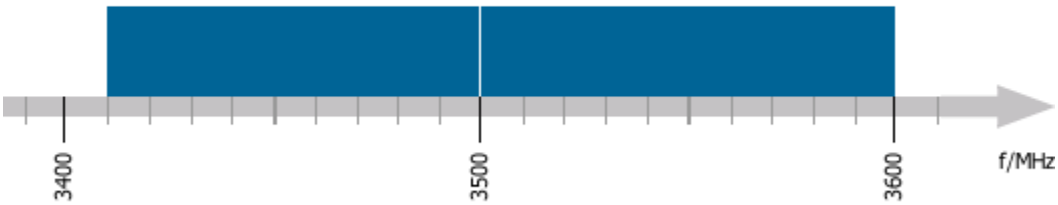

Figure 1: 3410-3600 MHz band (part of LTE band 42)

In addition to possible use for fixed wireless broadband systems, the band is expected to be used for mobile broadband in future. This band is suitable for high data transmission rates because of its position within the spectrum and its large bandwidth.

At the WRC-15 the mobile telecommunication identification for this band in Region 1 was converted into an entry in the frequency allocation table; the band was identified for IMT. This strengthened the position of the frequency band. The

[2] Cf. https://www.bmvit.gv.at/ofb/funk/frequenzverw/natplan/index.html (in German)
[3] LTE-Band 42 comprises the 3400-3600 MHz frequency range.

conditions[4] of a pfd limit and the application of footnotes 9.17, 9.18 and 9.21 are not expected to limit the use of the frequency band in Austria.

Previous awards [5] related to a paired spectrum as a multiple of 7 MHz, i.e. frequency blocks with a duplex distance of 100 MHz were assigned. Consequently, FDD was the preferred use. TDD use was also an option here but with the proviso that the use of FDD in neighbouring areas and on adjacent frequencies was not impaired.

After intensive discussions within the CEPT,[6] TDD was specified as the preferred duplex mode of operation in the European Union through Commission Implementing Decision 2014/276/EU:[7]

> *The preferred duplex mode of operation in the 3400-3600 MHz sub-band shall be Time Division Duplex (TDD). Member States may alternatively implement Frequency Division Duplex (FDD) mode of operation in the 3400-3600 MHz sub-band for the purpose of:*

a) *ensuring greater efficiency of spectrum use, such as when sharing with existing rights of use during a co-existence period or implementing market-based spectrum management; or*

b) *protecting existing uses or avoiding interference; or*

c) *coordination with non-EU countries.*

None of the reasons listed would speak for an alternative mode of operation (i.e. FDD), in the opinion of the regulatory authority. Consequently, an unpaired assignment of 5 MHz blocks (or multiples thereof) is planned. While a 'subordinate' enabling of FDD use would be feasible in principle, this would either make the assignment inefficient or significantly increase its complexity. No use for FDD is planned, therefore.

Current use in the 3400-3410 MHz spectrum limits use to frequencies above 3410 MHz, which means the 3410-3600 MHz range can be awarded. This can be done in blocks of 5 MHz (or multiples thereof):

4 Refer to Final Acts WRC-15.
5 Details on previous awards can be found at https://www.rtr.at/en/tk/Spectrum3410_3600MHz.
6 The result of the discussion within the ECC can be found in document ECC/DEC(11)06, at http://www.erodocdb.dk/docs/doc98/official/pdf/Rec1106.pdf.
7 Refer to https://www.rtr.at/en/tk/Spectrum3600_3800MHz/1999_2014_276_EU_en.pdf.

Table 1: List of 5 MHz frequency blocks in 3410-3600 MHz band (abridged view)

Frequency blocks in 3410-3600 MHz band	Frequency range/MHz
1	3410-3415
2	3415-3420
3	3425-3430
…	…
35	3585-3590
37	3590-3595
38	3595-3600

In the planned award procedure, these frequency blocks will be combined into (if required, abstract) award objects (lots, for example of 10 or 20 MHz).[8]

3.2 3600-3800 MHz band

The 3600-3800 MHz band (LTE band 43) has not been previously used for mobile telecommunications or broadband application and hence will be available for use immediately on assignment with legal effect.

EU Commission Implementing Decision 2014/276/EU defines TDD use for this band.

The following figure depicts the frequency band:

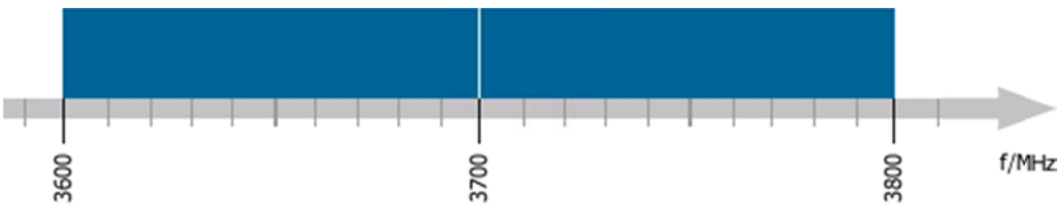

Figure 2: 3400-3600 MHz band (LTE band 43)

[8] Cf. chapter on product design and the separate report entitled "Options for Product and Auction Design".

The entire frequency band is available, apart from the geographical coordination zone around Aflenz.[9] The assignment can be made in blocks of 5 MHz (or multiples thereof):

Table 2: List of 5 MHz frequency blocks in 3600-3800 MHz band (abridged view)

Frequency blocks in 3600-3800 MHz band	Frequency range/MHz
1	3600-3605
2	3605-3610
3	3610-3615
…	…
38	3785-3790
39	3790-3795
40	3795-3800

In the planned award procedure, these frequency blocks will be combined into (if required, abstract) award objects (lots, for example of 10 or 20 MHz). [10]

3.3 Other usages

Alongside the usage to be awarded, the 3410-3800 MHz band is a key component of the fixed wireless access service via satellite. Depending on the geographical location and the technical parameters, the corresponding earth stations require coordination zones with varying expanses. For this reason, frequency use has to be coordinated in these geographical areas. There is currently one earth station that uses this frequency range, located at Aflenz. Due to the situation at Aflenz, a local coordination zone is required to protect the earth station there.

In addition to use for fixed wireless service via satellite, the frequency band concerned is also currently being used for wireless camera applications for a limited time.

[9] When constructed, the earth station was positioned so that it is surrounded by mountains, thereby minimising possible interference, for example that caused by airport radar systems. This positioning now supports terrestrial use of the 3600-3800 MHz band: the surrounding mountains provide a natural barrier and could at the same time constitute the border of the protection zone.

[10] Cf. chapter on product design and the separate report entitled “Options for Product and Auction Design”.

4 Technical terms and conditions of use

4.1 Service and technology neutrality

The regulatory authority plans to award the spectrum in line with the principle of service and technology neutrality.

Commission Implementing Decision 2014/276/EU frames technology neutrality in specific terms. This means in detail that the spectrum can be used for example both for 4G and 5G, provided these technologies are used in keeping with the Commission Implementing Decision. By referring to what is termed a block edge mask (BEM), the Commission Implementing Decision attempts to describe permitted use in terms that as far as possible are independent of any one technology, while at the same time defining the necessary condition allowing coexistence of neighbouring networks.

Service neutrality is achieved through specifying details of the services only to the extent required in order to achieve other regulatory goals (for instance efficient frequency use). With this in mind, terms such as 'broadband' and 'mobile telecommunications', which are used in other contexts within the consultation paper, are to be interpreted broadly and serve to describe the particular use by referring to familiar types of use. Coverage requirements necessary for the award can in effect limit service neutrality, while nonetheless being required to ensure efficient frequency use.

4.2 Channel sizes

Commission Implementing Decision 2014/276/EU describes the spectrum with reference to 5 MHz channels. Such 5 MHz channels are the 'smallest' indivisible units in the award procedure. The goal of the detailed product and auction design will be to combine these 5 MHz channels where required into larger award objects (lots) or to bundle them into abstract frequency blocks (which can be defined in concrete terms at a later stage of the award procedure).

The principle of technology neutrality aside, it is worth considering the question of channel sizes in relation to technologies currently used in this frequency range.

Technologies with bandwidths in multiples of 7 MHz have been used in the past. These technologies are obsolete, and such a bandwidth would also contradict Commission Implementing Decision 2014/276/EU.

LTE TDD ('4G') currently uses bandwidths of 5, 10, 15 or 20 MHz in LTE bands 42 and 43, according to 3GPP TS 36.101.[11]

The results of the Consultation on Future Frequency Awards, carried out last year, lead us to expect that no provider plans to use bandwidths of less than 20 MHz; it consequently appears justified to assume a channel bandwidth of 20 MHz for 4G and

[11] See http://www.3gpp.org/ftp/Specs/archive/36_series/36.101/36101-e10.zip

to not explicitly consider the potential narrower bandwidths specified in the standard.

With LTE, five channels at the most can currently be combined by means of carrier aggregation, giving a maximum of 5 x 20 MHz or 100 MHz.

Bandwidths broader than 100 MHz cannot be used by a single user at present, whereas one provider can for instance employ various frequency ranges for different uses (for example 80 MHz for outdoor coverage and 40 MHz for indoor coverage), thereby allowing the use of bandwidths exceeding 100 MHz. Beyond that, additional bandwidth might be required for non-synchronised operation. Even larger bandwidths cannot be ruled out in future.

The New Radio (NR) standard has been designated for 5G. Since it is currently at a very early stage of development, no binding definitions are available for this standard. From today's perspective, it is expected that NR will employ a channel width of 100 MHz. NR is supposed to entail mechanisms additionally allowing the use of narrower channels, while for transmissions with high bit rates it should be possible to use multiples of 100 MHz in a way similar to carrier aggregation.

With bandwidth specifications it needs to be kept in mind that the current 4G standard considers LTE bands 42 and 43 separately. For a specific provider, it therefore makes a difference whether a certain bandwidth is acquired in only one of the LTE bands or whether that provider's bandwidth is distributed over different bands. Distributed use could lead to higher costs, for example through the potential need for different transmitters and receivers for the LTE bands; this could also limit capacities or peak data rates, for instance due to possible limitations on carrier aggregation between the bands.

In summary, a bandwidth of 20 MHz can be considered necessary in any case and bandwidths of at least 100 MHz should be enabled for the case of carrier aggregation with 4G, while bandwidths greater than 100 MHz would also be an advantage with 4G, due to different kinds of use as well as for guard bands. A bandwidth of at least 100 MHz appears appropriate for 5G, whereas no upper limit can be predicted for 5G at present.

4.3 Block edge mask (BEM)

The BEM for this band is specified by Commission Implementing Decision 2014/276/EU.

Bilateral or multilateral agreements ensure that use is possible on both sides of international borders. In a typical case, this is achieved by defining field strength limits applying at or parallel to the Austrian border.

A similar arrangement is also useful and necessary along certain regional borders.

4.4 Synchronous vs. non-synchronous operation

The downlink to uplink ratios listed below are available with 4G:

Table 3: TDD-LTE frame structure options[12]

UL-DL Configuration	Subframe number										DL:UL Ratio
	0	1	2	3	4	5	6	7	8	9	
0	D	S	U	U	U	D	S	U	U	U	1:3
1	D	S	U	U	D	D	S	U	U	D	1:1
2	D	S	U	D	D	D	S	U	D	D	3:1
3	D	S	U	U	U	D	D	D	D	D	2:1
4	D	S	U	U	D	D	D	D	D	D	7:2
5	D	S	U	D	D	D	D	D	D	D	8:1
6	D	S	U	U	U	D	S	U	U	D	3:5

The Consultation on Future Frequency Awards that was conducted in 2016 demonstrated the general need to strive for synchronised use.

Yet synchronisation poses challenges, as listed below:

- Various interested parties desire varying downlink to uplink ratios; configurations 1 and 2 are specifically mentioned here.
- The NR radio standard for 5G probably requires a different frame structure than 4G; synchronisation between 4G and 5G consequently does not appear possible at present.
- The guard bands between non-synchronised operators depend on network planning details and the upper limits can only be roughly estimated for the award procedure.

The regulatory authority thus continues to assume the standard case of synchronised operation.

[12] Source: ComReg Consultation on 3600 MHz. 'U' is for uplink transmission, 'D' is for downlink transmission and 'S' is a time slot used for guard time.

4.5 Default value for synchronous operation

Assuming synchronised operation as the standard case, it is necessary to specify a default value. Two or more operators can additionally stipulate other specifications for synchronisation – provided that such do not put third parties at a disadvantage.

The consultation revealed that mobile telecommunications providers tended to prefer the asymmetric downlink to uplink ratio proposed by the regulatory authority, while regional broadband providers more often favoured a symmetric distribution between downlink and uplink traffic.

This could be considered in the auction design through the regulatory authority proposing a choice of two downlink to uplink ratios (referred to as 'standard users') for the award.[13] Bidders could state their preference in their applications. The auction rules would ensure that neighbouring bidders would use the same downlink to uplink ratio and two groups of bidders would be separated by a 10 MHz guard band.

This could be implemented in detail as described in the following:

- Band 42: Two user types (e.g. configurations 1 and 2). Bidders belonging to Standard Type 2 at the lower end of the band and Standard Type 1 at the upper end. The two configurations would be separated by a 10 MHz guard band, to be additionally awarded to the lowest bidder belonging to Standard Type 1. If no Standard Type 2 bidder is successful in the auction, the guard channel will be awarded in the auction.[14]
- Band 43: Exclusively Standard Type 1 bidders.

LTE bands 42 and 43 would be generally synchronised, so that there would be no guard channel between the sub-bands (except if band 42 were won only by Standard Type 2 bidders).

Should any one successful bidder at any time choose another transmission technique (for example NR), that bidder would then be directly responsible for maintaining the guard interval required by non-synchronisation from adjacent frequency-holders.

[13] Cf. chapter on product design and the separate report entitled "Options for Product and Auction Design".

[14] Cf. the separate report entitled "Options for Product and Auction Design".

5 Product design

5.1 Standard users for synchronous operation

As detailed in Chapter 4, two possible operating modes exist to protect against interference: synchronous and non-synchronous operation. Synchronous operation enables higher capacity limits and thus more efficient operation from a technical standpoint. Yet, to achieve synchronisation, a compatible frame structure between network operators is required. The frame structure defines the time slots for uplink and downlink traffic. The choice of the right frame structure depends on factors such as the traffic profile (in other words, the downlink to uplink ratio), which in turn can vary with the business model, as the consultation has revealed. In line with award goal 2, the regulatory authority is of the opinion that, while on the one hand synchronous operation should be encouraged as far as possible, the terms and conditions of use should nonetheless be compatible with as many of the business models as possible that are pursued by future users.

The consultation conducted in 2016 on the Spectrum Release Plan, along with various discussions with industry representatives, have revealed a demand for two traffic profiles. The majority of participants in the consultation came out in favour of an asymmetric ratio, with preference given to TDD-LTE Configuration 2 at the time of the consultation. Another group of consultation participants preferred a symmetric traffic ratio.

In principle, the regulatory authority could leave it up to users to agree on a common traffic profile for synchronous operation. In view of the complexity of such negotiations, the associated transaction costs and the likelihood of no consensus being achieved, the regulatory authority will specify a standard value (default value). The regulatory authority will nonetheless provide the frequency users with the opportunity to negotiate towards an agreement on a uniform frame structure.

To enable a certain degree of flexibility in relation to the frame structure, the regulatory authority proposes two standard users: In the assignment stage of the auction, standard user 1 will be positioned in band 43 and in the upper range of band 42. In the assignment stage, standard user 2 will be positioned in the lower range of band 42.[15]

The two configurations will be separated by a 10 MHz guard band. This will be awarded to standard user 1 in the lowest range in the event that two standard users prevail. If only one standard user is successful in the auction, the 10 MHz guard band can be used for synchronous operation. In this case the block will either be made available on flexible terms during the principal stage or awarded to a winner of the principal stage during the assignment stage.[16]

Considering the input received in the consultation and the fact that the market will probably move towards Configuration 2, the regulatory authority proposes TDD-LTE

[15] Cf. the separate report entitled “Options for Product and Auction Design”.
[16] Cf. the separate report entitled “Options for Product and Auction Design”.

Configuration 2 (in other words, an uplink to downlink ratio of 1:3) or an equivalent frame structure from another technology as the standard frame structure for standard user 1. For standard user 2, the regulatory authority proposes TDD-LTE Configuration 1.

The regulatory authority nonetheless wishes to use the consultation to again survey the market participants on their preferred TDD-LTE configuration and then to make a final choice for the two standard types after the consultation.

5.2 Lot structure

'Lots' refers to the objects of the auction for which bidders can submit bids. Either abstract (generic) lots or specific lots can be awarded in the auction.

The regulatory authority proposes offering the spectrum generically first, in the initial stage of the auction, in two product categories in each region (one category for each band) and then, in the second stage of the auction, assigning the specific frequency blocks to the winner of spectrum.[17]

The division into two categories (possibly by region) is needed to ensure that bidders are clear on the band in which they are acquiring frequencies. The regulatory authority considers this division to be necessary since: losses are associated with the aggregation of spectrum beyond band limits (for example with 5G New Radio); some users do not view the bands as (near) substitutes; and the bands will become available at different points in time.

To guarantee efficient frequency use (award goal 2), it is necessary for the product design to enable competition for incremental spectrum, while lots have to be made small enough to meet demand.

In the consultation on the Spectrum Release Plan, market participants proposed two lot sizes, namely 10 and 20 MHz.[18] Several participants came out expressly against 5 MHz lots, stating that such lots were no longer supported by technology or that they allowed too little bandwidth. No general preference can be recognised for either of the two options (cf. the table below).

[17] Cf. the separate report entitled "Options for Product and Auction Design".
[18] Cf. the results of the consultation, which can be viewed on the regulatory authority's website.

Table 4: Lot sizes proposed during the consultation

Band	Participants supporting a lot size of 10 MHz (option A)	Participants supporting a lot size of 20 MHz (option B)
3400-3600 MHz	7 participants	7 participants
3600-3800 MHz	6 participants	6 participants

The product and auction designs are strongly interdependent, so that the two need to be optimised simultaneously to take into account significant trade-offs such as minimising aggregation risks, simplifying aspects and avoiding lots that are inefficient and are not purchased.[19]

There are pros and cons to the lot sizes described above. The advantage of 20 MHz lots is that they entail fewer aggregation risks and less complexity and are identical with the maximum channel width in LTE. Yet they also imply potential disadvantages, including the following:

- They offer fewer possibilities for bidders that wish to purchase additional spectrum to protect against interference (from neighbours) and allow operation in asynchronous mode. This aspect could be relevant for the 5G New Radio interface or for operators who wish to retain greater flexibility in their business model during the licence term (UL/DL ratio).
- In the 3400-3600 MHz band, 190 MHz of spectrum are available in the pending award, an amount that is not divisible by 20; what to do with the remaining 10 MHz block still needs to be clarified.

The regulatory authority therefore wishes to propose these two options for discussion in the consultation:

- Option A: lots of 1 x 10 MHz
- Option B: lots of 1 x 20 MHz

[19] Cf. the separate report entitled “Options for Product and Auction Design”.

5.3 Geographical structuring

Usage rights in the 3400-3600 MHz and the 3600-3800 bands can be awarded both as nationwide rights of use and as regional rights of use. In the auction recently completed in Ireland, for example, regional rights of use were auctioned off.

The consultation on the Spectrum Release Plan revealed a demand for both nationwide and regional rights of use (cf. the table below).[20]

Table 5: Regional structuring in the 3400-3800 MHz range (consultation on the Spectrum Release Plan)?

Award of nationwide or regional rights of use?	Consultation participants
Nationwide	2
Nationwide for the most part	1
3400-3600 MHz at least partially regional and 3600-3800 MHz mostly regional	1
Regional	13

The main argument put forth for awarding nationwide rights of use was the business model in Austria (for example that used in mobile telecommunications or by the national provider of wholesale services) and the accompanying advantage of more efficient frequency use. On the other hand, those in favour of awarding regional licences for the 3400-3800 MHz range argue that a nationwide award would preclude the acquisition of these frequencies by (previously existing) regional providers and deprive them of the basis for staying in business. This is seen from a legal perspective as a highly dubious case of unfair treatment to the disadvantage of this group of providers. It is also emphasised that a regional award "would not be a disadvantage for anyone". It would not hinder individual providers from bidding in the auction to acquire frequencies spanning regions. Conversely, a nationwide award would exclude providers with a regional business model from the award.

With regard to regional structuring, the most support was identified for structuring along the lines of the federal states of Austria (cf. Table 6). The reasons given were that structuring according to federal states was easy to implement and "could be managed economically". Borders matching the federal states were also preferred due to the favourable topographical conditions (mountains), considering how radio waves propagate. Another aspect stated was that regional structuring based on federal states was compatible with certain branches of the industry and presented regional providers with a good opportunity to acquire frequencies.

[20] Refer to the results of the Consultation on Future Frequency Awards, which can be viewed on the RTR website.

Table 6: Which regions in the 3400-3800 MHz range (consultation on the Spectrum Release Plan)?

Which regions?	First preference	Second preference	Third preference
Federal states	14		
Administrative borders in sparsely populated areas	1		
18 current frequency regions		6	
14 consolidated frequency regions			4
6 original frequency regions		1	

For the auction in Ireland, rural and urban regions were designated, with demand in the two regional categories subsequently seen to differ strongly.[21] Both the consultation on the Spectrum Release Plan and industry talks did in fact reveal that the demand for (incremental) spectrum among individual demanders varied highly for the two regional categories. In particular, the demand on the part of mobile service providers for (incremental) spectrum in urban areas is probably higher. This is confirmed not only by the results of the Irish auction but also by the current coverage areas for frequencies assigned within the 2.6 GHz band – a band with comparable propagation characteristics – which are largely limited to urban areas. Considering these facts, in addition to a concept of regions determined largely based on consultation input, the regulatory authority also wishes to put out for discussion models which, drawing from the auction in Ireland, provide for a stronger distinction between rural and urban areas, while nonetheless using the federal state boundaries as a general basis.

[21] Cf. the results of the auction in IE, which can be viewed on the Comreg website.

The following types of regional structuring are therefore conceivable in the regulatory authority's view:

- Option 1: nationwide rights of use
- Option 2: federal states, with Vienna and Lower Austria combined into one region (8 regions)
- Option 3: 9 federal states (excluding Graz and Linz), with two separate urban regions of Graz and Linz (11 regions)
- Option 4: Rural and urban regions based on administrative boundaries (8-10 regions; see the table below)

Table 7: Regional packaging – option 4

Region	Area
1 (eastern urban)	Vienna (+ possibly St Pölten)
2 (eastern rural)	Lower Austria + Vienna + Burgenland, excluding Region 1
3 (northern urban)	Linz (+ possibly Wels)
4 (northern rural)	Upper Austria excluding Region 3
5 (western urban)	City of Salzburg + Innsbruck (+ possibly Bregenz)
6 (western rural)	Salzburg + Tyrol + Vorarlberg excluding Region 5
7 (southern urban)	Graz + Klagenfurt (+ possibly Villach)
8 (southern rural)	Styria + Carinthia excluding Region 7

Prior to defining regional structuring, the regulatory authority wishes to again survey market participants' opinion.

5.4 Consultation questions

Question 5.1: What lot sizes do you prefer (option A with 10 MHz or Option B with 20 MHz)? Please provide business and technical arguments for your preference. What lot size would you disapprove of in any case? Please provide business and technical arguments.

Question 5.2: The regulatory authority tentatively proposes two product categories of abstract lots (per region) in the prncipal stage: one category for lots in the 3410-3600 Hz range and the second for lots in the 3600-3800 MHz range. Do you agree with this proposal? How many categories (per region) would you propose? Please provide business and technical arguments for your preferences.

Question 5.3: What are your preferred uplink to downlink ratios (0-6) for synchronous operation (see Table 3)? Indicate your first and second preferences and give reasons for them (for example by including traffic evaluations).

- First preference for UL/DL ratio (0-6):
- Second preference for UL/DL ratio (0-6):

Question 5.4: Which types of geographical structuring do you prefer (option 1, 2, 3 or 4)? Please provide business and technical arguments for your preference. Which types of geographical structuring would you disapprove of? Please provide arguments. If you prefer option 4, you are invited to submit proposals for defining the boundaries of rural and urban regions.

Question 5.5: Which of the following options for product design do you prefer (A.1.1 to B.2.4)? You may also state more than one and include an order of preference (1 = first preference, 3 = third preference).

Options:	Lot size	Product categories (per region)1	Region	Lots per product category (per region)	Preference (1, 2, 3)
A.1.1	Option A 10 MHz	2	Option 1 Nationwide	18-19/ 20	
A.1.2	Option A 10 MHz	2	Option 2 8 federal states	18-19/ 20	
A.1.3	Option A 10 MHz	2	Option 3 8 federal states and 3 cities	18-19/ 20	
A.1.4	Option A 10 MHz	2	Option 4 Urban and rural regions	18-19/ 20	
B.1.1	Option B 10 MHz	2	Option 1 Nationwide	9/ 10	
B.1.2	Option B 10 MHz	2	Option 2 8 federal states	9/ 10	

Options:	Lot size	Product categories (per region)1	Region	Lots per product category (per region)	Preference (1, 2, 3)
B.1.3	Option B 10 MHz	2	Option 3 8 federal states and 3 cities	9/ 10	
B.1.4	Option B 10 MHz	1	Option 4 Urban and rural regions	9/ 10	
A.2.1	Option A 10 MHz	1	Option 1 Nationwide	38-39	
A.2.2	Option A 10 MHz	1	Option 2 8 federal states	38-39	
A.2.3	Option A 10 MHz	1	Option 3 8 federal states and 3 cities	38-39	
A.2.4	Option A 10 MHz	1	Option 4 4 urban and 4 rural regions	38-39	
B.2.1	Option B 10 MHz	1	Option 1 Nationwide	19	
B.2.2	Option B 10 MHz	1	Option 2 8 federal states	19	
B.2.3	Option B 10 MHz	1	Option 3 8 federal states and 3 cities	19	
B.2.4	Option B 10 MHz	1	Option 4 4 urban and 4 rural regions	19	

[1] One category per region means that the lots in both bands fall into one category. If a bidder won a lot in the first stage, that bidder would not yet know whether frequencies in band 42 or band 43 would finally be awarded. Two categories are required to avoid any uncertainties in this regard.

6 Other conditions of use

6.1 Period of use

The TKK pursues a number of goals in setting the validity period for rights of frequency use. A specific example is that all frequency usage rights within one band should expire at the same time (to allow the introduction of new technologies, and similar considerations). Within this award process, this applies to not just one but both of the bands concerned (3.4 to 3.6 GHz and 3.6 to 3.8 GHz).

Alongside this consideration, the regulatory authority assumes that an auction will be held in regular intervals (roughly every five years) to allow adaptation of capacities as well as new market entries and to be able to accommodate possible changes in technology. The licence period for all bands should be set between 15 and 25 years, depending on when the rights for other frequencies expire.

While we generally recognise an advantage in combining coverage and capacity spectra in one award, in this case it is not useful or relevant: combining this award with the 800 and 900 MHz band would result in a (too) brief licence period (10 or 15 years), while a combination with the 700 MHz spectrum would be very difficult since it is already planned to jointly award this band with the 1.5 GHz (core) band and the 2.1 GHz band.

Moreover, combination with substitutes is a goal in every auction. In view of this, the regulatory authority proposes a common expiry date for the 3.4 to 3.6 GHz and the 3.6 to 3.8 GHz ranges.

The rights to use the other mobile bands have been granted for the periods listed below:

- 2.6 GHz until 31 December 2026
- 450 MHz until 31 December 2029
- 800 MHz until 31 December 2029
- 900 MHz and 1800 MHz until 31 December 2034

We specifically propose the following periods of use for the 3.4 to 3.6 GHz and the 3.6 to 3.8 GHz bands:

- Period for 3.4 to 3.6 GHz begins as of 1 January 2020 (since the currently valid rights to use this range have been granted until 31 December 2019)
- Period for 3.6 to 3.8 GHz begins as of assignment with legal effect (by official decision)
- 31 December 2039 is proposed as the common expiry date for the entire 3.4 to 3.8 GHz range.

The period for the 3.4 to 3.6 GHz range would thus be 20 years and for the 3.6 to 3.8 GHz range approximately 21.5 years (depending on the specific date when assignment becomes effective).

6.2 Minimum bid

Art. 55 Par. 4 TKG 2003 allows for the tender documentation to include details of the minimum frequency licence fee that may be bid. These details are required to be based on the frequency assignment fees that are expected to be charged for the assigned frequencies.

The frequency assignment fees are specified in the Telecommunications Fee Ordinance (*Telekommunikationsgebührenverordnung*, TKGV). Where reasons exist, the authority can depart from the rule of defining the minimum bid based on the frequency assignment fees, specifically where this appears justified considering the actual market value of the frequencies.

If the regulatory authority does not set the minimum bid based on the assignment fee, the authority is required in any case to set the bid based on national and international reference values (explanatory comments on Art. 55 Par. 4).

The TKGV as amended in Federal Law Gazette II No. 108/2011 specifies the following:

"When assigning frequencies for telephone networks as referred to in Art. 3 No. 18 TKG 2003 for the purpose of providing a public service via mobile telecommunications and when assigning frequencies for wireless networks as referred to in lit. A No. IIIb by the telecommunications authorities (Art. 54 Par. 3 No. 3 TKG 2003), the assignment fee for each multiple and each partial multiple of 25 kHz of assigned spectrum shall be

1. EUR 207 for a local area of use (up to a maximum of 500,000 residents covered)

2. EUR 1,031 for a nationwide area of use

3. EUR 618 for an area of use other than that specified in No. 1 or No. 2"

Basing the fee on the TKGV would result in the following minimum bids for the frequency usage rights currently to be awarded:

Table 8: Minimum bid pursuant to the TKGV

Region		Price per 10 MHz lot	Price of 100 MHz
Nationwide licence		EUR 412,400	EUR 4,124,000
Region residents	<500,000	EUR 82,800	EUR 828,000
Region residents	>500,000	EUR 247,200	EUR 2,472,000

If the frequencies were packaged for all of Austria, the minimum bid for the two bands together (390 MHz) would be EUR 16,083,600, for example. Were the spectrum to be packaged by region, the figures in the table above for the region in each case would be used, with the minimum bid increasing depending on the number and sizes of the regions. With regional packaging, the amounts specified in the TKGV result in high minimum bids and price discrepancies. For example, in the case of regional packaging a minimum bid of about EUR 80 million would result for option 3 and roughly EUR 57 million for option 4. What is more, the minimum bids for a region with slightly over 500,000 residents would be equally as high as for a region having 1.8 million residents, for example.

While the regulatory authority considers it appropriate in principle to base the minimum bid in this award on the TKGV, certain factors would nonetheless seem to favour deviation from the figures specified in the TKGV; these include price discrepancies and minimum bids in the case of regional packaging as well as prices not conforming with the market, which could result from narrowly spacing caps in a clock auction with clinching.[22] *In this case the regulatory authority is required to use national and international reference values as a basis. Examples of benchmark market values would include the auction of spectrum in the 3.4 to 3.8 GHz range held in Ireland this year as well as revenues from other auctions of high frequency spectra (for example 2.6 GHz auctions), whereby setting a conservative value for the minimum bid seems appropriate due to the small number of directly comparable auctions. On the other hand, no justification is found for setting the value below the minimum bid specified by the TKGV for nationwide use. A higher minimum bid might need to be considered if a clock auction with clinching* were held.

The regulatory authority has calculated an average of differing reference values based on the 2.6 GHz auctions in Europe and the 3.4 GHz to 3.8 GHz auctions in Ireland and Romania. This mean value is 0.0393 €/MHz/resident. The regulatory authority invites the market participants to submit estimates as to how high the minimum bid should be set in comparison with the average of the reference values indicated above.

[22] Cf. the separate report entitled “Options for Product and Auction Design”.

6.3 Coverage requirements

In the context of awarding frequency usage rights, coverage requirements can be used to pursue various regulatory goals. The two most important goals are to ensure the effective use of the acquired frequencies (award goal 2) and to improve coverage of the population (award goal 5). By making strategic purchases of spectrum more costly, coverage requirements can help hinder such a strategy. At the same time, in the context of the federal government's 5G strategy, 5G can be viewed as an explicit goal in coverage. Another goal that can be defined is to give priority to end user services (over applications used in internal operations).

Imposing coverage requirements also entails potential risks and costs.

- Coverage requirements can exceed intended goals and consequently lead to socially undesirable infrastructure investments (inefficient replication of infrastructure) or prevent a company from covering its long-term needs to an efficient extent. In an extreme case, coverage requirements can be associated with such high costs that individual frequencies are not accepted by the market.
- Coverage requirements can have a negative impact on profitability without being offset by corresponding social utility.
- Coverage requirements are associated with regulatory costs (for example for monitoring compliance) which vary depending on the particular model.
- Coverage requirements can potentially squeeze out certain provider groups and business models.

The regulatory authority views it as necessary to weigh advantages, disadvantages and risks when defining appropriate coverage requirements.

Coverage requirements can be defined in different ways. The regulatory authority has identified the following potential kinds of coverage requirements:

- Related to the extent
  - Population supplied with services – conventional population coverage
  - Quantity of infrastructure elements such as base stations
- Related to geography
  - Nationwide
  - Federal state
  - Free definition of regions
- Quality parameters
  - Bandwidth

The regulatory authority views the two complementary variants of coverage requirements listed below as useful in the case of the pending award of frequency usage rights:

1. Basic requirement: Coverage requirements to ensure use of the frequencies (cf. table below).

   Table 9: Basic coverage requirement

Nationwide	Region
150 base stations	5 to 25 base stations

   This coverage requirement is aimed exclusively at ensuring use of the frequencies (award goal 2). It does not contribute to 5G coverage of the population and is independent of the amount of spectrum. Only base stations with connected end users count (no exclusively internal use). This coverage requirement will be imposed on each provider acquiring frequencies in the 3400-3800 MHz range. The figures are to be set for each region depending on the regional packaging option and the number of residents.

2. Coverage requirements to improve 5G coverage **in addition** to basic coverage.

   This coverage requirement is intended to support the federal government's 5G strategy, whereby due to the characteristics of the frequencies the regulatory authority is concentrating on the use case of enhanced mobile broadband and is focusing on the federal state capitals (including Vienna).[23]

   In the regulatory authority's view, a nationwide network operator with more than 80 MHz should provide about 30% of the population with coverage. Normally the regulatory authority refers to the centre point of the grid cell as the coverage point. If that point is covered, the resident population within that cell is considered covered. Any one point within a grid cell is considered covered where uplink bandwidth of 20 Mbps and a downlink of 20 Mbps are available.

   Appropriate adjustment needs to be made in the event of regional packaging as referred to in options 2 to 4, in which case the regulatory authority would apply this requirement only to regions in which a federal state capital is situated and the network operator acquires more than 80 MHz. In this case the network operator would have to supply coverage to a number of residents equivalent to 80 to 90% of the population residing in the federal

[23] Various use cases in the context of 5G have been defined. Aside from enhanced mobile broadband, these include massive internet of things and mission critical control.

state capitals situated within that operator's licence territory.[24] In other words, the requirement need not be met exclusively in the federal state capitals.

6.4 Infrastructure sharing

The previous position paper on infrastructure sharing[25] is currently under revision. In previous award procedures, coverage requirements presupposed a network operated directly by the provider.[26] A more far-reaching coverage requirement than that imposed in the most recent multiband auction has to be ruled out on account of the unfavourable propagation characteristics of the frequencies to be awarded. Based on expected usage, any possible infrastructure sharing could support densification of cell networks (small cell deployment) or take place in view of the expected 5G network rollout.

In the course of this consultation, the regulatory authority wishes to collect information relevant to the frequencies in question that relates to infrastructure sharing (cf. the questions in Section 6.6).

6.5 Spectrum sharing

The European Commission as well as a number of regulatory authorities (such as the FCC and OFCOM) have set the goal of improving the efficiency of frequency use by encouraging multi-user joint use of spectrum. In the previous consultation on the Spectrum Release Plan, the regulatory authority and BMVIT jointly proposed secondary use of spectrum (on the basis of non-interference and non-protection) in areas not used, specifically through temporary applications such as wireless cameras. Various sharing models are under discussion in the US that would permit the coexistence of different broadband uses in the 3.5 GHz range (Citizens Broadband Radio Service).[27] Commission Implementing Decision 2014/276/EU also specifies assignment for terrestrial electronic communications networks on a non-exclusive basis.[28] An amendment of the TKG 2003 would probably be necessary in order to allow certain forms of joint use.

To underscore the significance of this topic, we cite here by way of example the 2.6 GHz band (a band with comparable propagation characteristics). The figure below, depicting current FDD use of the 2.6 GHz band, shows potential areas of use by a secondary user (in addition to current use by the licence holder). Here a radius of 15 km[29] has been drawn around each base station and the resulting circles merged. Only within the yellow areas would secondary use not be possible.

[24] A user purchases 100 MHz in Graz + Linz + Upper Austria (but not Styria) based on option 3. The user is then required to provide coverage to 80 to 90% of the total population of Graz and Linz, but not only to residents of Graz and Linz.

[25] https://www.rtr.at/de/tk/TKKPosition2011

[26] Cf. the decision on the multiband auction.

[27] Cf. FCC website on 3.5 GHz / Citizens Broadband Radio Service (https://www.fcc.gov/rulemaking/12-354)

[28] Cf. https://www.rtr.at/en/tk/Spectrum3600_3800MHz/1999_2014_276_EU_en.pdf

[29] The actual broadcasting range of a 2.6 GHz base station is considerably smaller than 15 km and depends on the specific configuration and surroundings of the base station.

According to the regulatory authority's knowledge, the TDD range is not in use at all and could be deployed throughout Austria.

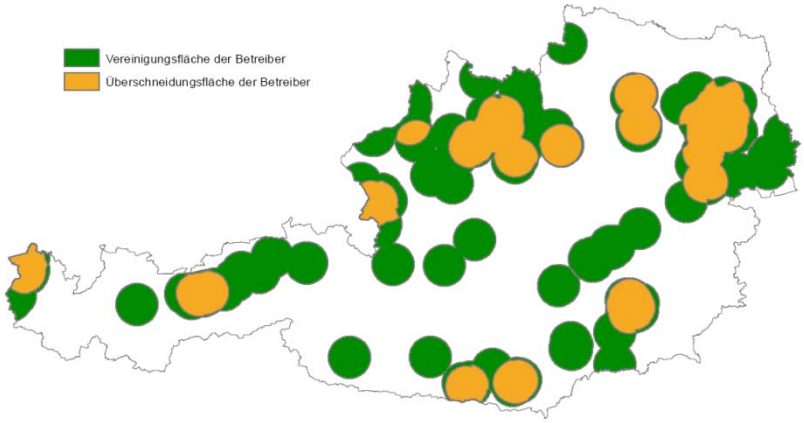

Figure 3: Potential for spectrum sharing in the 2.6 GHz range (FDD)

A number of frequency authorities are discussing various sharing models. The following four models would be conceivable for this band:

- Commercial leasing model: In this case the licence holder would lease spectrum to a secondary user (based on Art. 56 TKG 2003). The regulatory authority would prefer this model for various reasons (optimum interference frame, investment security for secondary users and no regulatory costs). Yet the question is whether such an agreement could be reached. The licence holder's interest in avoiding any long-term commitment (the hold-up problem) makes this seem unlikely.
- Two-tier model (primary and secondary users): In this case secondary users would be allowed to use frequencies as long as they do not interfere with the licence holder. Depending on the type of secondary use, coordination procedures of varying complexity are required by the frequency authority. Such procedures might possibly lead to delays (of several months), preventing frequency use by the licence holder. Any such temporary restrictions would in any case need to be considered in the requirements and disclosed by the date of the auction. Aside from the regulatory costs, the main disadvantage of this model is the lack of investment security for long-term secondary use. This model could in any case be considered for temporary frequency use by wireless cameras. Positive responses to this effect were given during the consultation on the Spectrum Release Plan.[30] Another consideration is the efforts put forth by a number of frequency authorities and the industry to developing sharing models and technologies that permit shared use without mutual interference. The regulatory authority views it as helpful in any case to define the usage rights for these frequencies

[30] Cf. the results of the consultation on the Spectrum Release Plan, which can be viewed on the regulatory authority's website.

in such a way that would allow these models to be applied in future, especially considering the frequency assignment period of 20 years.

- Compulsory spectrum sharing: During the industry discussions, one mobile network operator proposed imposing a condition requiring access to spectrum to be given to regional broadband providers as a way of avoiding regional packaging. The regulatory authority anticipates that such a condition would lead to high regulatory costs (price-setting, deciding on the user with priority in cases of dispute, and other costs). In the regulatory authority's view, such a condition would only be justified if it could solve a major competition challenge, which, however, would not seem to be the case.[31]
- Unlicensed use: For the sake of completeness, mention is also made of unlicensed use (the sharing model par excellence), which offers the advantage of highly simplified access to spectrum and thus could generate considerable potential for small innovative businesses. At present, the specifications in the frequency plan (currently) preclude any unlicensed use in this frequency range. A decision on this matter does not lie within the regulatory authority's sphere of competence.

6.6 Consultation questions

Question 61: What is your opinion of the proposed period of use? If you have an alternative proposal, please provide corresponding arguments.

Question 6.2: In the event of regional packaging, what rules should the regulatory authority follow in specifying the minimum bid? In the event of nationwide rights of use, what rules should the regulatory authority follow in specifying the minimum bid? Please provide legal and business arguments for the proposal.

Question 6.3: Which coverage requirements would you consider effective? Please provide business and technical arguments for your proposal. Please list important parameters of the coverage requirement and explain how they should be selected. How in your opinion should compliance with the requirements be verified?

Question 6.4: Which of the infrastructure sharing models could become relevant in the context of this spectrum?

Question 6.5: In view of the current position paper, what barriers exist to sharing and how could these be overcome?

Question 6.6: In view of the licence requirements (refer for example to the multiband auction), what barriers exist and how could these be overcome?

Question 6.7: In the context of this frequency award procedure, does the requirement regarding an independently operated network limit you in any way in achieving cost-savings or in improving the quality of service? If so, please provide details.

[31] Cf. the separate report entitled "Options for Product and Auction Design".

Question 6.8: What potential for spectrum sharing do you envisage? What in your view are the pros and cons of the various models? In this regard the regulatory authority is particularly interested in responses from potential secondary users.

7 Auction design

7.1 Auction formats

The regulatory authority commissioned DotEcon with preparing a product and auction design for the pending award procedure. The separate report entitled "Options for Product and Auction Design" contains a description of the auction methods coming under consideration and the pros and cons of these formats.

To ensure that contiguous spectrum within one band is assigned to the bidders, the auction procedure should generally be conducted in two stages, whereby the first stage would take place with abstract lots to determine the bidders that would receive certain amounts of spectrum within specified bands and in specified regions (principal stage), while the specific frequencies would then be assigned to spectrum winners in the second stage (assignment stage).

The formats listed below generally come under consideration for the principal stage:

- Simultaneous multi-round auction (potentially in a hybrid form involving the use of elements from the clock auction to speed up auction progress)
- Simple clock auction
- 'Clock plus' variants, i.e. employing various bid restrictions to reduce the risk of unsold lots
- Clock auction with 'clinching', format proposed by H3A in which lots are awarded early on in individual clock rounds
- Combinatorial clock auction (CCA)
- Combinatorial multi-round auction (CMRA), first used in the 1800 MHz auction in Denmark

A sealed bidding procedure with prices based on opportunity costs is suitable for bidding in the assignment stage. The rules applying in the assignment stage guarantee that contiguous spectrum is assigned within each band and in each region, while furthermore ensuring a minimum number of potentially unusable frequencies as well as the assignment to bidders of the same frequencies across regions whenever possible.

For a description and evaluation of the specific designs, we refer to the separate report entitled "Options for Product and Auction Design".

7.2 Measures safeguarding competition

One of the main goals of the TKK in awarding the spectrum is to ensure and encourage effective competition (award goal 2). To achieve this, the tools listed below are available to the TKK:

- Spectrum caps can be used to prevent a network operator or a group of network operators from acquiring too much spectrum and therefore a dominant position. Spectrum caps can be defined for individual bands and for groups of bands (for example for all frequency bands). By defining very narrow caps, spectrum can be implicitly reserved.
- Spectrum can be implicitly reserved by means of competition constraints (spectrum floors), ensuring that a minimum number of network operators have a minimum number of frequencies. This concept can only be implemented as part of auction designs involving a method of identifying winners, such as a combinatorial clock auction (CCA), and requires the normative determination of minimum spectrum portfolios for each (type of) network operator.
- The TKK also has the option of explicitly reserving (or setting aside) spectrum for certain groups of network operators (for example new entrants or very small operators). Reserving spectrum is a measure with far-reaching impact and is justified only where a corresponding lack of competition exists.
- Reserving spectra can be supplemented by additional measures to support new entrants, potentially compensating for the disadvantages of entering the market at a later date (entry assistance). These include, for example, obliging existing network operators to provide new entrants with temporary access to their networks especially in rural areas (i.e. national roaming, site-sharing or other measures).

In choosing measures to ensure competition, prime consideration is given to potential competition challenges.[32] The regulatory authority has identified three potential competition challenges (competition problems) with relevance for the present award procedure:

- Fewer than three effective competitors in the mobile market (entailing the risk of only one or two bidders successfully acquiring spectrum for 5G services)
- Excessively asymmetric spectrum assignment
- Negative impact on intermodal broadband competition

The risk of the competition challenge materialising in the auction is analysed in a second step. Here the regulatory authority bases assessment on the usual criteria for economic competition:

[32] A detailed analysis is found in Appendix 2.

- Is one company (unilaterally) or are several companies jointly (through coordinated action) capable of limiting competition through a strategic purchase of frequencies in the auction?
- Do (unilateral or coordinated) incentives exist for the company or companies to pursue such a strategic purchase? Do the expected gains exceed the costs?

Based on an initial, preliminary assessment, the regulatory authority recognises a relevant risk that the competition challenges mentioned above will materialise in the auction.[33]

In a third step, eight options for measures to ensure competition are initially evaluated based on the usual criteria related to regulatory measures, while taking into account industry proposals:

- How effectively could the measure help contain the potential competition challenge?
- Is the measure the mildest form of intervention?
- Is the measure proportionate?

The following options for spectrum caps were examined:

- Option 1: symmetric spectrum cap of 260 MHz (67% of the 3.4-3.8 GHz range)
- Option 2: symmetric spectrum cap of 180 MHz (46% of the 3.4-3.8 GHz range)
- Option 3: spectrum cap of 140 MHz for A1 and 180 MHz for all other bidders
- Option 4: symmetric spectrum cap of 160 MHz (41% of the 3.4-3.8 GHz range)
- Option 5: spectrum cap of 140 MHz for A1 and 160 MHz for all other bidders
- Option 6: symmetric spectrum cap of 140 MHz (36% of the 3.4-3.8 GHz range)
- Option 7: symmetric spectrum cap of 120 MHz (31% of the 3.4-3.8 GHz range)
- Option 8: symmetric spectrum cap at 100 MHz (26% of the 3.4-3.8 GHz range)

An initial, preliminary evaluation by the regulatory authority has shown that options 6 to 8 are not the mildest form of intervention and thus not proportionate (cf. Table 10). Options 1 and 2 are not effective, not being suited to avoiding the potential competition challenges. In regard to the other three options, some uncertainty remains in relation to the relevance of the three potential competition challenges and the underlying assumptions. Specifically, in the regulatory authority's view, option 3 would only be effective if the risk of A1 becoming the victim of a squeeze-out strategy were judged as minimal, while option 4 might possibly be ineffective for addressing the third competition challenge, depending on the assumptions one

[33] A detailed analysis is found in Appendix 2.

makes. Option 5, meanwhile, could be excessive because it does not represent the mildest form of intervention. Beyond this, special justification is required for asymmetric caps (options 3 and 5).[34] [35]

Table 10: Preliminary evaluation of spectrum options

Cap options	Evaluation
1: 260 MHz for all	Not effective
2: 180 MHz for all	Not effective
3: 180 MHz for all, 140 MHz for A1	Possibly ineffective against first competition challenge; possibly disproportionate
4: 160 MHz for all	Possibly ineffective against third competition challenge
5: 160 MHz for all, 140 MHz for A1	Effective but possibly disproportionate
6: 140 MHz for all	Disproportionate
7: 120 MHz for all	Disproportionate
8: 100 MHz for all	Disproportionate

With this consultation, the regulatory authority wishes to engage with potential bidders and the industry in order to achieve a better appreciation of the relevance of the specific competition challenges and an evaluation of the options. Based on these insights, the regulatory authority will select the particular option that is suited to addressing the potential competition challenges while at the same time representing the mildest form of intervention and qualifying as a proportionate measure.

7.3 Consultation questions

Question 7.1: In the event of regional packaging, which auction format would you prefer? Please give reasons why this format is better suited than the other formats to meeting the award goals. You may also make suggestions for key design parameters. Please provide arguments for your suggestions by referring to the award goals.

[34] If either a CCA were to be employed, with the price rule common for this format (minimum core price rule), or a clock auction with clinching, asymmetric caps would be very problematic given the asymmetric effects on pricing.

[35] A detailed discussion is found in Appendix 2.

Question 7.2: In the event of regional packaging, which auction formats would you oppose? Please give reasons why these formats are not well suited to meeting the award goals.

Question 7.3: In the event that nationwide rights of use are awarded, which auction format would you prefer? Please give reasons why this format is better suited than the other formats to meeting the award goals. You may also make suggestions for key design parameters. Please provide arguments for your suggestions by referring to the award goals.

Question 7.4: In the event that nationwide rights of use are awarded, which auction formats would you oppose? Please give reasons why these formats are not well suited to meeting the award goals.

Question 7.5: Do you agree with the regulatory authority's conclusion that a method similar to that used in the last two auctions (2.6 GHz and multiband) should be used for the assignment procedure? If not, please give your reasons and indicate a suitable alternative procedure by referring to the award goals.

Question 7.6: Do you have any comments or recommendations related to defining assignment options?

Question 7.7: Do you agree with the regulatory authority's evaluation concerning potential competition challenges? Please provide business arguments as to why you consider these challenges to be relevant or irrelevant, referring to facts and figures to support the arguments.

Question 7.8: Of which of the eight options for measures to ensure competition are you in favour or not in favour? Please give reasons why the options meet or fail to meet the stated requirements applying to regulatory measures?

8 Statements

Statements (in German or English) need to be emailed to tkfreq@rtr.at by 15 September 2017.

Please use the cover sheet below.

RTR will publish a summary (without naming organisations or individuals) of all the statements received. Additionally, a list of the organisations/individuals that submitted statements for the consultation and consented to disclosure of the organisation/individual will be published.

If requested, the complete individual statements will be published as well.

APPENDIX 1

to the Consultation
on the 3.4-3.8 GHz

Award Procedure

Cover Sheet

Cover sheet – statement for the consultation on the 3.4 to 3.8 GHz frequency award

General information

Statement submitted by:

Represented by (if applicable):

Postal address:

E-mail address:

Confidentiality

Please indicate whether your statement is confidential and, if so, which parts, while providing reasons:

Non-confidential	☐	Name/Contact information/Profession	☐
Contents of the statement are confidenti	☐	Organisation	☐
Passages of the statement are confidenti	☐	In this case we request you to additionally submit an appropriately redacted version of the document that you consider suitable for publication.	

RTR will publish a summary (without naming organisations or individuals) of all the statements received. Additionally, a list of the organisations/individuals that submitted statements for the consultation and consented to disclosure of the organisation/individual will be published.

Declaration

I hereby confirm that this communication is a formal statement within the framework of the current consultation and that the statement may be published by RTR subject to any confidentiality requests indicated above. When submitting the statement by e-mail, any standard e-mail texts concerning the confidentiality or disclosure of e-mail contents (including any attachments) will not be considered relevant by RTR for the case of publication.

Name: Signature:

RTR

APPENDIX 2

to the Consultation
on the 3.4-3.8 GHz
Award Procedure

Measures Safeguarding
Competition