Summary of Statements

Consultation on the Tender Conditions for the 700/1500/2100 MHz spectrum award procedure

NON-BINDING TRANSLATION

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Contents

1 Introduction

1.1 General information

Following the publication of a position paper on infrastructure sharing and the awarding of licences in the 3410 to 3800 MHz range, the Telekom-Control-Kommission (hereinafter: TKK) sees the awards in the 700/1500/2100 MHz bands as making a significant additional contribution to the introduction of 5G in Austria. Preparations for the joint awarding of those bands began back in 2016. This had been preceded by a consultation to discuss the auction design as well as the key points of the award, including in particular the various options for achieving the coverage targets. A number of important suggestions were contributed by market stakeholders and potential approaches discussed.

As part of a further consultation held in 2019 for the upcoming spectrum award, the TKK has published drafts of the Tender Document and the Auction Rules, and collected additional valuable suggestions from the market. This document presents a summary of material statements by participants.

The content addressed below is non-binding and is therefore without prejudice to any future decisions by the TKK.

1.2 Statements

A total of twelve statements have been received, of which the following nine entities and organisations may be mentioned by name:

- Office of the Provincial Government of Lower Austria
- Ventocom GmbH
- Österreichische Rundfunksender GmbH & Co KG and ORS comm GmbH & Co KG
- simpli services GmbH & Co KG
- ASFINAG – Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft
- ÖBB-Infrastruktur AG
- Inmarsat
- T-Mobile Austria GmbH
- Hutchison Drei Austria GmbH

A total of six participants have agreed to the publication of their statements on the RTR website (see https://www.rtr.at/en/inf/konsult-700-1500-2100-mhz-2).

The TKK also issued invitations to a hearing on 14 October 2019.

2 Award objectives

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

- Objective 1: Legal certainty
- Objective 2: Ensure efficient spectrum use
- Objective 3: Safeguard/promote effective competition
- Objective 4: Promote coverage
- Objective 5: Promote innovation

Maximising auction revenue is expressly ruled out as an award objective, as is actively supporting new market entrants by means of actions such as reserving spectrum. The regulatory authority will target these objectives in particular when designing the award procedure.

Efficient spectrum use is ensured if bidders are able to acquire spectrum to meet their individual needs and if a frequency lot is assigned to the bidder who apportions this lot the highest value by submitting the highest bid for it.[1] This requires a *product design* that matches the demands of potential users, ensures fair and equal participation of all users, and allows competition for incremental spectrum. This needs to be complemented by an *auction design* suited to identifying the bidder with the highest valuation. The award procedure also needs to be designed so as to largely avoid any *unnecessary fragmentation* of spectrum within a single band. *Aggregation and substitution risks* in the auction are to be minimised by means of a suitable auction design. Bidders should, for example, be allowed to acquire wider frequency blocks for 5G. Switching barriers or aggregation risks should not prevent such options being exercised.

The significance of the third award objective (competition) for the design of the award procedure is underscored by the most recent amendment to the TKG 2003. The regulatory authority intends to safeguard competition in the downstream mobile telecommunications markets in the coming years by selecting appropriate instruments. The aim here is not only to prevent an excess concentration of usage rights in the hands of a single network operator, but also to ensure that a sufficient number of effective providers (mobile network operators and MVNOs) will be active on the market after the auction.

The 700 MHz band could be the last coverage spectrum to be awarded for mobile services for some time. For that reason, and in order to take into account the ambitious 5G targets set by the federal government and the European Commission, the TKK will give special priority to the objective of providing the best possible coverage for Austrian residents and businesses. This approach is intended to achieve key coverage targets on the one hand, while also ensuring that spectrum is in fact used and not hoarded for the purposes of long-term strategy. Given the importance

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

of this objective, the regulatory authority plans to impose ambitious *coverage obligations*.

Following the awarding of the 3410 to 3800 MHz range and the publication of a position paper on infrastructure sharing, the TKK sees the award of the 700/1500/2100 MHz bands as a further significant contribution to the introduction of 5G in Austria. The regulatory authority is laying the groundwork for 5G innovation by expediting an award procedure that ensures legal certainty and with a design focusing on award objectives.

3 General legal conditions (section 2)

The planned award procedure covers spectrum in the 700 MHz, 1500 MHz and 2100 MHz ranges. The regulatory authority is responsible for the spectrum award because frequencies in these bands are defined as 'limited in number' by the Frequency Utilisation Ordinance.

As part of the consultation, and as required by Art. 55 Par. 3 of the TKG 2003, the regulatory authority published a draft of the Tender Document and the Auction Rules.

The general legal conditions set out in section 2 of the Tender Document have been recognised for the most part by the consultation participants. Only one participant has asked for secondary usage to be permitted for the frequencies to be assigned, as defined by TKG 2003 Art. 54 Par. 6. The same participant also recommends reserving separate spectrum for campus networks or making provisions for such networks.

4 Items for auction (section 3)

4.1 Technical terms and conditions of use

One consultation participant sees a risk of interference to mobile satellite services (MSS) from use of the 1500 MHz band for mobile telecommunications. The participant suggests that the regulatory authority should set field strength limits for airports and waterways. In relation to the 2100 MHz band, the consultation participant does not believe frequency requirements comply with Decision 2012/688/EU, and recommends setting limits to improve compatibility between MSS and mobile telecommunications use.

4.2 Lot sizes

In the consultation for the auction, the regulatory authority proposed the following lot sizes: 2 x 5 MHz for spectrum in the 700 MHz and 2100 MHz bands, and 1 x 10 MHz in the 1500 MHz band.

All consultation participants except one agree with the regulatory authority's proposal and have no objections to the chosen lot sizes.

One consultation participant considers 5 MHz blocks to be too narrow for 5G and instead advocates auctioning off the 700 MHz band in 10 MHz blocks. This participant argues that the chosen auction format does not prevent a situation where a provider wishing to obtain either 0 MHz or 10 MHz in the 700 MHz band is ultimately assigned 5 MHz, since provisional maximum bids cannot be withdrawn. This would also be open to abuse by bidding strategies. Awarding 10 MHz blocks in the 700 MHz band is suggested as a way of avoiding this *exposure risk*.

4.3 Product categories

In the consultation, the regulatory authority proposed product categories for the auction as follows:

- Six product categories for the 700 MHz lots (categories Aa to Af)
- One product category for the 1500 MHz lots (category B)
- One product category for the 2100 MHz lots (category C)

Two consultation participants have advocated changes. One consultation participant sees the six categories in the 700 MHz band as potentially resulting in a 'parking problem' in the auction. One solution suggested for resolving this problem is an auction with very small minimum bid increments. Another proposal, based on an initial analysis revealing comparable rollout costs, envisages combining the categories into just one and assigning the cadastral municipalities in a separate auction stage.

Another consultation participant views the cadastral municipalities that are linked with 700 MHz band blocks as exactly or effectively equal in value and consequently sees no reason to award them in six separate categories. Even if there were any

negligible differences in value, the participant argues, these would be smaller than the absolute amounts by which the block prices increase in each round (minimum increments). Combining the categories into one would therefore offer several advantages: less complexity in the auction, fewer opportunities for strategic bidding behaviour and improvements to the auction's utility in determining pricing. A phase that includes sealed additional bids and a second-price rule is recommended for assigning the cadastral municipalities. This phase would take place immediately after the clock phase as part of the first stage. Compared with price increments in the clock rounds, additional bids from this phase would better reflect marginal price differences, concludes the participant.

4.4 Period of use

All consultation participants welcome or at least acknowledge the periods of use as proposed. One consultation participant additionally calls for the licences for the three frequency bands to be set to expire uniformly at the end of 2044.

5 Coverage obligations (section 4)

5.1 General information

The regulatory authority has proposed a series of coverage obligations, whose requirements have also been chosen to best accommodate the ambitious 5G rollout goals set by policymakers.

The coverage obligations proposed by the regulatory authority have met with both approval and criticism. The participants generally support most of the coverage targets while criticising certain requirements or details of requirements. Specifically, certain mobile network operators reject some coverage obligations as being too ambitious. Mobile telecoms industry stakeholders also point out various risks and impediments associated with the coverage commitments.

One consultation participant highlights the need to strike a proper balance between coverage targets and the resources required. The fulfilment of the coverage obligations not only requires expenditure on resources and network expansion work, argues the participant, but also entails risks that arise from these commitments, including unplanned investments, delays or even fines. The participant emphasises the need for realistic, feasible, clear and fair coverage obligations, and for appropriate legal certainty.

Another consultation participant anticipates bottlenecks throughout the process—from the planning and acquisition of suitable objects to the granting of all necessary approvals. To implement the requirements effectively, active participation is called for on the part of all stakeholders, from making locations available to ensuring accelerated approval procedures. Specifically, where construction projects need lengthy approval periods—such as when erecting new 700 MHz sites—the two deadlines should each be extended by two years, from 31 December 2022 to 31 December 2024 and from 31 December 2023 to 31 December 2025.

One consultation participant accepts the coverage obligations proposed by the regulatory authority unconditionally. This participant does warn against letting mobile broadband distract from efforts to connect households in rural areas via gigabit-ready optical fibre, however. Instead, the 5G rollout should serve to complement and even support high-capacity fixed network infrastructure. The participant calls for a nationwide FTTH rollout, with mast sites connected to existing public fibre networks (mast connection requirement).

One consultation participant highlights the need for cooperation, coordination and management as a basis for economically sound investments. The participant recommends consulting with local municipalities when planning lines and deciding on mast sites.

One consultation participant suggests focusing public interest squarely on network security and reliability and national economic criteria. Competition at the infrastructure level should be avoided, since this could lead to investments that are detrimental for the economy as a whole. Promoting ‘open fibre networks’ would

instead ensure competition at higher levels. The participant describes standalone mobile masts as economically unnecessary structures and hence to be avoided. A telecoms infrastructure for emergencies and disasters should be ensured.

This basic idea has led to the derivation of numerous suggestions, with examples including the following:

- Operators should be required to connect mast locations to existing public fibre networks.
- Under certain conditions, the expansion of public fibre networks to include mast locations (for example, where masts are used to meet extended obligations) should be mandatory.
- Infrastructure in peripheral areas should be considered critical and should therefore be safeguarded from risks posed by nature and protected from outages in the event of a disaster.
- The erection of mast and transmitter locations should be coordinated and completed with local communities as partners. Good practice would also involve taking steps to safeguard at least one full-coverage 5G broadcasting network, while also utilising existing broadcasting locations to help avoid transmitter multiplication.
- To avoid redundant excavation and exploit synergy effects, connections between broadcasting locations should be coordinated with municipalities when rolling out full-coverage fibre networks.
- The shared use of mast locations should also be encouraged, so as to mitigate growing public concerns about health considerations in relation to 'radio waves' or 'radiation' etc.
- 'Sensitive buildings' such as daycare facilities and schools should not be used at all for mast locations, even for small-scale antennas, unless use is expressly agreed with the local administration.
- Public information campaigns about 5G should be organised to prevent the spread of misleading information.

Several consultation participants touch on the 30 Mbps data rate, especially in connection with the required coverage levels. One recommendation is to define 30/3 Mbps DL/UL as the cell capacity rate while requiring a user data rate of only 10/1 Mbps DL/UL outdoors. Instead of the data rate, one consultation participant suggests reducing the coverage levels. Another recommendation is to select a higher or the highest aggregation level when setting coverage levels. Consequently, it would be sufficient to meet coverage requirements on average or collectively for all cadastral municipalities, for instance. A separate requirement for each cadastral municipality is rejected. The median is advocated in place of the 25th percentile as the value used to evaluate each coverage area. Measurement procedures should be designed to ensure exclusion of non-representative measurements, for example during overload scenarios.

One consultation participant sees the coverage obligation scheme proposed by the authority as highly complex and overly costly, being defined in terms of population, roadway and area coverage. Alternative requirements are suggested as follows:

- For each and every coverage obligation, a cell capacity of 30 Mbps and a user capacity of 10 Mbps outdoors should be guaranteed. Percentages should be determined based on all areas collectively.
- Demonstrating and verifying compliance with coverage obligations must be transparent and replicable, and thus provide legal certainty. For verification, operators and authorities should apply a mutually agreed model to simulate radio wave propagation. Grid cell measurements should be avoided, as such measurements are not replicable for various reasons.
- At the same time, to ensure fulfilment of coverage targets, regulatory steps should be taken to ensure that operators are permitted to form a joint 5G rollout firm, so as to ensure a highly efficient 5G rollout and to allow operators to meet common coverage obligations effectively.
- In the interests of legal and investment certainty, regulation in the form of specific requirements for market segments that are already functional, such as rail services, must be avoided. The rollout facilitation measures introducing reduced fees for locations, as set out in the 2018 amendment to the TKG, must be ensured and feasible in practice. The state must shoulder its share of the responsibility for helping Austria to become a gigabit society, and make locations available under the terms specified in the TKG 2003.

Several consultation participants take a critical view of the timetable for meeting coverage obligations. In particular, participants note that these obligations would conflict with those defined in the 3 GHz auction. Each licensee holding usage rights in the 3 GHz and 700 MHz or 2100 MHz bands would face pressure to meet deadlines and invest. Fulfilling these overlapping commitments would overtax both the operational and financial resources of mobile telecoms providers.

One potential risk is that all investments over this period could end up being devoted exclusively to meeting the coverage obligations, with a demand-based 5G rollout then only possible after a prolonged delay. This would affect the entire industry, including tier one suppliers and qualified subcontractors such as engineering and construction firms. As a result, requisite resources that are outside Austrian providers' control could very well be unavailable.

For this reason, a postponement of the deadlines for (at least) two years is requested. According to one participant, the long approval periods expected mean that this issue will especially impact the rollout of low-band sites, along with 5G coverage of road infrastructure not administrated by the ASFINAG motorway authority (regional roads).

5.2 Band-specific coverage obligations

The regulatory authority has proposed band-specific coverage obligations framed in terms of a specified number of locations to be set up per frequency band.

One participant welcomes the use of locations as a suitable metric for band-specific coverage obligations but nonetheless criticises the setting of a minimum number of 2100 MHz locations for each Austrian province as inappropriate and inconsistent in terms of a nationwide licence.

The participant instead suggests basing distribution of locations on the share of the total population within each province.

5.3 Basic coverage obligations

The regulatory authority has proposed several obligations relating to basic coverage:

- A general population coverage obligation
- A coverage obligation for federal and regional roads
- An obligation to provide coverage to cities and towns with at least 10,000 residents (population coverage and urban coverage)
- An obligation to provide coverage to motorways and limited-access highways as well as to selected railway lines based on a cooperative model

One participant objects to the coverage requirements for the 2100 MHz band as being overly ambitious. A network operator without sufficient low-band spectrum would have great difficulty meeting the obligations. A relaxation of the rules for verifying coverage targets in the 2100 MHz band is requested (including a data rate of 30 Mbps at cell level while reducing the user data rate to 10 Mbps, coarser granularity for coverage levels and the exclusion of atypical measurements).

One participant, objecting to the coverage requirements as being overly demanding, requests a reduced data rate and/or reduced coverage thresholds. The threshold values proposed for basic coverage obligations are roughly as listed below:

	Coverage level	DL/UL
General population coverage for Austria	90%	30/3
General population coverage for Austria	95%	10/1
Coverage for urban populations	90%	30/3
Area coverage in urban and settlement areas	80%	30/3

As regards the coverage obligation for regional roads, the desired level of coverage is seen as overly optimistic. Accordingly, the currently proposed coverage deadlines for regional roads should be moved forward one year. One consultation participant suggests simplifying the road requirement. An outdoor DL/UL coverage level of 10 Mbps is regarded as sufficient. The additional obligation to provide uninterrupted coverage for B and L roads should therefore be struck out. If not, there are fears that

verifying road coverage obligations will result in exorbitant effort and expense. Restricting measurements to selected sections rather than the entire road system is also suggested. Tunnels and superstructures should be excluded from the road coverage obligation. The requirement for 'uninterrupted road coverage' is also criticised as being poorly defined. More details are requested concerning the division of B and L roads into 200-metre segments.

A recommendation is made to have the requirement for cooperation on the part of operators of infrastructure (railways, motorways and limited-access highways) apply to both new and existing locations. The cooperation requirement should also apply equally to the retrofitting of radio equipment to accommodate new technologies. Rents for existing locations must not be increased when the locations are refitted for new spectrum awarded in the multiband auction. When locations are proposed for network expansions to meet these obligations, MNOs should also be entitled to submit proposals of equal merit. The selection of suboptimal locations, with their associated overheads, is to be avoided. In terms of rail coverage, the supply of geodata is requested.

Two consultation participants characterise the meeting of coverage obligations as being the sole responsibility of mobile network operators. These participants take a critical view of infrastructure operators having to provide support services.

Another suggestion is to use a standard grid size for the geodata supplied. General population data (100 x 100 m) and data for permanent settlement areas (250 x 250 m) should be harmonised. A grid size of 250 x 250 m results in a resolution that is too low to allow detailed verification of coverage obligations.

5.4 Extended coverage obligations

The regulatory authority is using the extended coverage obligations to prioritise the target of near-universal coverage as set by policymakers. In this context, the regulatory authority has identified 2,100 municipalities with poor or mediocre coverage. This consultation proposal comprises the following main points:

- In stage 1 of the auction, winners of 700 MHz spectrum will be obliged to provide coverage to a total of 900 cadastral municipalities (150 per 700 MHz block).
- In stage 5 of the auction (now stage 4), spectrum winners can commit to providing coverage to additional cadastral municipalities in return for a discount on the frequency price.
- To avoid inefficient infrastructure redundancy, the coverage obligation for each cadastral municipality chosen will apply to only one operator.
- The TKK has proposed a multi-stage selection procedure to assign the specific cadastral municipalities.
- Operators are also free to engage in various kinds of cooperation with and without their own spectrum.

- The extended obligations comprise coverage targets relating to both area and population, aimed at guaranteeing near-universal coverage in the cadastral municipalities to which they apply.
- The regulatory authority has also proposed an obligation to provide coverage to households with poor coverage.

5.4.1 Coverage targets

No significant objections were raised to the primary goal of ensuring universal mobile broadband coverage wherever possible, even in rural municipalities. Several consultation participants expressed their full agreement. Positive mention was made especially of the adjustments introduced in response to the first consultation. Several participants criticise the coverage obligations as still too demanding and as being too costly to achieve, while recommending adjustments.

While fully supporting the regulatory authority's goal, one participant argues that if Austria is to achieve the goal of becoming a gigabit society, the country requires near-universal coverage with fixed and mobile digital infrastructure that is capable of meeting long-term technological needs. This goal, it is argued, implies a commitment to ensuring a suitable living standard in rural areas.

Another participant, while welcoming the proposal to focus requirements on cadastral municipalities with poor coverage, nonetheless views an interactive process involving regional authorities as being a more effective way of selecting cadastral municipalities.

In relation to population and universal coverage requirements, aspects receiving critical mention included the following:

- The required data rate of 30/3 Mbps is seen as overly high and singularly demanding compared with other countries. The data rate is five times higher than for previous coverage targets. Full coverage of 30/3 Mbps in peripheral areas would require a disproportionate level of expenditure.
- A reduction of the user data rate from 30/3 Mbps to 10/1 Mbps is requested here (with the 30/3 Mbps data rate applicable only to cell capacity). Alternatively, coverage levels could be lowered (for example, reducing population coverage from 95 to 90 per cent and area coverage from 90 to 80 per cent for settlement areas). Another suggestion is to define the median instead of the 25th percentile as the target value for a cadastral municipality.
- These reductions to data rates or coverage levels are justified by the heavy utilisation of radio resources in certain areas (such as at cell edges during temporary events that cause high peak loads, for instance).
- One consultation participant rejects any requirement to provide coverage to permanent settlement areas within cadastral municipalities, claiming it would result in an unprofitable rollout to unsettled areas.
- The highest aggregation level possible should also be aimed for when setting coverage levels. Accordingly, coverage levels should apply for all cadastral municipalities as a whole and not for each (single) municipality.

The obligation to provide coverage (of 10/1 Mbps) to households with poor coverage in selected cadastral municipalities met with criticism, with the objections raised including the following:

- Mobile broadband access must not distract from efforts to connect households in rural areas via gigabit-ready optical fibre.
- The onus to improve this poor level of coverage is not only on the mobile telecommunications industry but on every infrastructure provider, including provincial governments, municipalities and federal authorities (broadband funding).
- Mobile telecoms industry stakeholders criticise the lack of a sound basis for planning and the potentially high costs of providing coverage, claiming that the number of households eligible for or interested in coverage is still an unknown quantity. Such households are expected to be in remote areas. One participant estimates the additional investment risk at roughly EUR 1 billion. This is claimed unjustified from an economic perspective. The requirement therefore renders investment planning impossible and, in turn, an accurate assessment of spectrum value.
- The requirement also allegedly discriminates against mobile network operators without access to a nationwide fixed network.
- Two participants call for the requirement to be dropped completely. One consultation participant requests a number of adjustments, at a minimum (relating among other things to judging whether there is a legitimate need as well as an obligation for owners to cooperate and rules to safeguard proportionality).

5.4.2 General conditions

Several consultation participants draw attention to the prerequisites for fulfilling the extended coverage obligations, which include the need to find suitable locations and to complete the corresponding approval procedures in time. Some are also wary of municipalities potentially charging excessive fees in cases where a failure to meet rollout obligations incurs fines. As with motorways and railways, a duty of cooperation on the part of municipalities or federal authorities is therefore requested. These duties should include the following: identifying properties, buildings and locations within an appropriate period; making such resources available free of charge (or while providing the maximum compensation set in the Reference Rate Ordinance); and providing support in approval procedures or granting approval within an appropriate period. Operators should be exempted from rollout obligations if verifiably unable to identify a suitable location in one of the municipalities concerned or if a municipality does not comply with its obligation to cooperate within an appropriate period.

One consultation participant asks for mandatory third-party access to be granted to infrastructure that an operator must set up to fulfil coverage requirements in the cadastral municipalities acquired by the operator during stage 5 (now stage 4) of the procurement auction. This is considered justified because this infrastructure is publicly funded. Use of the standard reference offers for wholesale access is also recommended to be used as a basis for this access.

Other suggestions, including a requirement to connect mast locations to existing public fibre networks, are listed in section 5.1.

5.4.3 Selection process for cadastral municipalities

The regulatory authority has proposed a multi-step process for selecting the specific cadastral municipalities in stages 1 and 5 (now stages 1 and 4). Bidders acquiring spectrum in stage 1 may select the 150 cadastral municipalities (per block acquired) exclusively from the list associated with the particular block within a set period during the auction (three to five working days). Based on the proposal, coverage would have to be provided to those cadastral municipalities by 2023 or 2025. Bidders acquiring cadastral municipalities in stage 5 (now stage 4) have the exclusive right, within a specified waiting period, to select cadastral municipalities from the lists associated with the frequency blocks acquired by those bidders in stage 1. On expiry of that waiting period, municipalities are assigned on a 'first-come first-granted' basis. Service would then have to be rolled out within one year to the cadastral municipalities nominated in that phase. The proposal also allows operators to exchange previously selected cadastral municipalities for unassigned cadastral municipalities at any time or to exchange such municipalities amongst themselves.

The process itself attracted very little criticism in the consultation. One consultation participant recommends extending the period allowed for selecting cadastral municipalities in stage 1.

Citing the time required for approval processes and for acquiring locations, a postponement of the deadlines for rolling out service to cadastral municipalities is suggested. The one-year period provided for in the 'first-come first-granted' model is therefore thought to be too short. A further recommendation is to extend the deadline for rolling out 700 MHz locations to 2027.

One participant suggests having the lists of cadastral municipalities with poor coverage evaluated by regional authorities on an annual basis, to allow coordination with the provinces' broadband activities. Specifically, the provinces could re-evaluate the lists yearly and set priorities based on a point system. The operators would then have to select municipalities in order to achieve a certain number of points (*specified in advance*).

5.5 Proof and verification of the coverage level

Discussing the need to verify coverage obligations, one participant advocates drawing samples, which would then be extrapolated into coverage figures. The participant also notes the serious difficulties involved in fulfilling the requirement for "continuous, i.e. uninterrupted" coverage. This requirement is also considered to be dependent on the CPEs that are used for 5G, and specifically on whether a seamless handover will be possible within and from out of a tunnel. Potentially, this could also require action from vehicle manufacturers.

Another consultation participant requests the following changes relating to verification by measurement:

- Measurement points for verifying coverage should not be selected at random within the grid cell. Instead, the midpoint of the grid cell should be used instead, as in previous spectrum awards.
- Grid size of 100 x 100 metres for verifying population and area coverage targets.

Based on the test samples taken (three valid readings from a maximum of five), fulfilment of coverage targets is to be determined as follows:

- The mean of the valid measurements would have to be above the target value (given in Mbps).
- The measured values would have to be at or above the 50th percentile (median) of the target value, instead of the 25th percentile, as the latter would not be sufficient to compensate for the differences expected between predicted and measured coverage.

To reduce measurement uncertainty, 100-metre sections should be used instead of 200-metre sections to evaluate coverage along routes.

The collection of geographic data for railway lines is also requested.

One consultation statement discusses verification by measurement. The statement calls for the exclusion of all side-effects capable of negatively impacting measurement results from verification (values are to be rejected outright or measurement should be repeated after sources of error are eliminated). Network outages could seriously impair coverage measurements, for example. A brief outage affecting ten mobile base stations in Vienna during the measuring period would result in a failure to meet coverage targets for 98 per cent of the population in urban areas and nationwide.

Simulation models are suggested as an alternative to verification by measurement. An MNO cannot predict coverage for a single selected town or village with the required accuracy, according to the statement. This is inherent in radio network planning models and planning that must account for inhomogeneous areas. While simulation models are calibrated so as to minimise mean error across the area as a whole, forecasts relating to individual points are relatively inaccurate. Even with

careful planning, an MNO is therefore unable to predict coverage in detail (i.e. area or population coverage or effective data speed). Conversely, base stations that have already been built but do not provide coverage to anticipated levels would have to be refitted or even relocated more than once until the coverage target was met by a minimum number of stations. This level of expenditure is not considered viable.

Accordingly, to avoid disputes over the interpretation of results from verification by measurement as well as the uncertainty posed by the heavy fines levied even if operators fall only marginally short of target values, the statement rejects the use of verification by measurement.

5.6 Penalty payments for non-fulfilment of coverage obligations

Citing the penalty payments for non-fulfilment of coverage obligations, one consultation participant proposes setting fines based on a linear progression. Operators should also be entitled to later remedy failed targets.

Another participant views the proposed penalty payments as far too severe on the whole, describing their application in full as posing an existential threat to MNOs.

Instead, this participant suggests, penalty levels should be based on the value of the items awarded in the auction, together with their matching coverage obligations.

When determining actual coverage levels, the regulatory authority should consider that, regardless of whether a verification tool is used by an MNO or comprehensive field testing is conducted by the authority, the operator's level of coverage cannot be assessed precisely. An MNO should therefore be allowed to take corrective measures while verification is still ongoing and prior to any negative test result.

This consultation participant lists the following requests for the upcoming multiband auction:

- A cap on fines, based on the value of the items awarded in the auction (limiting penalties to 10 per cent of the licence fees charged to the particular MNO is proposed as a guideline).
- The maximum penalty should apply to the sum of all fines that become due for all coverage targets during the term of the corresponding spectrum licence.
- A linearly progressive scheme of effective penalties based on the reference levels previously proposed.
- MNOs should have the right to later remedy deficiencies before the calculated fines are levied. The justification given here is that non-fulfilment of obligations is not usually intentional but is caused by unknowns relating to mast location identification and radio wave propagation (and possibly user traffic within a cell). The high coverage targets—as much as 85 per cent of an area or 30 Mbps for each customer—are considered to be especially prone to fluctuations, since both targets approximate the economically feasible limits of a rollout. Whatever steps are taken, this means that actual coverage could differ from the levels planned. Furthermore, operators would have no

chance of successfully addressing such volatility pre-emptively with coverage reserves. The right to later remedy deficiencies should give operators the chance to use both capacity and construction measures over a period of at least nine months.

Similar arguments are presented in another consultation statement. The respondent sees the current penalty payment scheme for non-fulfilment of coverage obligations as overly complex and detailed, with unforeseeable consequences due to the cumulative principle applied. The respondent further claims that, depending on the type of coverage obligation, several fines could be levied for one and the same case of non-fulfilment. An inadequate number of locations could represent a failure to comply with band-specific coverage obligations, basic coverage obligations and extended coverage obligations, for example, with multiple fines being levied accordingly. This, it is claimed, could result in fines amounting to several hundred million euros.

The respondent also notes that, while setting out the penalties for the extended coverage obligations, the current proposal fails to mention any need for certain duties of cooperation on the part of representatives of the municipalities requiring coverage. Setting up the new locations needed to fulfil the coverage obligation will not be possible without the constructive cooperation of the municipalities concerned, however. It should not be possible for a penalty to be levied without this kind of cooperation from the municipalities. Since coverage is in the interests of the municipality, this duty of cooperation is therefore justified.

The respondent argues that there are many reasons why operators may be unable to meet coverage obligations or why measurement results may fall short of targets. Some of these factors are not under the direct control of the company under obligation. For this reason, the TKK should make decisions about the fine levied, including the amount, on a case-by-case basis and within a certain margin of discretion. Currently, fixed amounts have been defined that do not permit any deviation even in justifiable cases. Such a system is seen as limiting the TKK's discretionary freedom in individual cases while preventing the consideration of factors that could justify the non-fulfilment of coverage obligations in exceptional cases.

The statement therefore recommends a revision of the penalty scheme as described below.

A ceiling should be introduced, which sets the maximum amount chargeable per year to remove any threat of annual payments amounting to several hundred million euros. One way to achieve this would be a rule whereby only the maximum fine would be due for any single circumstance triggering a penalty. Even if several separate fines could be levied for this circumstance, only the maximum fine would be due. Such a ceiling should also envisage a maximum overall amount: this amount would never be exceeded, in order to ensure the penalised company's continued competitiveness. The same effect could also be achieved by granting the TKK a margin of discretion when deciding penalties. This would enable examination on a

case-by-case basis, while considering factors potentially not under the direct control of the company under obligation and therefore allowing fines to be reduced as appropriate. As a prerequisite for fines under the extended coverage obligations, a duty of cooperation would be incumbent on the municipality in question. Any penalty should be waived where the municipality concerned does not meet fulfil its duty of cooperation.

5.7 Obligation to disclose coverage data

One consultation participant questions the need to disclose data relating to the bandwidth that is available to consumers 95 per cent of the time during the day. This key figure allegedly ignores the realities of mobile telecommunications. The participant suggests reporting the "maximum bandwidth based on the TSM Regulation" instead.

6 Rules for infrastructure sharing (section 5)

Several consultation participants request the lifting of restrictions on active sharing and frequency pooling, particularly in relation to cadastral municipalities with required coverage. One participant calls for cadastral municipalities to be required to allow access if a coverage obligation is imposed for these municipalities in the procurement auction.

Several participants also request frequency pooling as an option for meeting basic coverage obligations. One participant asks for frequency pooling and active sharing to be allowed except in prohibited zones and where excluded by band-specific obligations; one participant requests more clarification here.

One participant calls for a specific exemption from the prohibition on active sharing in connection with band-specific obligations, in order to allow legacy sharing.

One consultation participant requests a requirement for operators to provide basic coverage also using their own spectrum. As a means of verifying whether operators provide basic coverage via their own frequencies, one participant proposes, where appropriate, measurement of data rates via the pool, measurement of frequency transmission by scanner, or simulation: operators could thereby demonstrate direct provision of an adequate level of coverage.

One participant calls for equipment that is used in supplying service to railways and motorways to be exempted from the prohibition on active sharing in Vienna, Graz and Linz, and to be classified as non-replicable infrastructure.

7 MVNO obligation (section 6)

The regulatory authority had proposed attaching an MVNO obligation to the spectrum award. This proposal was presented in the first round of consultations for the 700, 1500 and 2100 MHz bands with market participants. Only cursory details of the obligation had been set out.

Going into this second round, the TKK no longer saw any need for an MVNO obligation but nonetheless included a more detailed proposal entailing a voluntary MVNO obligation: this would once again grant market participants the opportunity to provide feedback on this preliminary view as held by the authority. Specifically, a potential obligation was considered that would ensure wholesale access for MVNOs under generally defined conditions, in exchange for a discount on the frequency licence fee by an as-yet unspecified amount. The MNO bidding the lowest price discount would receive this discount and simultaneously acquire an obligation to grant wholesale access. If no MNO expressed an interest in the price discount, no MVNO obligation would be imposed.

On entering the second consultation round, the TKK revised its view and considered the MVNO obligation no longer necessary. The developments largely responsible for this change are as follows:

- The 3400–3800 MHz spectrum award, whereby spectrum could also be assigned to local firms (i.e. telecoms companies, some of whom also provide mobile telecommunications services).
- The market debut of products and mobile flat-rate substitutes for fixed network services in particular: these are entirely new products now offered by more than one provider.
- The entry of new providers into the discount market segment, with the potential to stimulate competition.
- A rapid growth in demand for virtual unbundling services, also on the part of small companies.

In light of these changing conditions, the TKK asked RTR to hold in-depth discussions with mobile telecoms providers to assess the longevity of products currently offered on the market, as well as other aspects (such as flexibility in market entry, price structures and uniformity of contract terms). Based on the reports and insights gathered from market observations and the provider discussions, the TKK took the view in the second consultation round that an MVNO obligation would no longer be necessary if participants did not submit any significant new arguments. With reference to the MVNO obligation, two specific questions were put to providers in the second round:

On the need for an obligation—question 3: Concerning the need for an MVNO obligation, do you have any comments, anything to add or proposals for changes? Please give reasons for your opinion.

On the obligation details—question 4: In the event that the final Tender Document does include an MVNO obligation, do you have any comments, anything to add or proposals for changes concerning the definition of this obligation? Please state whether the obligation adequately ensures wholesale access for MVNOs and whether the specific terms are acceptable to MNOs. Please give reasons for your opinion and/or provide suggestions for specific changes and/or additions.

Seven of the twelve companies participating in the consultation responded to the two questions. Most of the responses agreed with the TKK's (revised) view and did not see any need for mandatory MVNO access. Reasons cited in support of this position included the current level of competition, reduced incentives for investment, existing safeguards for MVNOs, operator interest in additional distribution options, and the companies that had recently entered the market. Two of the responses addressed details of a potential obligation (question 4).

Three companies expressed an interest in compulsory MVNO access, either by setting out their case in their responses to the second consultation round or referring to their first-round statements. Some statements also made suggestions about the design of the obligation, on aspects such as pricing and access to new technologies. One of the three statements recommended that, in the absence of an MVNO obligation, the regulatory authority should take steps to strengthen the demand-side market position of MVNOs relative to MNOs. Measures to support IMSI porting were specifically mentioned here. Input from another participant cited a statement from the first consultation round that called for the TKK to impose obligations in support of a 5G broadcasting mode. Other comments related to frequency-specific issues such as guard bands and secondary spectrum use but offered no new responses to the two specific questions raised in the consultation.

8 Auction procedure (section 7)

8.1 Auction design

8.1.1 General information

The regulatory authority has proposed a model encompassing four auction stages in total. According to the model, 700 MHz and 2100 MHz spectrum will be awarded in the first stage and 1500 MHz spectrum in the second. The purpose of stage 3 (the assignment stage) is to assign specific frequency blocks, while stage 4 is used to assign additional coverage obligations. An optional fifth stage had been planned for the assignment of an MVNO obligation.

One consultation participant commented on the stage model. While complex, the participant considers the model appropriate to the specific situation. Separation of the 1500 MHz band is considered acceptable although not entirely necessary because this band could also be operated with an 'anchor' in the 1800 MHz range.

8.1.2 Stages 1 and 2

For stages 1 and 2 of the auction, the regulatory authority has proposed an SMRA clock hybrid format with the following main features:

- Award of generic frequency blocks
- Consolidation of the 1500 MHz band and the 2100 MHz band lots into one category each
- Determination of provisional highest bidders by means of a waiting list while accounting for the joint spectrum cap
- Disclosure of aggregate demand after every round
- Rules of activity as proposed by Takon (see appendix to this consultation document)

No objection is raised to the auction format chosen for stages 1 and 2. The format is considered suitable for achieving the award objectives. Two consultation participants propose a change of product design, suggesting one category for the 700 MHz band (see section 4.3) along with an additional stage for assigning the lists of cadastral municipalities.

Several participants expressly welcome the disclosure of aggregate demand at the end of each auction round. Participants also request the disclosure of the following information in the auction:

- Bidders and demand in each round
- Participating companies or at least the number of participants (communicated before the auction starts)
- Any infringement of the joint spectrum cap on the part of A1 Telekom Austria AG and T-Mobile Austria GmbH (after each round)

One participant maintains that the rules of activity are unusual and could lead to dynamic processes that are difficult to predict. Reference is also made to potentially undesirable effects relating to the joint spectrum cap.

Several participants suggest lowering the maximum increment (from 15 per cent to between 5 and 10 per cent, for example). One participant recommends low minimum bid increments (of e.g. 1 per cent) as one of two possible solutions to the 'parking problem' in the 700 MHz band that is an artefact of the product design (see section 4.3).

8.1.3 Assignment stage

The model proposed by the TKK for the assignment stage has been used in several auctions in the past. In this model, assignment options (positions within the band) compatible with the outcomes of award stages are determined for each band and bidder. During a sealed bidding round, bidders have the opportunity to submit bids for their preferred positions. The auctioneer then determines the highest-value combination of assignment bids that are mutually compatible (and so produce a permissible band plan). The additional prices are then calculated based on a 'modified second-price rule'.

The basic plan for the assignment stage is generally accepted. One consultation participant would not wish to see any sequential progression for the assignment stage nor any combinatorial linking of the assignment options.

The regulatory authority's proposal to award the lowest 10 MHz block to the winner of block B02 in the assignment stage rather than in stage 2, on account of usage restrictions, is expressly welcomed. However, one consultation participant does not consider it appropriate to count this block when calculating spectrum caps in this and future auctions. This block should therefore be exempted from the spectrum caps.

One participant points out the high degree of interdependency among the frequency bands and names two contributory factors. Noting that harmonics from sub-ranges of the 700 MHz spectrum fall within sub-ranges of the 1500 MHz spectrum, the participant claims that intermodulation artefacts from sub-ranges of the 700, 1500 and 2100 MHz spectra would produce interference within these frequency bands. The consultation participant therefore asks for the determination of potential band combinations to be based on all three bands as a whole when assigning specific frequencies.

8.1.4 Additional extended coverage obligations

With reference to the extended coverage obligations, the regulatory authority has proposed a separate auction stage in which spectrum winners may obtain a discount on the frequency price in return for accepting additional extended coverage obligations. In this stage, spectrum winners may submit various bids, specifying the number of additional cadastral municipalities they would be willing to provide coverage to as well as the price discount. When determining the winning bid, the

auctioneer only considers bids below a certain ceiling, which remains unknown to the bidders. From all valid bids, a bid combination is selected that ensures coverage for the greatest number of cadastral municipalities while also falling within a 'budget' set by the TKK prior to the auction.

Two consultation participants request disclosure of the ceiling applicable per cadastral municipality. One consultation participant requests disclosure of the maximum discount for all cadastral municipalities. One participant asks for the total income derived from the previous auction stages to be made available for the price discount.

One consultation participant objects to the first-price sealed bid auction format. This format, the participant claims, prevents bidders from bidding their effective valuation, making arbitrary 'bid shading' necessary at a level that hugely increases bidder risk exposure. The participant therefore requests use of the second-price sealed bid auction, a widely used format with a proven international pedigree.

8.2 Minimum bid

Several participants object to the minimum bid level as unjustified on objective and legal grounds, and ask for this level to be reduced (by at least 50 per cent). Arguments given include the following:

- Minimum bids at the proposed level would jeopardise Austria's avowed role as a leading 5G nation.
- The minimum bid and the market price are interrelated: every spectrum award in Austria in the last 15 years has resulted in prices at least 3.7 times higher than the minimum bid.
- The refunding of licence fees in stage 5 (now stage 4) must not lead to higher minimum prices.
- If the TKK does not base minimum bids on frequency assignment fees, these cases must be justified. The consultation documents do not offer any such justification. A request is made for minimum bids to be based on frequency assignment fees.
- The consultation participants list a series of reference values they describe as suitable estimates of market value. These values are intended to show that RTR's estimate of spectrum market value does not lie at the lower end of the range of auction revenues in recent years, and the minimum bid level is therefore set too high.
- The proposed minimum bids do not comply with the maximum set by the TKG, i.e. no higher than 50 per cent of the lowest market value. Indeed, the planned minimum bid level is even higher than the median of the outcome achieved in the five 2100 MHz band European auctions.
- As regards an appropriate benchmark for determining the lowest market value, a number of recommendations are made. If the requirement is taken literally, then the least costly auction (in Iceland) should be used. The auction in Switzerland is also proposed as a benchmark (because of the similar topography, recentness and comparable spectrum). One participant

recommends using only comparable international values that are below the median, and these values could then be averaged.

- One participant suggested using initial values instead of final prices for determining the market value, noting that the initial prices would be higher than those in other countries.
- Another criticism aired was the purported failure to adequately consider the cost of rollout commitments, since comparisons had been made with the final prices from the auctions of bands entailing much more moderate obligations. The principle of licences in exchange for rollout obligations and not for licence fees should be applied. The proposed coverage obligations in Austria are seen as leading to high rollout costs and thus indirectly to a minimum spectrum fee. International comparisons show that low minimum prices have been proposed in particular for spectra associated with more stringent coverage obligations (such as in Denmark).
- The participant sees the expense of meeting coverage obligations as resulting in reduced market prices, a factor to be considered in relation to international comparisons. The greatest disparity is seen for the 700 MHz band. Accordingly, the participant offers a detailed estimate of the costs incurred by meeting the extended coverage obligations.
- Several consultation participants offer calculations of minimum bids that vary significantly from the figures proposed by the regulatory authority.

8.3 Participation requirements/bank guarantees

One consultation statement addresses the submission of a bank guarantee in the amount of the price discount as determined. In light of the prolonged retention period and the potentially high price discount, the participant believes that this form of security would incur expenses for operators amounting to several hundred thousand euros.

The regulatory authority is consequently asked to consider the use of other, less costly mechanisms as guarantees for meeting rollout obligations.

As an alternative, the participant suggests granting operators the price discount only once rollout obligations are met or have expired, allowing operators to finance the rollout from their own funds until this time.

Another consultation statement addresses the same topic, raising the objection that bank guarantees requested for stages 4 and 5 would be refunded only once the conditions for the price discount had been met. With the proposed obligations, this could take years and incur considerable costs, however. The fees for providing securities to cover EUR 20 million over a period of five years are estimated at EUR 150,000. This, it is argued, drives up costs unnecessarily while making it more difficult to acquire additional coverage obligations in stage 5 of the auction (now stage 4).

An alternative proposed in this case would be to require any licensees who do not meet the obligations to refund the reduced amount from stage 5 (now stage 4), in addition to paying the penalties already defined.

8.4 Spectrum caps

One consultation participant asks for the lowest 1500 MHz block to be ignored when calculating spectrum caps. One participant sees a risk of the joint cap advantaging an operator who demonstrated a lack of willingness to pay for spectrum in a previous auction. The participant therefore recommends disclosure of any infringement of the joint spectrum cap in the auction: only in this way would the auction fulfil the criteria of simplicity, comprehensibility and transparency as set out in Art. 55 Par. 2 of the TKG 2003. One consultation participant welcomes the caps as proposed. One participant calls for tighter caps in the 1500 MHz band and in the middle bands (1800, 2100 and 2600 MHz FDD/TDD).

One participant calls for 15 MHz to be reserved in the 2100 MHz band for each MNO, as well as a 25 MHz cap for each bidder or a joint cap of 45 MHz applicable to two bidders.