

Consultation

for the Award of Spectrum Use Rights in the 2300 MHz and 2600 MHz Ranges

NON-BINDING TRANSLATION

Telekom-Control-Kommission and RTR-GmbH

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Table of contents

1	Introduction	4
2	Award objectives	5
2.1	Consultation questions	6
3	Spectrum bands	7
3.1	2300 MHz band	7
3.2	2600 MHz band	7
4	Limitation by number	10
4.1	Introduction	10
4.2	2300 MHz band	12
4.3	2600 MHz band	12
4.4	Other ECS bands	15
4.5	Consultation questions	15
5	Competition	16
5.1	Spectrum caps	16
5.2	Retail competition and MVNOs	16
5.3	Infrastructure sharing	17
5.4	Consultation questions	17
6	Selection procedure	19
6.1	Introduction	19
6.2	Selection criteria	20
6.3	Legal requirements relating to the selection criteria	21
6.4	Efficient usage and distribution of spectrum	23
6.5	Assessment and validity of offers	25
6.6	Enforcement of commitments	25
6.7	Design of selection procedures	26
6.8	Selection procedure decision pursuant to Art. 15 TKG 2021	27
6.9	Consultation questions	28
7	Product and auction design	29
7.1	Technical terms and conditions of use	29
7.2	Lot structure and lot categories	32
7.3	Auction design	32
7.4	Period of use	32
7.5	Coverage obligations	34
7.6	Obligations to ensure resilience	37



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7.7	Consultation questions	39
8	Statements.....	41
ANNEX 1	42
ANNEX 2	44
ANNEX 3	46

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1 Introduction

Authored jointly by the Telekom-Control-Kommission (TKK) and RTR-GmbH (RTR), this consultation primarily addresses potential users of spectrum in the 2.3 GHz and 2.6 GHz bands. The consultation serves as a basis for preparation, among other things for the various decisions to be made by ordinance and for the award procedure. Decisions to be taken include any definitions of limitations by number pursuant to Art. 14 Par. 1 of the Telecommunications Act 2021 (TKG 2021) as well as selection procedures pursuant to TKG 2021 Art. 15 Par. 1. The 2022–2026 Spectrum Release Plan published in February 2022 had scheduled the assignment of the above-mentioned spectrum for 2025. At the time of publication, a joint award of the two bands was still dependent on the availability of spectrum in the 2.3 GHz range. This spectrum has now been allocated for terrestrial systems capable of providing electronic communications services, as specified in the 2013 Frequency Utilisation Ordinance (FNV 2013) published by the Federal Ministry of Finance. Pursuant to Art. 11 Par. 4 TKG 2021, it has also been specified that the assignment of this sub-band should be limited by number. Accordingly, the regulatory authority is competent to award spectrum in the 2300 MHz to 2360 MHz range.

As of this writing, the TKK assumes that a consultation on the tender conditions can be held in the third quarter of 2025. The tender could thus take place in autumn 2025, with the auction then beginning in the first quarter of 2026. In the event, however, of delays not lying within the regulatory authority responsibility, the authority reserves the right to alter this plan accordingly.

In the following the TKK and RTR consult with stakeholders on the key terms of the award procedure. The consultation will involve the presentation of considerations relating to key issues. Apart from preparing the ordinances as stated pursuant to Art. 14 Par. 1 TKG 2021 and Art. 15 Par. 1 TKG 2021, as well as the product and auction design, the regulatory authority also wishes to address the topic of competition.

Statements are to be e-mailed to tkfreq@rtr.at by 14 February 2025. Please use the cover sheet template (Annex 1). Additionally, a list will be published of the organisations/individuals that submitted statements for the consultation and consented to disclosure of the organisation/individual. If requested, the individual statements will be published in full as well. Independently of this, a summary of the statements can be published.

2 Award objectives

The regulatory authority has defined the following award objectives:

- Legal certainty
- Ensure efficient spectrum use
- Safeguard/promote effective competition
- Promote coverage and service quality
- Promote innovation and business development

A core objective of the award is ensuring the efficient utilisation of spectrum. The frequencies to be awarded are categorised as capacity spectrum, which is deployed in particular in regions with high levels of traffic. A glance at current levels of usage in the 2.6 GHz frequency range reveals significant differences in current usage (and therefore in demand) from one network operator to another. Assigning frequencies based on demand and thus on economic efficiency is a fundamental goal of the award. The current band plan in the 2.6 GHz range envisages a mixed use of FDD and TDD for historical reasons. It now needs to be assumed that restricting usage to TDD for the entire band (band 41) could prove to be more efficient. There are a number of obstacles to a short-term changeover, however. These include general regulatory conditions, irreversible investments, business continuity and a lack of coordination for TDD-only usage at the boundaries, resulting in suboptimal usage. With this award, the regulatory authority nonetheless wishes to lay the groundwork for a potential changeover to TDD in the long term, to promote the goal of efficient spectrum use.

Another core objective of the award is safeguarding and promoting effective competition. Economically efficient assignment is conditional on bidders bidding in line with their intrinsic assessment, with strategic assessments effectively playing no part in this process. Strategic assessment is most strongly driven by anti-competitive incentives (e.g. strategic purchase of spectrum with the aim of suppressing competition). This tendency must therefore be contained through measures capable of safeguarding competition. Essentially, the aim is to prevent a distribution of frequencies that is harmful or not conducive to competition in the mobile and broadband markets. Obligations may need to be imposed to promote competition at the wholesale and consumer level (e.g. coverage obligations or rules on network access).

A third goal relates to promoting coverage. The frequencies in question are not well-suited to providing cost-effective, wide-area coverage. Laying down requirements would therefore fail to help achieve to any substantial extent the wide-area coverage goals set by policymakers and regulators, and particularly the 5G connectivity goals from the European Commission's *Digital Decade Policy Programme* (DDPP). Furthermore, deployment relating to the coverage obligations from the 700/1500/2100 MHz award will still continue for several years. Accordingly, regions lacking long-term coverage as defined in the DDPP cannot be identified as of this writing. In the award, 250 MHz of capacity spectrum in the mid-band range with good but not outstanding propagation characteristics will be assigned. Noting the importance of efficient frequency usage, it should be ensured that this spectrum is not

purchased and hoarded for strategic reasons but is deployed in a way that benefits the population with higher data transmission rates. This applies in particular to regions where mobile broadband services are a decisive factor for competition in the broadband market. Recent crises and natural disasters have drawn public attention to the issue of resilience as it affects communications networks. The regulatory authority is proposing coverage obligations that not only accommodate these goals but also enable licence holders to design their deployment strategy to be flexible and primarily oriented towards demand.

In line with the objective of promoting innovation and business development, the regulatory authority wishes to use the award conditions to support as much as possible (e.g. through technology and service neutrality) a variety of business models and use cases. As one example, bidders should not acquire within one band a frequency portfolio that is too small for a cost-effective rollout or for offering innovative services.

Maximising auction income is expressly ruled out as an award objective. The regulatory authority also seeks to uphold climate targets, supporting relevant measures as part of the objectives defined for spectrum awards.¹

2.1 Consultation questions

Question 2.1: Which award objectives should be prioritised, in your opinion? Where could objectives give rise to conflicts? Please give reasons for your answer.

¹ Cf. Art. 21 Par. 5 TKG 2021

3 Spectrum bands

The planned award comprises the 2300 MHz and 2600 MHz spectrum bands.

3.1 2300 MHz band

In this spectrum band, the 2300–2360 MHz frequency range will be awarded for the first time.² The frequency range is unpaired, i.e. both the base station and the mobile user device send and receive alternately on the same frequency.

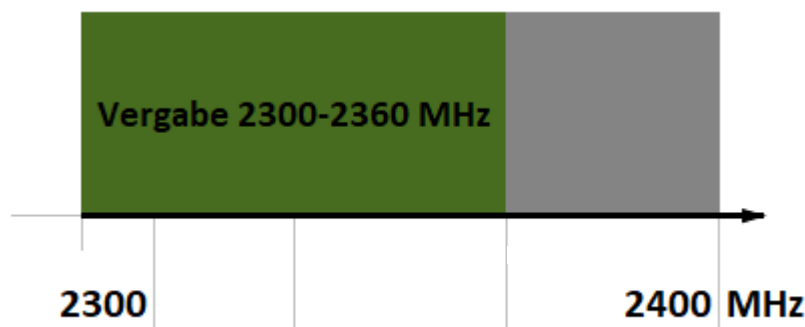


Figure: 2300 MHz TDD

The 3GPP refers to this use as band 40 for 4G, while the designation n40 is used for 5G.

3.2 2600 MHz band

The 2600 MHz band comprises the frequency range 2500–2690 MHz. This range has been previously awarded by procedure F 4/08 in 2010.³ Previous assignments expire on 31 December 2026.

In the previous award, the 2600 MHz band was split into two sub-bands, for FDD (paired range) and TDD (unpaired range), as shown below.

² The regulatory authority is not yet aware of any specific terms and conditions of use. As of this writing, the regulatory authority assumes that the entire range will be available for use soon after being awarded.

³ Information on the F 4/08 award procedure is available from https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/Frequenzvergabe_2600MHz_2010/FRQ_2600MHz.en.html.

3.2.1 Paired frequency range (2600 MHz FDD)

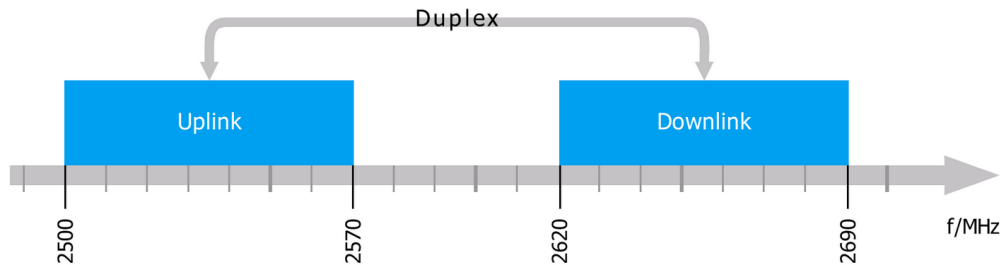


Figure: 2600 MHz FDD—paired frequency range

Further information about the paired frequency range is available from https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/bands/2600MHz_FDD/Spectrum2600MHzFDD.en.html.

The 3GPP refers to this use as band 7 for 4G, while the designation n7 is used for 5G.

3.2.2 Unpaired frequency range (2600 MHz TDD)

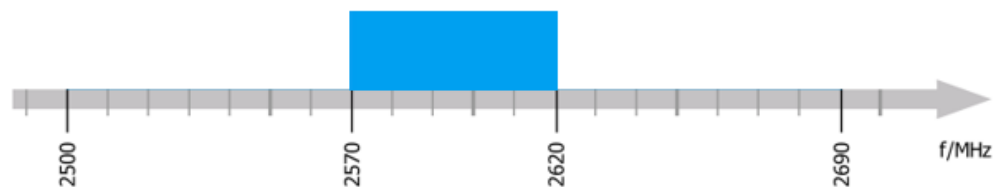


Figure: 2600 MHz TDD—unpaired frequency range

Further information about the unpaired frequency range is available from https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/bands/2600MHz_TDD/Spectrum2600MHzTDD.en.html.

The 3GPP refers to this use as band 38 for 4G, while the designation n38 is used for 5G.

3.2.3 Option—entire band unpaired (TDD)

The option of keeping the previous subdivision will be retained in principle for the new award. However, as discussed in section 7.1.4, within the medium term at least, the entire 2600 MHz spectrum could be used for TDD. This would require the following band plan:

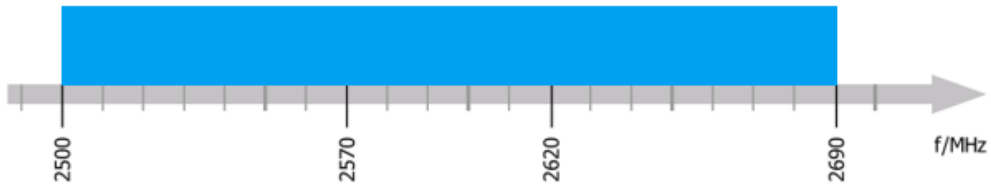


Figure: 2600 MHz fully TDD (unpaired)

The 3GPP refers to this use as band 41 for 4G, while the designation n41 is used for 5G.

4 Limitation by number

4.1 Introduction

The spectrum entrusted to the regulatory authority for assignment is envisaged for mobile and broadband use as part of electronic communications systems (ECS). In the EU, harmonised terms and conditions of use are being developed for this spectrum, both to ensure usage free of interference and to utilise economies of scale relevant for telecommunications equipment.

With a few exceptions (such as the 24.3–24.9 GHz range), most of the frequencies previously assigned for broadband and mobile use have been awarded in the form of nationwide usage rights (occasionally as regional usage rights in larger regions) using a selection procedure (auction). This spectrum assignment model (auction with nationwide usage rights) offers several advantages. First, it allows operators to use spectrum efficiently within their licence region (interference management) and provide (wide-area) coverage to the licence region. Second, this spectrum assignment model creates investment security for business models aimed at larger geographic areas, which incur significant (sunk) fixed costs (e.g. for backbone infrastructure, marketing, sales and distribution).

In contrast, frequencies that are not limited by number are assigned through a request procedure based on the first-come, first-served principle. On such a first-come, first-served basis, assignment follows the chronological order of requests received until available spectrum has been fully awarded (either for a certain site or for a certain region). If scarcity truly proved a problem (demand exceeds availability), the risks inherent in this procedure might jeopardise the TKG's strategic targets. Such a procedure is particularly unsuited to the assessment and objective evaluation of competing spectrum demands from potential users. This is because a request procedure using a first-come, first-served approach assigns spectrum solely according to chronological order.

Where no usage rivalry exists, first-come, first-served allows the entire (potentially local) demand to be met. This is because the (presumably local) demand does not exceed (local) supply. The smaller the geographic scale for the spectrum allocated or applied for, the less likelihood there is of usage rivalry. This means many local demand scenarios can potentially be met. The administrative procedure is therefore especially suited to local awards. An example here is the sub-range 24.3–24.9 GHz, and its envisaged real estate-based local usage model for campus networks and industrial use.

Yet, where demand for spectrum exceeds availability, such an assessment and evaluation of demand is critical for achieving the aims defined in the TKG. Decisions are required not only on the nature and number of spectrum users but also concerning the volume of spectrum each of these users will receive. A wide range of factors plays a role here (end-customer demand, market structure, business models, trade-offs between spectrum and investments in infrastructure etc.). Evaluation therefore requires a selection procedure aligned with the aims set out by the TKG 2021. This

ensures that the assignment of spectrum will secure the greatest benefits for end users.

It follows that a selection procedure can only be waived if long-term demand for spectrum does not in fact exceed availability, meaning demand for spectrum is so low that the frequencies cannot be considered a scarce resource. Such a situation was not to be expected previously, considering the rapid growth in demand for mobile (data) services, the resulting demand for suitable spectrum and the technical suitability of these frequencies, which are to be awarded, for providing these services.

The TKG 2021 envisages a broad-based and forward-looking assessment that is based on clear-cut criteria. Art. 14 TKG 2021 specifies as the main aims the benefits for end users, and the facilitation and promotion of competition. In addition to ensuring competition, the regulatory authority's assessment needs to account for the following criteria:

- Maximum user benefit
- Facilitation of competition
- Efficient use of spectrum
- Current and foreseeable future usages
- Foreseeable technical developments
- Duration of the expected spectrum assignment

The benefits accruing to users if a selection procedure is applied for assigning frequencies susceptible to usage rivalry have already been discussed. As have the benefits of a local application-based procedure in cases where sufficient frequencies are available for all (potentially regional and local) demand-side parties.

In terms of impact on competition, a nuanced view needs to be taken. On the one hand, a local application-based assignment procedure can have a positive effect on competition by eliminating barriers to market entry. But this presupposes sufficient availability of spectrum. If this is not the case, a selection procedure is more appropriate in order to achieve an efficient distribution of frequencies that promotes competition.

The assessment must consider current and foreseeable types of use. The coverage and licence regions necessary for these usages have a central role to play here. The larger the licence region, the greater the expected usage rivalry, so that an award by selection procedure recommends itself. In the extreme case, when assigning nationwide usage rights, operators even become rivals for spectrum for local usages (in Vienna and Vorarlberg, for example) within one frequency block, despite the geographic separation precluding interference. Which licence regions are necessary for the expected usages is therefore an issue to be examined. The issues of interference (see further below) and investment protection must also be properly addressed. Establishing a wide-area mobile communications network supportive of uninterrupted mobility requires long-term planning certainty and investment

protection, and therefore long-term, exclusive usage rights in larger regions. Such rights are not, in contrast, required with purely selective usage in hotspot areas.

Efficient use of spectrum constitutes another assessment criterion. In this context, the assessment must address whether efficient use of spectrum can be more readily assured with or without spectrum 'limited by number'. On the one hand, an administrative assignment procedure based on small units (local licensing) can increase usage density (multiple separate users) across a specific area, which can therefore lead to more intensive usage of available frequencies. With the entry of new users, this can also have a positive effect on competition. On the other hand, licensing for separate users requires the establishment of guard bands in order to ensure usage without interference. In affected regions, spectrum can be used only to a highly limited extent or not at all, which for example in heavily populated areas is potentially detrimental for the goal of efficient spectrum usage.

The assessment as to whether spectrum is limited by number is not based on a single point in time but must consider the spectrum assignment period in its entirety. European and international frequency assignment plans must also be taken into account in the context of foreseeable future use. These assignment plans materially affect future global demand for hardware and, as a consequence, the investment decisions made by equipment manufacturers. Ultimately, these factors decide whether an ecosystem consisting of terminal equipment and devices for using a specific frequency is available in the access network. Furthermore, anticipated technical developments should also be considered in the context of foreseeable future use.

4.2 2300 MHz band

As a result of the specifications in the 2013 Frequency Utilisation Ordinance (FNV 2013) published by the Federal Ministry for Finance, the frequency sub-range 2300 MHz to 2360 MHz is allocated for terrestrial systems capable of providing electronic communications services. Pursuant to Art. 11 Par. 4 TKG 2021, it has also now been specified that the assignment of this frequency sub-range should be limited by number. Accordingly, the regulatory authority is competent to award spectrum in the 2300 MHz to 2360 MHz range. There is no (longer a) requirement for a specification by RTR pursuant to Art. 14 Par. 1 TKG 2021.

4.3 2600 MHz band

4.3.1 Previous consultation

During the consultation on the Spectrum Release Plan in summer 2021, questions were also raised about frequency demand in the 2300 MHz and 2600 MHz ranges. The following bandwidths were mentioned in the consultation:⁴

- Minimum bandwidth/demand for FDD usage: 2x20 MHz

⁴ Cf. https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/konsultationen/Zusammenfassung_Konsultation_SRP_2021_2026.pdf (in German)

- Minimum bandwidth/demand for TDD usage: 1x30–1x40 MHz
- Maximum bandwidth FDD usage: 2x30 MHz
- Maximum bandwidth (overall): 100 MHz
- Individual demand for bandwidth (overall): 40–100 MHz

Among the reasons given were the following:

- A cost-effective rollout in the mid-bands would not be possible if the spectrum on offer were less than 2x20 MHz (FDD usage) or 1x30 MHz (TDD usage).
- From a technical perspective, there is no upper limit to the amount of spectrum usable by a network operator. A limit of this kind should be set, however, for reasons of competition. The amount stated was 2x30 MHz.
- If the amount of spectrum were less than 40 MHz (for TDD usage), the initial investment per location would be too high.

The levels of demand stated exceed supply. The upper limit given for the FDD range is cited as being for reasons of competition, alongside non-technical or economic reasons.

Informal talks held prior to the award procedure with network operators and manufacturers reveal a very similar picture.

4.3.2 Status quo—current usage

The initial question as to the usage type assumed for spectrum in the 2600 MHz band can be answered as follows:

- By decision F 4/08-76 of October 2010, the four national network operators at the time (now three) were assigned national usage rights comprising 2x70 MHz FDD and 50 MHz TDD in the 2600 MHz band for a term expiring on 31 December 2026. The regulatory authority is aware that the FDD spectrum in particular is being deployed (and has been deployed to date) for extending capacity in the eMBB/FWA use case, with usage generally distributed throughout Austria—as envisaged in the usage rights. In terms of intensity, usage varies among network operators and is primarily limited to larger cities although it has penetrated into rural areas in some cases.⁵ Home broadband products (cubes) in particular are a key driver for higher capacity. The TDD band has been used to a lesser extent, with one network operator recording no expansion in this band in their operational status report.
- A similar picture is seen across Europe: with a few exceptions, spectrum in the 2600 MHz band has been awarded to MNOs—the predominant use case is again likely to be capacity expansion.⁶

⁵ Also see the analysis given in https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/konsultationen/2022_10_14_Zweite_Konsultation_26_GHz_und_RestfrequenzenEN.pdf, section 4.2.2.3.3, especially figure 5.

⁶ In individual countries (such as Croatia, France), there is a use case in the TDD band, for campus networks on the basis of local licensing.

4.3.3 Assessment for the future

Informal talks conducted prior to this consultation make it clear that additional capacity is again likely to be a focus for the upcoming award, from both a manufacturer and a network operator perspective.

For this band, an assignment of 2x70 MHz FDD and 50 MHz TDD could again be made for the entire licence term, or a migration to TDD for the entire band during this term may be preferable. This question needs to be clarified. In LTE, a carrier is limited to 2x20 MHz (although a network operator can use multiple carriers). In contrast, 5G supports up to 2x50 MHz in FDD mode and up to 100 MHz in TDD mode as a single carrier. In technical terms, three network operators could therefore deploy significantly more than the available 190 MHz—and regardless of whether the assignment is made in FDD/TDD mode or exclusively in TDD mode. In all cases, the average costs per network operator for a frequency assignment of up to 2x50 or 100 MHz would fall as spectrum increases. These economies of scale contribute to a corresponding overall demand beyond the original 190 MHz.

To date, the TDD band has been used by only one network operator, with one operator not using the band, according to their operational status report. It is likely that this can be primarily attributed to the small amount of spectrum per operator.⁷ In the future, a higher level of usage is to be expected, assuming a more efficient distribution of TDD spectrum. Other factors driving this development include a significantly broader availability of equipment, technical innovations supporting spatial multiplexing and assignment over a long time frame. Accordingly, one may assume that corresponding investment in FDD and in the TDD band will indeed be made, consequently resulting in a situation where demand exceeds supply.

The regulatory authority assumes that this band—independently of FDD/TDD assignment—will be used primarily for mobile services (capacity expansion for eMBB/home broadband use cases, i.e. for both cubes and smartphones). While this does not preclude other forms of use, such as campus or industrial use, these are nonetheless not seen as the primary usage type here.

As before, usage in future does not need to be nationwide throughout Austria. Expansion will be driven in particular by corresponding capacity demand, although it would not appear expedient to limit demand to specified regions. On the contrary: nationwide assignment offers planning certainty for network operators. In future, this band can thus be expanded nationwide according to demand and operators can handle interference management themselves. The alternative would be to specify very extensive guard bands or severely restrict transmission power. With exclusive nationwide assignment, network operators are granted sufficient flexibility and the peace of mind of knowing that they can invest in band usage according to demand.

4.3.4 Regulatory authority recommendation

As of this writing, the regulatory authority assumes that, in light of current and foreseeable usage as well as technical developments, the award of national usage

⁷ This tallies with the minimum amounts of spectrum stated by network operators and manufacturers.

rights would not only maximise benefits for users but also achieve the most efficient use of spectrum. This type of award should therefore be prioritised over an assignment procedure on a geographically smaller scale (e.g. a regional award or a local award through an administrative procedure).

Even so, an evaluation of whether these frequencies should be limited by number must take into account the potential regional and local demand. On the other hand, even if potential demand from regional and local network operators is set aside, and the analysis is restricted to demand from existing mobile network operators, demand in terms of economic and technical factors will still exceed supply.

Accordingly, the regulatory authority recommends limiting as previously the entire 2.6 GHz band by number nationwide.

4.4 Other ECS bands

With one exception, all ECS spectrum for mobile and broadband assigned in the past and currently in use has been specified as limited by number pursuant to Art. 2 of the RTR ordinance concerning the limitation by number of frequency awards (ZaBeV 2023). The exception is the frequency range in the 26 GHz band (24.3–24.9 GHz), which, as per the Frequency Utilisation Ordinance, is reserved for local real estate-based assignment in clearly defined, small-scale geographical areas and especially for internal usage (e.g. campus networks, industrial use). The regulatory authority is tasked with reviewing this limitation by number at regular intervals, and therefore at least before the expiry of the licences and before any reassignment of the overall band. The rationale for limitation by number continues to apply. Accordingly, these frequency ranges will continue to be limited by number until further notice.

4.5 Consultation questions

Question 4.1: Do you concur with the regulatory authority in its assessment regarding the question of whether spectrum should be limited by number? Please give reasons for your answer.

Question 4.2: If you wish to use spectrum in the 2.6 GHz range: What licensing regions would be most compatible with your business model? Please give reasons for your answer.

Question 4.3: Do you agree with the regulatory authority's assessment regarding other ECS bands? Please give reasons for your answer.

5 Competition

5.1 Spectrum caps

The regulatory authority has conducted a competition analysis, provided in a separate annex. The preferred option for caps is to apply 2x30 MHz caps in the FDD spectrum as well as one cap totalling 120 MHz for H3A, and 100 MHz for A1 and TMA. These measures are supplemented by coverage obligations, which prevent the strategic acquisition of spectrum (hoarding). The interplay of these two measures aims to create flexibility in the auction. Accordingly, network operators can then set individual priorities in specific bands (core band strategy), which furthers the goal of efficient frequency usage. At the same time, this effectively addresses issues of competition.

5.2 Retail competition and MVNOs

Art. 23 (2) No. 1 TKG 2021 potentially makes the assignment of spectrum conditional on the award recipient granting wholesale access. In imposing such a condition, the regulatory authority must make a predictive assessment of competitive relationships and clarify whether such measures are necessary to maintain or achieve effective competition.

The MVNO role is discussed in greater detail in the competition analysis annex. Granting wholesale access became mandatory for H3A in 2012, as a result of regulatory decisions relating to the merger. From 2015, MVNOs were thus able to exert competitive pressure in the networks of several MNOs, significantly boosting competition. Whether wholesale access is granted—and on which conditions—is a decisive factor for MVNOs. In recent years (and especially following the expiry of the obligation as mentioned above for H3A), problems in relation to wholesale access were again observed, such as when negotiating 5G access or, in some cases, for access to specific functions such as a VoLTE, for example.

Looking to the future, MVNOs may not command enough negotiating power to continue to exert effective competitive pressure. If they do not, the specific areas where this negotiating power could be lacking should be addressed.

The regulatory authority therefore reserves the right to attach to this upcoming award an obligation to grant wholesale access. Potential options include a mandatory grant of wholesale access to each bidder acquiring spectrum in the current award or a link to monetary incentives in the auction (see also the annex on product and auction design).

If wholesale access is linked to the award, then the details of this obligation are extremely important. In the consultation on the tender document for the 700/1500/2100 MHz multi-band auction, comments were also invited on an MVNO obligation.⁸ While the corresponding design forms a starting-point for the current

⁸ See chap. 6, F1/16—Annex 2 to the Consultation on the Tender Conditions in the procedure for awarding spectrum in the 700, 1500 and 2100 MHz bands, https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/Anlage_2_Ausschreibungsunterlagen_700_1500_2100.pdf (in German)

discussion, it would nonetheless need to be adapted.⁹ The provisions of the mandatory wholesale access imposed on H3A could also be used as a further basis.

The regulatory authority is therefore seeking an assessment of future conditions for competition, also from the MVNO perspective, as well of how a potential measure affecting competition should be designed in detail.

5.3 Infrastructure sharing

In line with the 2018 position paper, and as is already the case in the bands 700/1500/2100 MHz and 3600 MHz, the regulatory authority is considering a ban on active sharing in Graz, Linz and Vienna, together with an access obligation as recently imposed in the 26 GHz award. This safeguards infrastructure competition in these three major cities. Furthermore, active sharing is also subject to a review pursuant to Art. 85 TKG 2021.

5.4 Consultation questions

Question 5.1: For which use cases will these frequencies be deployed? What is their significance for competition, especially competition in the mobile telephony and broadband markets? Please give reasons for your answer.

Question 5.2: Do you agree with the competition analysis set out in the annex? Does it lack any essential details, in your opinion? Please give detailed reasons for your answer.

Question 5.3: Do you agree with the concerns related to competition that are raised in the annex in the context of the strategic acquisition of frequencies (caps, coverage obligations) and measures as proposed? Do you have any other concerns about competition in relation to the above? With respect to the concerns stated, would you prefer an option other than the ones presented? Please give reasons for your answer and provide details of alternative measures as appropriate.

Question 5.4.: In your opinion, will the future negotiating power of MVNOs be capable of negotiating adequate wholesale access and of continuing to generate effective competitive pressure in the retail market? If not, give details of the type of wholesale access that you believe should be linked to the frequency award. Should the link be made to all of the frequencies offered or limited only to certain frequency packages?

Question 5.5.: How should wholesale access be designed? Which wholesale prices should be required and how should they be indexed over time? Could the proposal from the consultation on the tender document for the 2020 multiband auction be used in part as a starting-point? Which parts could potentially be used and which not? What should form the basis for wholesale pricing, both in absolute terms and in relation to adjustment over time? Of the wholesale obligation imposed on H3A after the 2012 merger, which parts should be used?

⁹ Following an announcement that an MVNO obligation would not be included in the 2020 auction, only a few responses were received and no adjustments were made.



Question 5.6.: What other general conditions need to be ensured through wholesale access?

Question 5.7.: What disclosure and reporting duties—and what penalties—should be envisaged with the aim of enforcing wholesale access?

Question 5.8.: Do you have any comments on the planned rules for infrastructure sharing? Do you have any suggestions for changes?

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6 Selection procedure

6.1 Introduction

If spectrum is limited by number (and thus ‘scarce’), the regulatory authority is mandated to issue an ordinance defining the selection procedure (Art. 15 Par 1 TKG 2021). A decision is to be made between either a competitive selection procedure or a comparative selection procedure. A comparative selection procedure is nonetheless to be used only if the goals and aspects to be accounted for as specified in Art. 15 Par. 2 and 3 TKG 2021 would be better served by this type of selection procedure.

In the competitive selection procedure (auction procedure or auction), the amount of the spectrum licence fee offered determines who is awarded a spectrum licence (see also Art. 16 TKG 2021). The competitive selection procedure has become the dominant type of selection procedure for scarce spectrum over the last 30 years. In practically all European countries and OECD countries, spectrum for mobile and broadband services is awarded on this basis.

An overview of developments in the last 35 years can be found in Marsden (2024).¹⁰ Examining 545 spectrum awards in 65 countries during the period 1990 to 2023, the analysis reveals a steady rise in the number of auctions and a steady decline in other award mechanisms (assignment, beauty contest). During the 5G era, this disparity has become larger than ever before. Of the 65 countries investigated (throughout the world), only eight countries chose a different award mechanism. Once a country has decided to use auctions as an award process on one particular occasion, it rarely switches to a different mechanism at a later point in time. The author concludes that the increasing use of auctions in conjunction with a broader acceptance of market mechanisms could be seen as an instrument adequate for enabling authorities mandated with regulating spectrum to manage usage. This development is being driven by the growing economic and social significance of mobile telephony—which has maintained the scarcity value of mobile spectrum despite an increase on the supply side—as well as the high-profile status that frequency awards have now secured with governments and the general public.

The comparative selection procedure (beauty contest) was the dominant procedure in the period before it was replaced by the competitive selection procedure. The main feature of a comparative selection procedure is that several selection criteria are used to decide which company is assigned a spectrum licence. One of these selection criteria can also be the amount offered. Depending on the design and emphasis, there is a grey area between these ‘pure’ types of procedures.

A substantive difference between the two procedure types is that in the competitive selection procedure the requirements are defined in advance in the form of binding terms and conditions of use (including coverage obligations), while in the case of usage rivalry the spectrum licence fee offered decides which applicant is awarded the

¹⁰ Marsden, R., Round-by-round Learning from the First 35 Years of Spectrum Auctions, NERA, New York, 2024.

contract. In the comparative selection procedure, the terms and conditions of use are partially determined by the selection process. Although this does not necessarily mean that the award objectives might be better achieved. As was demonstrated with the second 5G auction in 2020, clearly defined coverage targets could best be achieved with a competitive selection procedure. This type of procedure enables the broadest implementation, which minimises costs and keeps to budget constraints.

TKG 2021 gives priority to the competitive selection procedure over the comparative selection procedure. The regulatory authority has to choose a comparative selection procedure only if it can better achieve the objectives and aspects mentioned in Art. 15 Par. 2 and 3 TKG 2021.

When deciding on the selection procedure, various objectives and aspects must be considered (Art. 15 Par. 2 and 3 TKG 2021). Besides the award objectives, these especially include:

- Promote competition
- Improve coverage
- Ensure the necessary quality of service
- Promote the efficient use of radio spectrum, including by taking into account the conditions attached to the usage rights and the level of fees
- Promote innovation and business development

6.2 Selection criteria

Art. 16 TKG 2021 defines how a selection procedure must be designed and the selection criteria that can be used. In contrast with the comparative selection procedure, the competitive selection procedure is defined in great detail. In a competitive selection procedure, the award objectives (competition, improvement of coverage, efficiency etc.) are taken into account in advance through the terms and conditions of use and the auction design; in the case of usage rivalry, only the spectrum licence fee offered is then used as a selection criterion (see above).

In a comparative selection procedure, the selection is made on the basis of various selection criteria. When seeking potential selection criteria, Art. 16 Par. 2 and 4 TKG 2021 specifically apply, referring in this context to the objectives of the TKG 2021 (Art. 1) as well as to Art. 15 Par. 3 TKG 2021. The objectives and aspects mentioned here are listed in the table below.

Table 1: Potential selection criteria in a selection procedure

Potential selection criteria	Competitive selection procedure	Comparative selection procedure
Promote competition		X
Improvement of coverage and promotion of connectivity		X

Potential selection criteria	Competitive selection procedure	Comparative selection procedure
Access to networks / use of networks		X
Effective and efficient use of spectrum		X
Quality of service performance		X
Inexpensive services		X
Innovation and business development / new technologies		X
Spectrum licence fees (economic efficiency)	X	X

6.3 Legal requirements relating to the selection criteria

A selection procedure must be open, objective, transparent and proportionate. The criterion of openness is comparatively easy to achieve, namely by ensuring that the procedure is accessible for all potential participants.

In order for a selection procedure to be objective and transparent, the selection criteria must be chosen so that it is known in advance how the applications will be assessed (including the assessment points that a particular application will receive) and how relevant individual selection criteria are for the overall result (weighting). When wording their requests, applicants should also be able to anticipate final assessment outcomes (overall points) based on varying application options. The result of the selection procedure must be transparent and arguable. In the case of the spectrum licence fee offered, these requirements are clearly met.

For the other selection criteria, this applies only to a very limited extent. For example, selection criteria such as quality of service, innovation or business development can hardly be objectified. One reason for this is that many criteria are not quantifiable. How many additional assessment points, if any, will be awarded to an operator who, in addition to broadband services, also places an emphasis on other services such as telemedicine (innovation criterion)? How many additional assessment points are awarded to a new entrant whose market entry in an oligopoly market naturally leads to an increase in competition with an existing operator (criterion of promotion of competition)? What if, at the same time, one of the existing operators loses competitive power because of facing capacity bottlenecks due to a lack of spectrum, which the operator could, however, compensate for in turn through a denser network? How are these two scenarios assessed relative to each other in terms of assessment points?

Selection criteria that at first glance appear to be fundamentally suitable to quantification may in practice be much more difficult to cast in figures. If the

regulatory authority were for example to use end-customer rates as a criterion for inexpensive services, apart from the fact that in a market economy prices should reflect supply and demand, the authority would have to evaluate the future tariff plans presented by the operators in their requests. This is not practicable in view of the large number of elements factoring into rates (non-linear rates, varying services in packages and elements such as user categories, which cannot be quantified). Even quantifying the (additional) coverage criterion encounters limits in practice, for example when the increasingly significant role of quality (availability, latency or data transmission rates under load) is taken into account. Using simply data transmission rates as a selection criterion also raises many questions in practice. It makes a big difference whether moderate minimum data transmission rates are mandated within the framework of coverage obligations or whether the data rate offered (in Austria) decides who receives a frequency: at which sites and at what times will the data rate be measured, or which SIM card and which rate and which priority will be used as the basis for the decision and for monitoring compliance?

In addition to objectivity and transparency, award procedures must also fulfil two other legal criteria, namely the criteria of non-discrimination and proportionality. Accordingly, the selection criteria must be chosen and defined operationally in such a way that individual operators are not discriminated against in an objectively unjustified manner. The choice of selection criteria as well as their assessment and impact on the outcome must be appropriate in relation to the specified objectives of the TKG 2021.

As shown in the following example, a selection procedure can quickly come into conflict with these two criteria. Let's assume that two operators with different spectrum portfolios are competing for one frequency. The operator with the better portfolio has, precisely because of such a spectrum portfolio, better network coverage and a network utilised below capacity, and this operator can offer customers higher data transmission rates on average. The authority chooses the two selection criteria of level of coverage and data transmission rate (quality). The operator with the better portfolio will obviously be awarded the contract, having the better prerequisites, while the additional spectrum reinforces these advantages. The argument that the result would improve quality and coverage for a significant part of the population (the first operator's customers), being the goal of the TKG 2021, ignores the fact that the selection may have broad negative impact in the longer term. This could be the case, for example, if the second operator is confronted in future with considerable capacity bottlenecks because of not being able to cover spectrum needs and thus loses competitive power, so that as a result prices rise, for example. Similar considerations can be made for a number of other selection criteria.

The situation is different with the criterion of spectrum licence fee offered, the only criterion that can be used in both the comparative selection procedure and the competitive selection procedure. This criterion is based directly on demand and is closely related to the goal of efficient spectrum use (see below).

The legal requirements placed on a comparative selection procedure restrict flexibility with regard to choosing and operationally defining selection criteria. The proportionality requirement necessitates close orientation on the objectives of the

TKG 2021 in general and on the award objectives of the regulatory authority in particular. In addition, deficits in relation to these objectives must be identified (such as gaps in coverage or competition deficits).

Examples of selection criteria that could be used include:

- A higher rating would be awarded in the selection procedure for the willingness to supply coverage to a larger number of poorly served areas (criterion of coverage), if no detrimental impact on other objectives, in particular competition, is to be expected from the resulting distribution of spectrum (see example above). A prerequisite for this is that there are coverage gaps needing to be closed. In addition, the spectrum to be assigned must be principally suitable for the coverage of poorly served rural areas (e.g. coverage spectrum).
- A higher rating would be awarded in a selection procedure for a new market participant whose market entry is associated with noticeable positive impact on competition (criterion of competition). This assumes that there are competitive deficits at the level of infrastructure competition that justify positive discrimination. In addition, the assigned spectrum package must be suitable for supporting wide-area deployment.
- A higher rating would be awarded in the selection procedure for the willingness to sell wholesale services to service providers (such as MVNOs) and under more favourable conditions than the other applicants (criterion of competition and criterion of access to networks). This assumes that competition is correspondingly deficient, otherwise the selection criterion would not be proportionate.

As the second 5G auction in 2020 demonstrated, ambitious coverage targets can also be achieved within the framework of a competitive selection procedure with an appropriate design. Other objectives, including those relating to competition, can also be addressed in a competitive selection procedure, through spectrum caps, set-asides (for new entrants, for example) or access obligations. Since policymakers have given priority to the competitive selection procedure, any comparative selection procedure would need to contribute more towards achieving the (award) objectives than a competitive selection procedure would be able to. As discussed above, the legal requirements for selection procedures clearly allow significantly less freedom in this respect.

In addition to legal certainty, the TTK has made the efficient use of spectrum a central objective of the present award. Ensuring efficient and effective use of spectrum is one of the central objectives (if not the central objective) of spectrum administration (Art.°10 TKG 2021).

6.4 Efficient usage and distribution of spectrum

Pursuant to Art.°10 Par.°3 TKG 2021, a key objective of spectrum regulation is to ensure an efficient and effective use of spectrum. In the present context, this means that the spectrum must be distributed among the potential users so as to ensure that the greatest possible economic benefit is achieved.

The decisions required here include not only choosing the users to receive licenses, but also how many users receive spectrum (market structure) and how much spectrum each of these users receives. The needs of potential users and their individual demands for spectrum derive from the overall demand for mobile services (in the retail and wholesale markets). Therefore, influencing factors that fall within the operator's scope of decision-making and information responsibility (such as retail demand, market structure, business models, costs, product differentiation) play a central role in assessing needs. Such private information is not transparent for the regulatory authority and cannot therefore be sufficiently taken into account in a (comparative) selection procedure. The authority cannot sufficiently confirm the validity of the information provided by the operators. In addition, the regulatory authority has to look to the future, and would therefore have to make forecasts on how the aforementioned factors will change in future with respect to the individual market players.

In this context, it is also important to understand that spectrum can be substituted by alternative measures. For example, operators may invest in denser network infrastructure (more sites, more sectors) instead of spectrum to expand the capacity of their mobile networks. There is then a trade-off between spectrum and infrastructure investment. An operator that has more capacity or can expand capacity more cost-effectively through infrastructure investment most likely has less demand. But that is not the only trade-off. Operators differ in relation to how they compete for customers. An operator offering products with better quality and coverage at higher prices needs to maintain more capacity and has a higher demand for spectrum.

In a selection procedure, spectrum as a scarce resource must be distributed in accordance with the principle of economic efficiency (see Art.°16 Par.°2 TKG 2021). This is only possible if the trade-off between spectrum, investment costs and network quality is optimally resolved. Economic theory shows that if the rules are properly designed, an auction procedure (competitive selection procedure) is capable of achieving an economically efficient distribution. The operator with the highest demand has the highest (intrinsic) assessment rating for a frequency (or a spectrum package). In a properly designed auction procedure, the operator with the highest (intrinsic) assessment rating tends to win the award and can make best use of the spectrum.¹¹

An auction procedure generates market prices. Market prices reflect the scarcity of the resource, encourage efficient and productive use of the scarce resource, and operators bear the opportunity costs associated with using that resource. This close connection between auction procedures, market prices, economic efficiency and efficient use is also reflected in the applicable provisions of the TKG 2021 (see for example Art.°15 Par.°3 and Art.°16).

¹¹ See for example: Monopolkommission, Telekommunikation 2021: Wettbewerb im Umbruch, 12. Sektorgutachten (Monopolies Commission, Telecommunications 2021: Competition in transition, 12th Sector Report), 2021 (in German only). RSPG, RSPG Report on Efficient Awards and Efficient Use of Spectrum, 2016. Cramton, P., Spectrum auctions, Elsevier Science, Amsterdam, 2002. McMillan, J., Why auctioning the Spectrum?, in: Telecommunication Policy Vol. 19, 1995. Milgrom, P., Putting Auction Theory to Work, Cambridge University Press, 2004.

The comparative selection procedure is not suitable for such a complex needs assessment. With a view to the future, for each frequency block (in each region) the needs of each individual applicant would have to be examined and weighed objectively against the needs of the other applicants. In doing so, the regulatory authority would also have to take into account alternative measures (network densification) and competitive strategies.

6.5 Assessment and validity of offers

A necessary prerequisite for ensuring that an award procedure is factually correct and results in legal certainty is the ability to (quantitatively) assess applications and offers and to check the validity of the information.

The competitive selection procedure is based on proven market mechanisms. Monetary bids are very easy to compare. The payment obligation associated with the bids is usually made as an upfront payment and is also secured by corresponding bank guarantees. This ensures that bidders meet their payment obligations.

In the comparative selection procedure, selection criteria are chosen that often cannot be quantified, or the quantification method is criticised as not being objectively transparent and arguable.¹² Yet the ability to transparently quantify criteria (mapping to a point system) is a necessary prerequisite for an overall assessment, if this assessment is to be carried out in a legally secure manner (based on law). Why does an operator offering a certain service (such as e-health) receive more assessment points than another operator offering a different service? Why is 2% more coverage more important than a higher data transmission rate? Is a higher data transmission rate with more latency better than a lower data rate with less latency? There are often trade-offs between various features. These decisions should be made by the market (and thus the customers) and not by a regulatory authority. In addition, there are often limits to checking the validity of the information provided. For example, it would hardly be possible to evaluate network utilisation if taken as a criterion for demand.

6.6 Enforcement of commitments

As part of selection procedures, applicants enter commitments. In the competitive selection procedure, bank guarantees serve to ensure that these commitments are honoured.

In comparative selection procedures, whether the commitments entered during the selection procedure are fulfilled often comes to light only years later (for instance, only 97% instead of the promised 99% coverage level is reached). Under the TKG 2021, it is possible to revoke spectrum licences, but as a rule it is rather problematic and impractical where commitments are only partially fulfilled. Revocation would cause significant harm to users as well. So in practice it is hardly possible to amend the

¹² In this context, the Monopolies Commission identifies risks, for example that the licence will be awarded to the applicant who by coincidence best meets the criteria of the selection procedure, which are not fully known. Another risk is that the regulator could be accused of having chosen or weighted the selection criteria in such a way as to achieve a politically desirable outcome. Cf. Monopolies Commission, Telecommunications 2021: Competition in transition, 12th Sector Report, 2021 (in German only).

distribution of spectrum ex post. This in turn creates an incentive for overly optimistic commitments. The procedure can create advantages for companies that accept the risk of sanctions for failing to comply.¹³

Commitments to comply with coverage obligations, for example, are also made in competitive selection procedures, but these are not usually decisive for the assignment of spectrum.

6.7 Design of selection procedures

Art.°16 TKG 2021 regulates the design of the selection procedure. The established regulations governing competitive selection procedures are detailed, while providing insights—also from the perspective of legal certainty—into relevant case law on TKG award procedures for scarce frequencies on the basis of TKG 2003.¹⁴ As a result of the virtually identical design of the award procedure in TKG 2021, insights into such case law are still relevant. In contrast, hardly any specific regulations to guide the regulatory authority exist for the comparative selection procedure.

Since auction procedures were first used in the late 1980s and early 1990s to award spectrum in New Zealand, Australia and the USA, spectrum auctions have become a subject of economic research. There are now a large number of relevant publications dealing with specific aspects of spectrum auctions, and there are even auction formats, such as the simultaneous multiple-round auction procedure, which have been developed specifically for spectrum auctions and have proven their worth over the years.^{15,16} Conducting spectrum auctions has now become a core competence among many regulatory authorities.¹⁷

When designing spectrum auctions, the focus is primarily on economic efficiency and the goal of efficient spectrum use (see Art.°16 TKG 2021). Based on rudimentary theory, appropriate design elements are used to ensure that specific risks potentially occurring in spectrum auctions (aggregation risks, substitution risks, fragmentation risks, winner's curse risk etc.) are eliminated or reduced. This is one of the reasons why spectrum auctions almost always have a multi-stage structure.

The regulatory authority is not aware of any corresponding research in connection with comparative selection procedures for spectrum awards. Comparative selection procedures nonetheless entail risks for the participating companies and for the awarding authority. In response to an inappropriate or overly conservative offer deriving from false expectations, a company might be awarded no, too little or inappropriate spectrum or, conversely, companies that based on economic or

¹³ This is extensively documented in the literature. See for example: Monopolies Commission, Telecommunications 2021: Competition in transition, 12th Sector Report, 2021 (in German only).

¹⁴ See Supreme Administrative Court (VwGH) ruling (VwSlg 18984 A/2014) of 4 December 2014, 2013/03/0149, on the 2013 multi-band auction.

¹⁵ See for instance Milgrom, P., *Putting Auction Theory to Work*, Cambridge University Press, 2004.

¹⁶ Research on auctions gained much momentum with the FCC's decision in 1993 to auction off spectrum licences. Partly because of this work, Robert Wilson and Paul Milgrom received the Swedish National Bank Prize in Economic Sciences in Memory of Alfred Nobel on 10 December 2020.

¹⁷ RSPG, RSPG Report on Efficient Awards and Efficient Use of Spectrum, 2016.

efficiency criteria should not receive spectrum but actually do.¹⁸ The comparative selection procedures that the regulatory authority is aware of are not structured in multiple stages, companies are instead able to submit just one bid. It is also difficult to imagine how multiple selection criteria, some of them qualitative, could be taken into account in a multi-stage procedure.

6.8 Selection procedure decision pursuant to Art. 15 TKG 2021

Pursuant to Art.°15 Par.°1 TKG, the assignment of spectrum ‘limited by number’ must be carried out in a competitive selection procedure. The regulatory authority must only choose a comparative selection procedure if it determines that the objectives and aspects of Par.°2 and 3 that must be taken into account can be better achieved by such a procedure.

The aspects mentioned in Art.°15 Par.°3 TKG 2021 which are to be taken into account are the following:

1. Promote competition
2. Improve coverage
3. Ensure the necessary quality of service
4. Promote the efficient use of radio spectrum, including by taking into account the conditions attached to the usage rights and the level of fees
5. Promote innovation and business development

Ensuring efficient use of the frequencies is a core award objective for this frequency award procedure. In the case of scarce spectrum (demand exceeds supply), this can best be achieved through an auction procedure. A comparative selection procedure is not suitable for assessing needs accordingly.

To give preference to the comparative selection procedure, the safeguarding of efficient use would need to have a lower priority when compared with the other goals and aspects. This is clearly not the case, as it is prominently mentioned in the TKG’s relevant provisions on goals (Art. 1 Par. 2, Art. 10 Par. 3 and Art. 15 Par. 3 TKG 2021).

Secondly, the other objectives and aspects would need to be better served through a comparative selection procedure than using a competitive selection procedure. The previous spectrum auctions have demonstrated that ambitious coverage and competition goals can also be achieved through competitive selection procedures (such as supplying poorly served cadastral municipalities). The only potential advantage of a comparative selection procedure might be to favour a defined objective through positive discrimination. This would be done by emphasising criteria to (significantly) increase an operator’s chances of winning if that operator makes a higher contribution towards achieving this objective (e.g. a new entrant to increase competition). Apart from methodological weaknesses with regard to the assessment and validation of applications as well as the enforcement of commitments, the provisions of Art.°15 Par.°2 TKG 2021 also limit the related options required in a

¹⁸ The 3G award in Sweden is often cited as an example in the literature. For details see: Monopolies Commission, Telecommunications 2021: Competition in transition, 12th Sector Report, 2021 (in German only).

comparative selection procedure. Strongly emphasising individual selection criteria could be disproportionate and discriminatory, while other selection criteria are very difficult to define operationally and thus are potentially incompatible with the criteria of objectivity and transparency. Aspects such as quality of service, innovation, business development and prices should result from processes within a competitive market and not from an administrative selection procedure.

6.9 Consultation questions

Question 6.1: Do you concur with the regulatory authority's analysis of the selection procedure and with regard to Art.°15 TKG 2021? Please give reasons in detail for your answer.

Question 6.2: Do you concur with the regulatory authority's assessment that a competitive selection procedure (auction procedure) is best suited to assign the spectrum in question, which will be limited by number as defined in Art.°14 TKG 2021 or Art. 11 Par. 4 TKG 2021? Please give reasons in detail for your answer.

Question 6.3: If you consider a comparative selection procedure to be more appropriate, please give reasons in detail why this is the case in the given procedural context. Which selection criteria should be used? How should these be weighted and defined operationally? How could the selection criteria be assessed quantitatively (and modelled in a system with assessment points)? Please also explain for each selection criterion how the regulatory authority could validate the information, and how compliance with the relevant commitments could be enforced (e.g. by revoking a spectrum assignment). Please provide detailed reasons why the selection criteria you named are in line with the TTK's award objectives, the objectives of the TKG 2021 (Art.°1 and Art.°10) and the aspects listed in Art.°15 Par.°3 TKG 2021, and in particular why this can ensure efficient use of spectrum.

7 Product and auction design

7.1 Technical terms and conditions of use

The technical terms and conditions of use are instrumental for the award procedure, and form a fundamental part of the award. As required by the TKG 2021, these terms and conditions are announced by the competent ministry, currently the Federal Ministry of Finance.

The terms and conditions are based on implementing decisions from the European Commission, if these are available for the frequency range in question. For this specific award, implementing decisions (or formerly 'decisions') are available for the 2600 MHz band but not for the 2300 MHz band. Recommendations from the CEPT/ECC will be consulted in the latter case.

2600 MHz:

- Commission Implementing Decision (EU) 2020/636 of 8 May 2020 amending Decision 2008/477/EC as regards an update of relevant technical conditions applicable to the 2500–2690 MHz frequency band
- Commission Decision 2008/477/EC of 13 June 2008 on the harmonisation of the 2500–2690 MHz spectrum band for terrestrial systems capable of providing electronic communications services in the Community

2300 MHz:

- ECC Decision (14)02 of 27 June 2014 on harmonised technical and regulatory conditions for the use of the band 2300–2400 MHz for Mobile/Fixed Communications Networks (MFCN), amended 10 March 2023 (ECC#61)

7.1.1 Synchronisation

An essential requirement for the use of TDD is synchronised operation of neighbouring TDD blocks, so as to prevent mutual interference. While guard bands offer an alternative strategy, this would undermine the idea of efficient frequency usage. Synchronisation can be waived as a requirement only if the usage rights for an entire band are awarded in toto to a single bidder.

Synchronisation means that all affected network operators use the same time frame, which is transmitted simultaneously, and keep the downlink and uplink proportions identical.

The regulatory authority therefore proposes the following rule:

In the event that reciprocal interference between rights holders occurs in the 2.6 GHz band as a result of unsynchronised or inadequately synchronised operations, and no bilateral or multilateral agreement on synchronisation can be achieved, the following specifications apply:

- a) Transmissions from a licence holder's base station or to use a certain frame duration and frame structure. This frame structure is defined in ECC Recommendation (20)03, Annex 1, Table 1, Frame B: the frame duration is 10 ms, with a frame structure periodicity of 5 ms. This is complemented by use of the "DDDSUDDDD DDDSUDDDD" frame structure, where 'D' stands for a downlink timeslot, 'U' for an uplink timeslot and 'S' for a special timeslot as defined by the 3GPP standards. The special timeslot consists of 6 symbols in the downlink, 4 symbols guard period and 4 symbols in the uplink. This is equivalent to the LTE "DSUDDDSUDD" frame structure (LTE frame configuration 2) from the F 1/16 award for the 3.6 GHz band.¹⁹
- b) Licence holders are responsible for ensuring that frames are based on a uniform reference time (+/- 1.5 µs), so that all of any licence holder's frames are aligned equally and transmissions are consequently synchronised.

7.1.2 Guard channels between FDD and TDD in the 2600 MHz band

Guard channels, each of 5 MHz, are specified between the FDD and TDD ranges in the 2600 MHz band. Accordingly, only 40 MHz is available for TDD usage. These guard channels will not be awarded in the principal stage but assigned to the winner of the neighbouring TDD block in the assignment stage. Use of the guard channels for TDD is not excluded entirely. However, such a use must not cause interference with the neighbouring FDD user, nor may any corresponding demands be made of the neighbouring FDD user (such as horizontal or vertical antenna distances) with the aim of facilitating use of the guard channel.

7.1.3 Conditions of use at borders

Bilateral or multilateral agreements also apply to the use of the frequencies along state borders.

7.1.4 Migration to TDD

As a result of general regulatory conditions²⁰, investments already made, business continuity and restrictions to use at borders due to a lack of coordination, the regulatory authority considers it prudent for this award to retain the current band plan, which envisages mixed FDD and TDD usage.

However, most network operators and manufacturers are of the opinion that the use of the entire 2500–2690 MHz range for TDD would be more efficient in the long term.

From an economic perspective, operators would be in a better position to exploit economies of scale when using the entire band in TDD mode. Access network costs—

¹⁹ Award F 7/16: https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/Procedure_3600MHz_2019/Procedure_3600MHz_2019_en.html; see also <https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2020/04/3.5-GHz-5G-TDD-Synchronisation.pdf>.

²⁰ As of this writing, and in accordance with Commission Decision No. 2008/477/EC of 13 June 2008, last amended by Commission Implementing Decision No. 2020/636/EU of 8 May 2020, Annex Section B, Nos 2 and 3, usage with time division duplex outside the 2570–2620 MHz sub-band is not envisaged.

such as active antennae—are incurred only once by each network operator and are spread across larger amounts of spectrum.

In technical terms, a larger amount of spectrum enables an even greater amount of bandwidth. Guard bands are also no longer required between FDD and TDD mode, so a greater amount of spectrum can be used effectively.

Spatial multiplexing technology is more advanced with TDD, and therefore enables greater capacity and higher peak data rates than with FDD. This is because spatial multiplexing requires corresponding information about transmission channels. In TDD mode, these can be determined in the same frequency range directly via the uplink. In FDD mode, however, this kind of information must be explicitly provided by the uplink, thereby reducing capacity.

For strongly downlink-focused traffic, TDD enables the use of the entire 190 MHz (in the timeslots as envisaged for this), while in the FDD band, half of the spectrum is reserved for the uplink.

As regards equipment, both currently and as far as can be predicted, the TDD ecosystem and hardware are significantly more advanced—also in relation to spatial multiplexing, for example.

There are some disadvantages to TDD usage, however. Guard periods increase proportionally to the distance between the base stations and the user device. If the entire amount of spectrum is used for transmission and transmission power remains constant, effective performance per MHz will drop, as will coverage. The exactitude of the synchronisation required can also create difficulties, namely between uplink and downlink, neighbouring stations and neighbouring bands.

A short-term migration of the entire band to TDD would be challenging, however. First, new equipment would be required. Second, parallel operation would not be possible. To ensure continuous use of the band, both FDD and TDD equipment must therefore be present on the masts at the time of changeover. Accordingly, the removal of legacy equipment cannot take place simultaneously with the installation of new equipment. In both the short term and the long term, this changeover will require coordination with neighbouring states, at least in border areas. Ideally, both countries would migrate at the same time. If this proves impossible, then broad guard bands would need to be set up between neighbouring states using FDD on the one hand and those using TDD on the other. As a consequence, this could make the band unavailable for use in border areas.

The spectrum in question will be assigned for at least 20 years. During this period, regulatory frameworks may change and TDD-only usage may become the norm. However, efficient TDD migration requires that the specific assignments be newly ordered ('reshuffling'). Depending on the consultation input and the final assessment, the regulatory authority is weighing up the use of incentives for efficient frequency usage. Such as:

- Establishing an extension model that incentivises efficient frequency usage and grants network operators an additional amortisation period for replacing their base stations in the event of a migration to TDD
- Establishing rules that simplify newly ordering of the specific assignments (reshuffling)

7.2 Lot structure and lot categories

Industry stakeholders have called for a minimum bandwidth for TDD usage that should be significantly larger than the block size of 5 MHz typically used in spectrum awards. For purely selective usage in hotspot areas, 20 MHz has been proposed, with 30 to 40 MHz proposed for a more extensive and cost-effective wide-area rollout. The incremental value of the blocks rises sharply until the stated minimum amount of spectrum is reached. The planned use of a non-combinatorial auction format entails the risk of inefficiently distributing frequencies (exposure risk). To avoid this risk (and therefore dispense with the use of a combinatorial format), the regulatory authority proposes using lot sizes of 40 MHz (band 38) and 30 MHz (band 40) for the auction (see also the annex on product and auction design).²¹ Alternatively, and depending on the actual minimum amount of spectrum for a cost-effective, wider-area expansion (30 or 40 MHz) and the network operators' rollout strategies (wide-area deployment versus purely selective hotspot usage), a division of band 40 into two 40/20 MHz lots would also be conceivable.

Various lot sizes are proposed for band 7: these depend on the stipulation of an MVNO obligation. In the event of an MVNO obligation not being imposed, the regulatory authority proposes a lot size of 2x5 MHz. Otherwise, an auction model with two stages is proposed, with lots of 2x15 MHz being auctioned in the first stage and lots of 2x5 MHz being auctioned in the second stage.

A more detailed discussion is provided by the annex on product and auction design from DotEcon.

7.3 Auction design

The reader is referred here to the annex on product and auction design from DotEcon.

7.4 Period of use

Where the regulatory authority assigns spectrum for a period other than the one specified in Art. 18 Par. 1 TKG 2021, the regulatory authority must ensure that the assignment is granted for a period that is appropriate in light of the objectives pursued in accordance with Art. 16 TKG 2021, taking due account of the need to ensure competition, as well as, in particular, the effective and efficient use of radio spectrum, and to promote innovation and efficient investments, including by allowing for an appropriate period for investment amortisation. Where the regulatory authority assigns spectrum for which harmonised conditions have been set by technical

²¹ The regulatory authority is not yet aware of any specific terms and conditions of use. As of this writing, the regulatory authority assumes that the entire 2300–2360 MHz range will be available for use soon after being awarded and generic blocks can therefore be assigned. If this is not the case, changes may be made to the proposed design.

implementing measures in accordance with Decision No 676/2002/EC, in order to enable its use for wireless broadband communications services ('wireless broadband services'), the regulatory authority must ensure regulatory predictability for rights holders over a period of at least 20 years regarding conditions for investment in infrastructure that relies on the use of such radio spectrum, taking account of the requirements as set out in Art. 18 Par. 3 TKG 2021.

For the purpose referred to in Art. 18 Par. 4 TKG 2021, it must be ensured that such rights are valid for a duration of at least 15 years and, where necessary to comply with the conditions laid down in that provision, an extension not exceeding ten years is to be included. No extension is possible if this period is at least 20 years. In accordance with Art. 18 Par. 10 TKG 2021, the regulatory authority may adjust the duration of spectrum assignment to ensure simultaneous expiry in one or several bands, provided that reassignment is expected to significantly enhance the efficiency of spectrum use.

Art. 13 Par. 15 TKG 2021 allows spectrum to be awarded only for a specified period. In setting the validity period for rights of frequency use, the Telekom-Control-Kommission pursues a number of objectives. A specific example is to ensure if possible that all spectrum usage rights within one band expire at the same time (to allow the introduction of new technologies, and similar considerations). Alongside this consideration, the regulatory authority assumes that auctions 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 any changes in technology.

In consideration of the legal situation, the premises as stated and recent decision-making practice, the regulatory authority recommends that the usage rights for the frequency blocks to be awarded in the 2300 MHz range be assigned until 31 December 2050.²²

For the 2600 MHz range, the regulatory authority proposes an extension model aimed at creating incentives for the efficient use of frequency, granting network operators an additional amortisation period for replacing their base stations in the event of a migration to TDD. This extension model envisages a fixed period of use of 19 years and a variable, additional period of use that is dependent on the usage format (see table below).

Table 2: 2600 MHz extension model

		TDD migration advisable for efficient frequency usage?	
		Yes	No
Successful TDD migration (including defragmentation) by the date of the extension decision (approx. two years	Yes	19 + 10 years	19 + 5 years
	No	19 + 1 year	19 + 5 years

²² In terms of recent decision-making practice, especially worth mentioning is the term of approximately 24 years specified in the F 1/16 procedure for 700/1500/2100 MHz.

before expiry of the fixed usage period)?			
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Efficient frequency usage as implied by the extension model is achieved if network operators migrate (promptly) to TDD usage, where such a migration becomes advisable in light of the following criteria:

- As technical innovations continue to be made, one may expect TDD usage to become the more efficient form of frequency usage in the long term, for reasons of reach, data transfer rates, capacity or cost.
- The general regulatory conditions at both national and European level permit the currently paired portion of the band to be utilised for TDD at the time the decision is made.
- Regarding the neighbouring countries relevant for cross-border coordination, the entire band will either already be in use for TDD or a migration process will be in place to ensure TDD usage in due course.

If migration to TDD usage in accordance with the foregoing criteria is not feasible, the total term will be oriented towards that of the 2300 MHz frequencies (19 + 5 years).

If however TDD usage based on the foregoing criteria is in fact practicable, then the term of the extension will depend on whether the owner of the corresponding frequency usage rights migrates to purely TDD usage by the date of the extension decision (approx. two years before expiry of the usage rights). Network operators meeting this deadline will qualify for the maximum possible legal period of ten years and are granted an additional amortisation period for replacing their base stations. If this condition is not met, usage rights will be extended for one year and the frequencies reassigned on the basis of a TDD band plan.

The TDD migration process is conditional on approval from all network operators and—if necessary—the reshuffling of specific assignments with the aim of utilising contiguous frequency blocks (defragmentation). This reshuffling can be carried out on the basis of a civil agreement or a rule-based system, or can result from a separate assignment stage that makes use of the TDD band plan (see annex on auction design).

7.5 Coverage obligations

7.5.1 Definition of coverage obligations

In the context of awarding frequency usage rights, coverage obligations can be utilised to pursue a number of regulatory objectives. These goals include ensuring the efficient use of frequency, ensuring and/or promoting effective competition (by making the strategic acquisition of spectrum prohibitively expensive), and promoting coverage and service quality. For this award, the regulatory authority is proposing coverage obligations designed with the following aims in mind:

- The regulatory authority is proposing a site-based coverage obligation. This proposal is supported by the wide-ranging coverage obligations from the 2020

multiband auction of 700/1500/2100 MHz and by the fact that the spectrum to be awarded by this procedure is suitable only to a limited degree for wide-area coverage (without combination with coverage spectrum). Assuming an adequate number of sites, this will prevent the hoarding of spectrum while guaranteeing a minimum level of deployment and/or enforcing a continuation of usage.

- The regulatory authority also wishes to meet the goals of effective competition as well as promoting coverage and service quality in suburban areas. For 2300 MHz and 2600 MHz TDD, the authority therefore also proposes to enforce the deployment of a subset of the required number of sites in such areas.
- For new market entrants not yet assigned frequency usage rights in the 2600 MHz range, the regulatory authority envisages a postponement of coverage obligations with the aim of establishing fair and non-discriminatory conditions.

7.5.2 Location within the meaning of the coverage obligation

A location meeting the requirements listed below qualifies as a location within the meaning of the coverage obligation:

- A location that is eligible for meeting the coverage obligation must have a base station capable of transmitting at a minimum level of 20 watts of electrical power per sector. The actual transmission power level can be less.
- The site must use at least 4x4 MIMO for FDD and at least 8x8 MIMO for TDD (or an equivalent method in each case for multiplexing).
- A site qualifies as a site within the meaning of the coverage obligation only if the frequencies transmitted there are used to connect end users.
- Only base stations operated outdoors are considered locations within the meaning of this obligation.
- The spectrum holder must have actual, legal and technical control of any such base station.
- Locations operated as active sharing locations are not considered to be locations for the sharing party within the meaning of this obligation. Accordingly, a location is therefore counted as a location within the meaning of this coverage obligation for at most one rights holder.
- The site must be serviced by a connection of at least 1 Gbps downstream and at least 1 Gbps upstream.
- Two locations are counted as two separate locations for the purpose of the coverage obligation only if spaced at least 100 metres apart as measured with a straight line.
- The spectrum assigned to the operator must be used at the site.

7.5.3 2600 MHz FDD

The following table specifies the minimum number of sites—depending on the amount of spectrum assigned and the effective date—that are to be operated in the 2600 MHz FDD band by an owner of frequency usage rights:

Table 3: 2600 MHz FDD coverage obligations for existing network operators

Sites	31.12.2029	31.12.2032	31.12.2036
2x10 MHz	1250	1250	1250
2x15 / 2x20 / 2x25 MHz	1500	2000	2500
2x30 MHz	2000	2500	3500

Where the owner of frequency usage rights is a new market entrant (no 2600 MHz spectrum held), this entity must operate the following minimum number of sites in the 2600 MHz FDD band in each case, depending on the assigned amount of spectrum and the effective date:

Table 4: 2600 MHz FDD coverage obligations for new market entrants

Sites	31.12.2029	31.12.2032	31.12.2035	31.12.2039
2x10 MHz	500	1250	1250	1250
2x15 / 2x20 / 2x25 MHz	500	1500	2000	2500
2x30 MHz	500	2000	2500	3500

In the event of a TDD migration, the FDD obligations also apply to TDD usage for winners of FDD spectrum.

7.5.4 2600 MHz TDD and 2300 MHz TDD

As already stated for 2600 MHz FDD, the number of sites varies according to the effective date and amount of spectrum acquired. For the 2600 MHz TDD and 2300 MHz TDD bands, a subset of these required sites must be established and/or operated in suburban areas:

Table 5: 2300 MHz coverage obligations for existing network operators

Sites (of which in suburban areas)	31.12.2029	31.12.2032	31.12.2036
1 block in 2300 MHz	500 (170) ²³	1000 (330)	1500 (500)
2 blocks in 2300 MHz	670 (220)	1200 (400)	2000 (670)

Table 6: 2600 MHz TDD coverage obligations for existing network operators

Sites (of which in suburban areas)	31.12.2029	31.12.2032	31.12.2036
1 block in 2600 MHz TDD	500 (170)	1000 (330)	1500 (500)

For new market entrants (no 2600 MHz spectrum held), the following coverage obligations apply:

Table 7: 2300 MHz coverage obligations for new market entrants

Sites	31.12.2029	31.12.2032	31.12.2035	31.12.2039
1 block in 2300 MHz	250 (80)	500 (170)	1000 (330)	1500 (500)
2 blocks in 2300 MHz	330 (110)	670 (220)	1200 (400)	2000 (670)

Table 8: 2600 MHz TDD coverage obligations for new market entrants

Sites	31.12.2029	31.12.2032	31.12.2035	31.12.2039
1 block in 2600 MHz	250 (80)	500 (170)	1000 (330)	1500 (500)

7.5.5 Definition of suburban areas

Suburban areas are defined as those areas that are not listed in Annex J2 of assignment decision F 1/16-394 (coverage obligation for urban areas).²⁴

7.6 Obligations to ensure resilience

To safeguard the availability of mobile network coverage with the frequencies to be awarded, the regulatory authority is proposing certain availability requirements.

²³ Numbers in brackets refer to the number of sites to be operated in suburban areas. Numbers outside brackets refer to the number of sites to be operated in total. In the case in question, this means that (at least) 500 sites are to be operated, of which (at least) 170 must be located within suburban areas. The definition of 'suburban areas' can be found under 7.5.5.

²⁴ https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/Multibandauktion_700-1500-2100MHz_2020/FRQ5G_2020.en.html

These are based on the number of systems to be set up in accordance with coverage obligations (see above).

As a general rule, availability is evaluated at six-month intervals. Specifically: 1 January 00:00:00 to 30 June 24:00:00 for the first half of the year and 1 July 00:00:00 to 31 December 24:00:00 for the second half.

In each of these periods, the network operated on the respective band (2300, 2600 TDD, 2600 FDD) may not be unavailable for more than 35 minutes.

A mitigatory weighting factor is applied to non-availability (from maintenance or failure, for example) at night or at weekends. Absolute unavailability may therefore be longer, depending on the time of day/day of the week.

Table 9: Availability weighting factors

	Monday to Friday	Saturday	Sunday
For the period 7 a.m. to 12 a.m.	1	1/2	1/4
For the period 12 a.m. to 7 a.m.	1/4	1/8	1/16

The availability obligation is based on the number of stations from the coverage obligation for the respective band. If more stations are operated in the band, the stations are placed in descending order of availability and the number is applied according to the coverage obligation (relevant stations). If fewer stations are operated than envisaged in the coverage obligation, these stations and this number is applied.

Availability is determined from the availability of the individual relevant stations. The weighted unavailability minutes of the individual stations are summed and divided by the number. This number represents the availability for the band.

A station is considered unavailable if end users of this station receive no broadband services in the respective band. The reasons for this unavailability may be faulty antennae, maintenance work, power outages or faults in the core network.

Penalties are levied for breaches of this obligation. No penalties are levied for periods of unavailability resulting from force majeure.

Network operators are required to submit an annual report to the regulatory authority that lists the periods of unavailability for each station, classified by the weighting factor time frames (see above). If requested, reports must also be submitted on specific unavailability incidents and their causes.

7.7 Consultation questions

Questions about the technical terms and conditions

Question 7.1: Do you consider the synchronisation specifications to be appropriate? Please give reasons for your answer.

Question 7.2: Do you consider the rules governing guard bands between FDD and TDD to be appropriate? Please give reasons for your answer.

Question 7.3: In your opinion, which usage form (TDD-only, FDD + TDD) in the 2600 MHz band offers greater long-term efficiency? In the long term, which band plan will become the norm for the 2600 MHz band in Europe? Should the regulatory authority include provisions in the terms and conditions that promote long-term migration to a TDD band plan? Which precautions would be advisable here? When do you expect such a migration to take place? What obstacles do you see to TDD migration? Please give reasons for your answer.

Questions about product and auction design

Question 7.4: In the event of a TDD migration, how should the 'reshuffling' of specific frequency assignments be handled? Should the regulatory authority (in the event of a civil agreement being unachievable) ensure that the award conditions provide for an assignment auction on the basis of the TDD band plan, to be conducted shortly after the extension decision? Or do you consider a rule-based system, as proposed in the auction design annex, to be more expedient? Please give reasons for your answer.

Question 7.5: Do you agree with the proposed lot sizes for the TDD range (bands 38 and 40) in the auction? If not, which lot size would you propose? Which rollout strategy (selective in hotspot areas or wider-area deployment) will you be planning in the event of acquiring spectrum in these ranges? What minimum bandwidth would result from this strategy? Please give reasons for your answer.

Question 7.6: Do you generally agree with the suitability of the proposed subdivision of available spectrum (2x5 MHz FDD blocks and a single 40 MHz block in the 2600 MHz band, and two blocks, each of 30 MHz, plus one 20 MHz and one 40 MHz block in the 2300 MHz band), which aims to ensure efficient frequent usage in conjunction with bidding restrictions? If not, what would be your preferred subdivision strategy here?

Question 7.7: What subdivision of spectrum in the 2300 MHz band is preferable, in your opinion? Which rollout strategy (selective in hotspot areas or wider-area deployment) will you be planning in the event of acquiring spectrum in these ranges? What minimum bandwidth would result from this strategy? Please give reasons for your answer.

Question 7.8: If the procedure also envisages imposing a requirement to provide wholesale access to MVNOs, what are your thoughts on the proposal to link this requirement to larger blocks of frequencies (2x15 MHz)? Please give reasons for your answer.

Question 7.9: Do you consider the subdivision into two stages—assignment of bandwidth in the form of generic frequency blocks, followed by the assignment of specific positions within the band—to be expedient for ensuring efficient frequency usage? If not, what would be a more suitable alternative, in your opinion? Please give reasons for your answer.

Question 7.10: Do you consider the proposed options (eSMRA or SMRA-Clock hybrid) to be suitable for the principal stage (assignment of abstract frequency blocks)? If not, what would you prefer to see as an alternative format? Do you see any risks arising here (e.g. aggregation risks) that are not adequately mitigated by this procedure in conjunction with bidder restrictions? Would you express a preference for one of the two proposed procedures? Please give reasons for your answer.

Question 7.11: In the event of larger blocks being offered in conjunction with an obligation to provide wholesale access to MVNOs, there is a proposal to offer bidders an opportunity to bid on an exemption to this obligation (this being conditional on at least one bidder accepting the obligation). What do you think of this proposal?

Question 7.12: Do you consider the proposed procedure for the assignment stage (assignment of specific positions within the band) to be suitable? If not, what would you prefer to see as an alternative procedure?

Question 7.13: In the event of a potential migration to exclusive TDD use of the 2600 MHz band coupled with an inability to reach consensus between network operators, which do you see as being the best fallback option for determining positions in the band (automatic position adjustment, separate assignment bids as part of the procedure, assignment bids at the point in time of migration)? How would you assess the respective impacts on the motivation of a network operator to support or block such a migration?

Questions about the period of use

Question 7.14: How would you assess the proposed period of use for the 2300 MHz frequency range and the extension model for the 2600 MHz frequency range? Please give reasons for your answer.

Questions about coverage obligations

Question 7.15: Do you agree with the regulatory authority's proposal and rationale for coverage obligations in the respective bands? Please give reasons for your answer.

Question 7.16: Do you agree with the requirements for the definition of a site (as given in section 7.5.2)? Please give reasons for your answer.

Questions on the obligation to ensure resilience

Question 7.17: Do you consider the rules on mobile network availability to be appropriate? Are the parameters fit for purpose and appropriate? Please give reasons for your answer.



8 Statements

Statements (in German or English) must be emailed by 14 February 2025 to:

tkfreq@rtr.at

Please use the cover sheet below.

NON-BINDING TRANSLATION



ANNEX 1

to the Consultation

for the Award of Spectrum Use Rights
in the 2300 MHz and
2600 MHz Ranges

Cover Sheet

Cover sheet—Statements on the consultation for the award of spectrum in the 2300 MHz and 2600 MHz bands

General information

Statement submitted by:

Represented by (if applicable):

Postal address:

Email address:

Confidentiality

Please indicate whether your statement or parts thereof are confidential and if so provide reasons:

No confidential content

Statement content is confidential

Passages within the statement are confidential

In this case we request you to additionally submit a version of the document that you consider suitable for disclosure.

RTR will in any event publish a list of the organisations/individuals that submitted statements on the consultation.

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 email, any standard email texts concerning the confidentiality or disclosure of email content (including any attachments) will not be considered relevant for publication by RTR.

Name:

Signature:



ANNEX 2

to the Consultation

for the Award of Spectrum Use Rights
in the 2300 MHz and
2600 MHz Ranges

Options for product and auction design



The annex on auction design is available to be downloaded as a separate document

NON-BINDING TRANSLATION

ANNEX 3

to the Consultation

for the Award of Spectrum Use Rights
in the 2300 MHz and
2600 MHz Ranges

Competition analysis



The competition analysis is available for download as a separate document.

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