Consultation

on Future Spectrum Awards of Harmonised ECS Spectrum for Mobile and Broadband

BMLRT and RTR

Vienna, 15. Juni 2021

RTR

Contents

1 Introduction

In 2016 the regulatory authority published a Spectrum Release Plan covering the period up to 2020 and then successfully completed two 5G auctions in accordance with this declaration of intent. Together with the Federal Ministry of Agriculture, Regions and Tourism (BMLRT), the regulatory authority now wishes to draw up and subsequently publish a new Spectrum Release Plan for the next five years. The aim of this plan is to ensure planning reliability for all stakeholders.

Over a very long time frame, use of the following spectrum is being proposed for mobile and broadband services:

- 26 GHz
- Remaining 3410–3800 MHz spectrum
- 2.6 GHz
- 2.3 GHz
- 42 GHz
- 6 GHz
- 60 GHz

For some of these bands, decisions on harmonisation have already been made by the European Commission (EC); for others, harmonisation is being planned or discussed.

Based on the TKG 2003, the currently applicable legal framework, the regulatory authority (Telekom-Control-Kommission, TKK) is responsible for awarding spectra that in the frequency usage plan has been classified as specified in Art. 52 Par. 3 TKG 2003 (limited in quantity). In accordance with the draft of the TKG 2021 (E-TKG) distributed for review, the regulatory authority will in future be responsible for awarding harmonised ECS spectrum (for mobile and broadband), if no general authorisation (unlicensed usage) applies according to the frequency usage plan. As a consequence—and depending on decisions that are still to be taken at international level (by the ITU, CEPT or EU)—in all likelihood the spectrum mentioned above (or at least some of it) will fall within the TKK's scope of responsibility.

The BMLRT and RTR wish to collect important ideas and suggestions on the upcoming awards and discuss possible approaches during this consultation. The BMLRT and RTR-GmbH are thereby addressing in particular: current mobile network operators, regional wireless broadband providers, possible new entrants, manufacturers, 5G vertical industries, users of private and local 5G networks, and the interested public.

This consultation focuses in particular on the 26 GHz band. Within Europe, the 26 GHz band has been identified as a 5G pioneer band above 24 GHz for high-capacity applications. The EU legal framework envisages a prompt award process to meet corresponding demand. However, there are considerable uncertainties in relation to the longer-term use of this band. As a result of its low technical range, the band is unsuitable for providing the kind of wide-area mobile coverage familiar from frequency ranges previously assigned for mobile service use. Instead, potential use cases envisage local usage (such as for hotspots or campus solutions). As a consequence, local licensing models are now being discussed at national and international level as an alternative to exclusive, nationwide usage rights: these models focus more strongly on local usage and are flexible enough to cover a number of separate applications. These models include the shared use

of spectrum (such as the club use model) as well as models that envisage local licensing for spectrum usage. If different licensing models are applied for the various frequency bands within the Spectrum Release Plan—or even for sub-ranges within individual bands—this would limit options for simultaneously assigning bands as part of a multiband award procedure. This must be properly accounted for in the Spectrum Release Plan. As with novel spectrum sharing models, such procedures are new territory for the competent authorities and require an appropriate period of preparation on their part.

From the regulatory authority's perspective, focus should be placed on the following objectives when planning further action:

- Ensuring efficient use of spectrum as a limited resource
- Ensuring sustainable competition
- Legal certainty
- Improving broadband coverage of the population
- Encouraging investment
- Encouraging innovation and new value creation models (e.g. new application fields for 5G)

To ensure planning security for market participants, the regulatory authority together with the BMLRT intends to publish a general roadmap for the future frequency awards (Spectrum Release Plan) after the internal discussions are completed. This legally non-binding plan is intended to reflect the authorities' current assessment of future spectrum awards.

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

1 Market developments

1.1 Mobile and wireless broadband services

1.1.1 Current providers

Three mobile network operators (MNOs) with nationwide networks are currently active in Austria. A1 is the market leader, with a 39 per cent share of the retail market in Q4 2020 (see Figure 1, share calculated based on SIM cards excluding M2M). The largest competitors with their own mobile networks are T-Mobile and H3A, with a 25.5 and 23.7 per cent share respectively. Mobile virtual network operators (MVNOs) account for more than 10 per cent of the market. The largest MVNOs are HoT with more than 7 per cent of the market and Mass Response—and its Spusu brand in particular—with a 2.4 per cent market share.

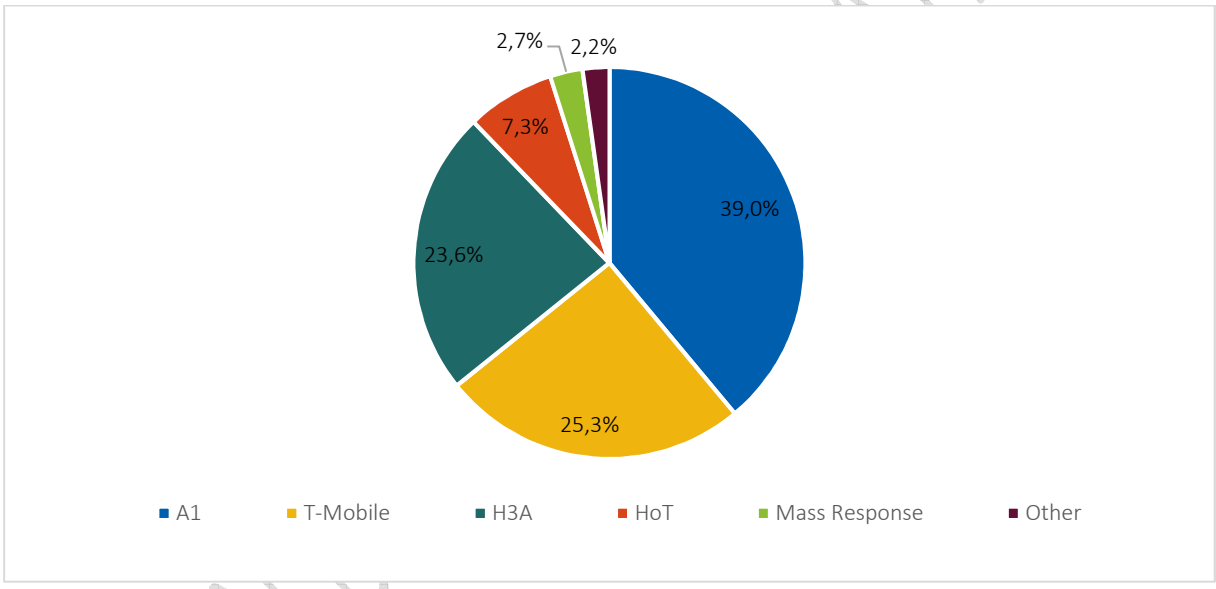

Figure 1: Mobile telecommunications market shares in Q4/2020 (number of SIM cards used, excluding M2M); source: KEV (RTR)

Mobile service data volume—see Figure 2—quadrupled between 2011 and 2014. From 2014 to 2017, during the LTE rollout, this volume sextupled and had increased by a further 160 per cent by 2020. Awards of spectrum in the 3.4–3.8 GHz band and the ensuing rollout will markedly increase data transmission capacities in the future. This enhanced capacity would enable an even greater rise in data volume over the next few years.

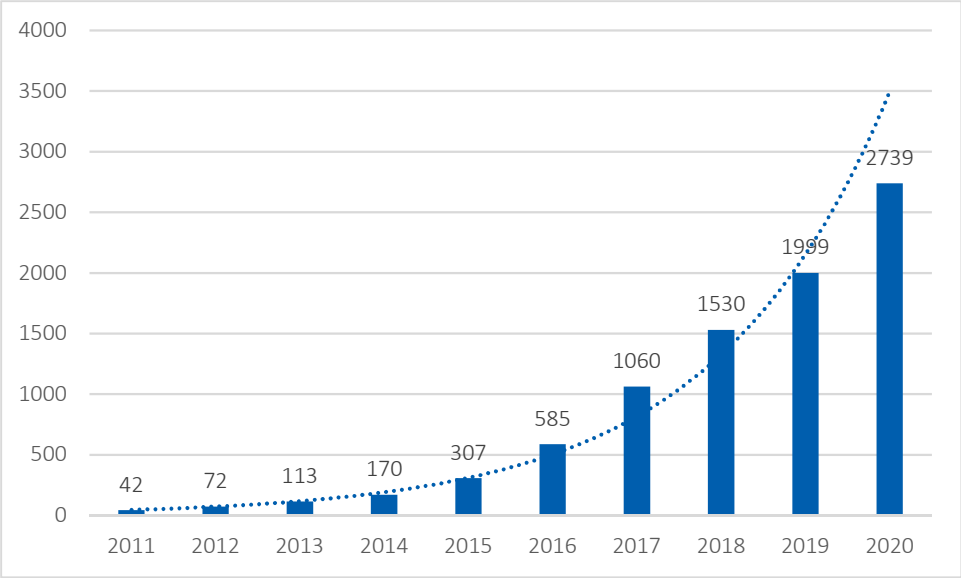

Figure 2: Mobile retail data volume upload/download (in petabytes); source: RTR (KEV)

Alongside varying amounts of spectrum, the three nationwide Austrian MNOs also have at their disposal extensive wired networks for broadband coverage. Besides these national providers, regional broadband providers—often utilising regional coaxial cable connections to end users—are especially relevant. Major regional providers include Salzburg AG, LIWEST and Kabelplus: together, these three regional providers supply service to around 100,000 end users with broadband connections. The segment also features a large number of minor regional broadband providers. With their wired broadband connections, these regional broadband providers generate competitive pressure that is independent of the oligopoly of 'big three' mobile network operators. In future Salzburg AG and LIWEST are likely to exert even greater competitive pressure by offering connectivity via spectrum in the 3.4–3.8 GHz range, acquired in 2019 (see below). Apart from the 'big three' MNOs, radio-based broadband connectivity is not especially significant for the market, since no provider has more than 5,000 customers connected via radio link.

Home broadband products, a term referring to data subscriptions serviced—often without limits—by mobile networks are especially important in Austria. These products are part of the 'data-only subscriptions' surveyed by the KEV. Figure 3 correspondingly shows the data volume transferred via fixed (i.e. wired) broadband connections and by mobile networks under the previously mentioned data-only subscriptions, as well as other subscriptions. The latter include mostly smartphone subscriptions for mobile networks. The figure highlights the importance of the mobile network for data volumes: roughly a third of the entire data volume is handled by mobile telecommunications. Within mobile services, it is the data-only subscriptions—mostly home broadband products—that account for more than three quarters of data volume and thus traffic load in the mobile network. Expanding mobile network capacity (such as by assigning new radio frequency resources) would therefore similarly facilitate increased competitive pressure on wired broadband and thus on such providers. In general, wired technologies play an essential role in expanding capacity in provider networks, both by supplementing mobile telecommunications and also by enabling a separate connection infrastructure.

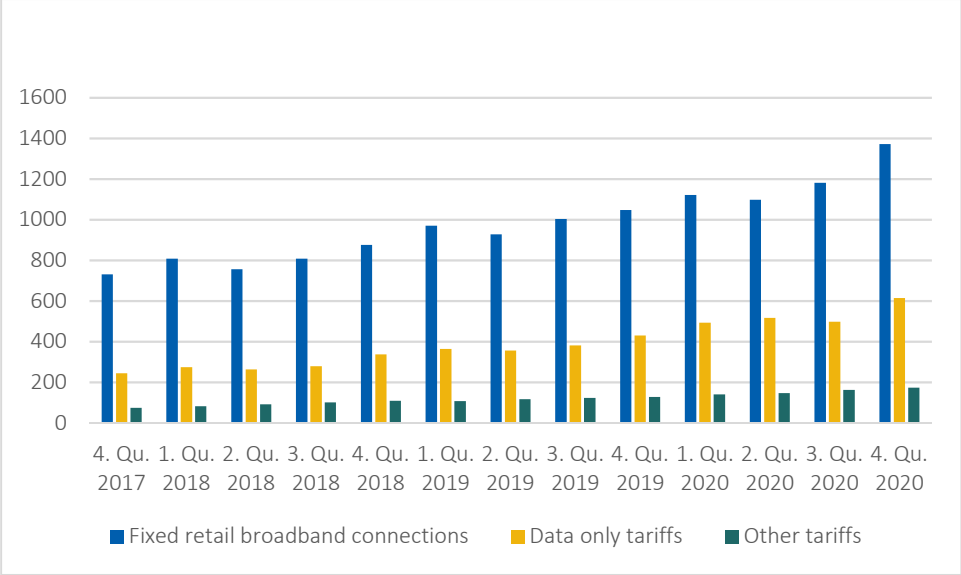

Figure 3: Data volume upload/download by infrastructure and subscription type (in petabytes); source: RTR (KEV)

1.1.2 Frequency assignments

Table 1 shows the nationwide spectrum assigned to mobile network operators up to and including 2026. These frequency assignments have a material influence on the respective data transmission capacity. In this nationwide overview, A1, T-Mobile and H3A respectively hold 38 per cent, 32 per cent and 30 per cent of frequency usage rights. T-Mobile holds more than 2x45 MHz of the total 2x95 MHz of low-band (or sub-1 GHz) spectrum available, while A1 clearly leads in the 1800/2100 MHz bands, with 2x60 MHz of the 2x135 MHz available. At regional level, A1 can draw on up to 40 MHz in the 3410 to 3800 MHz range in individual regions. Within this band, several regional providers also hold spectrum, some as much as 80 MHz, namely: Salzburg AG, LIWEST, Holding Graz and Mass Response. The first two companies mentioned are also mid-sized wired broadband providers, each with around 100,000 end users. All four regional providers are expected to increasingly roll out wireless broadband products in the 3.4–3.8 GHz band in future.[1]

Frequency band	A1	T-Mobile	H3A	Total
700 MHz FDD	-	2x20	2x10	2x30
800 MHz FDD	2x20	2x10	-	2x30
900 MHz FDD	2x15	2x15	2x5	2x35
1500 MHz SDL	30	20	30	80
1800 MHz FDD	2x35	2x20	2x20	2x75
2100 MHz FDD	2x25	2x15	2x20	2x60

[1] A detailed listing of regional frequency assignments in the 3.4–3.8 GHz band is provided at https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/5G_Frequenzvergabe_3_4-3_8GHz/5G-Auction-Outcome.en.html.

2600 MHz FDD	2x25	2x20	2x25	2x70
2600 MHz TDD	25	-	25	50
3400 MHz TDD	100*	110	100	310
Total	395	330	315	1,040
Share in %	38%	32%	30%	100%

* In individual regions, A1 can also draw on up to an additional 40 MHz in the 3400 MHz band. This listing does not include the companies with regional frequency assignments at 3400 MHz.

Table 1: Nationwide frequency assignments to mobile network operators for 2021–2026; source: RTR

1.1.3 Other 5G developments and trends significant for the SRP

Considerable potential has been ascribed to 5G for applications with major economic and social relevance (vertical industries). Fields of application mentioned in this context include transport, Industry 4.0, energy, education, e-health, smart cities and administration.[2] With these applications, 'operators' potentially refers not just to telecoms companies but also companies who are active members of these industry sectors.

On the one hand, 5G technology presents operators with a toolbox (including network slicing and virtualisation) that enables them to develop for these application fields tailor-made communications solutions that meet relevant quality standards. On the other hand, Industry 4.0 applications require higher communications and data protection standards, creating demand for local 5G networks that are operated independently using dedicated spectrum (campus networks).

The Radio Spectrum Policy Group (RSPG) has published several reports on spectrum-relevant topics in relation to 5G. For the RSPG, 5G also has a central role to play in communications services that are tailored to vertical industries. Such services could be realised by mobile network operators, third parties or the industry itself. In the event of mobile network operators being unable to develop solutions capable of meeting demand, the RSPG recommends that Member States also consider other spectrum solutions, including dedicated spectrum or shared spectrum to meet the needs of vertical industries. The RSPG notes that such solutions could take advantage of the economies of scale created by harmonised technical conditions.[3]

A number of countries in Europe have opened up access to 5G spectrum for broader user groups and have dedicated spectrum for use by private networks for vertical industries (e.g. Finland, Germany and Sweden). The aim here is to enable both indoor and outdoor networks at the respective business sites (indoor campus and outdoor campus solutions).

Spectrum licensing for (private) campus networks is conditional on a licensing system that is geared to local usage, additionally enabling the co-existence of various user groups. The RSPG considers a system with individual licensing (at the local level) as capable of meeting the needs of

2 By way of comparison: the 5G strategy of the Austrian Federal Government (5G Strategy: Austria's Path to Pioneering 5G in Europe) or the 2018 5G study commissioned by BEREC and carried out by DotEcon Ltd and Axon Partners Group (Study on Implications of 5G Deployment on Future Business Models).

3 Cf. RSPG 2019, STRATEGIC SPECTRUM ROADMAP TOWARDS 5G FOR EUROPE, RSPG Opinion on 5G implementation challenges (RSPG 3rd opinion on 5G).

this group of users.[4] Where spectrum is not scarce, a first-come, first-served approach would be appropriate. In some of the countries mentioned above, a local licensing model of this kind is now being introduced or is in planning.

The European Commission has published a recommendation for a toolbox to reduce costs. Based on this recommendation, a group of experts (including experts from EU Member States) has worked with the RSPG and BEREC to develop a connectivity toolbox encompassing 39 best practices.[5] One best practice concerns the licensing system for the 26 GHz band. Accordingly, Member States are asked to meet corresponding demand by promoting a flexible licensing system for spectrum in the 26 GHz band, with a strong focus on local licensing and spectrum sharing as an alternative or a supplement to exclusive, nationwide usage rights.

Compared with the regulatory authority's previous spectrum award practice, this kind of licensing system is a novel approach and needs appropriate preparation. This consultation paper also serves to provide an overview of the spectrum demand and requirements posed by vertical industries, private networks and campus solutions in Austria, so as to ensure that development of a tailor-made licensing system can be started in good time.

1.1.4 Traffic trends

Mobile data traffic is growing exponentially. This is reflected in recent trends, depicted in Figure 2. One important driver of traffic volume demand in mobile networks is the use of mobile home broadband products, often as a substitute for fixed broadband. What is more, the volume of data consumed by smartphones is also rising exponentially (see Figure 3). Available transmission capacity is in turn materially dependent on an appropriate portfolio of frequencies.

4 Cf. RSPG 2019, STRATEGIC SPECTRUM ROADMAP TOWARDS 5G FOR EUROPE, RSPG Opinion on 5G implementation challenges (RSPG 3rd opinion on 5G).

5 EU Connectivity Special Group 2021, Common Union Toolbox for Connectivity, accessible from: https://digital-strategy.ec.europa.eu/en/news/connectivity-toolbox-member-states-agree-best-practices-boost-timely-deployment-5g-and-fibre

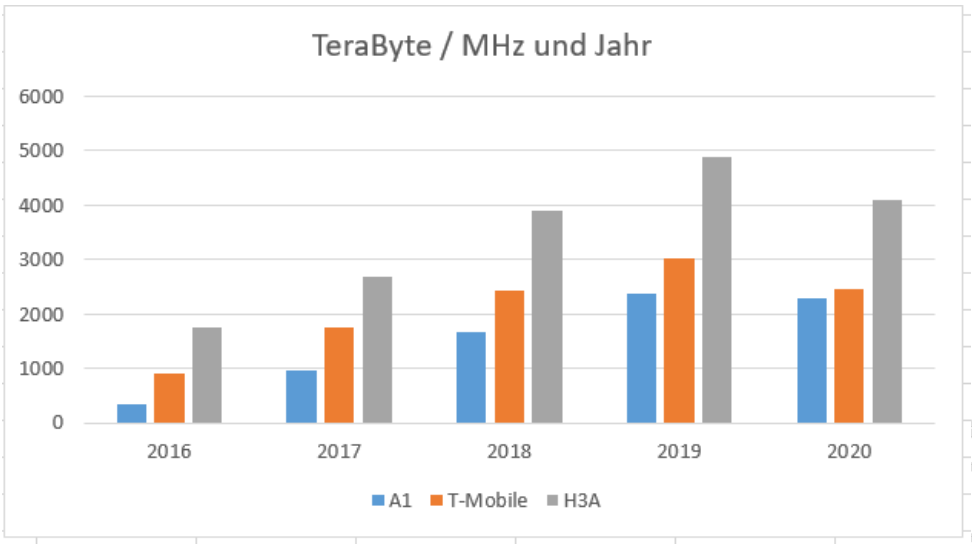

Figure 4: Terabytes per MHz and year (source: RTR and RTR (KEV)); spectrum portfolios in 2019 before assignment of 3.4–3.8 GHz spectrum

Figure 4 shows data volumes in terabytes per MHz and year as a metric for capacity utilisation. When interpreting these data, it should be noted that they do not reflect the extent to which wide-area coverage using the respective frequencies has been rolled out. Data volume per MHz rose steadily until 2019. In 2020 the newly assigned frequencies in the 3410–3800 MHz band are taken into account for the first time, although rollout of coverage was only marginal in this year. A corresponding rollout of base stations is certain to facilitate considerable expansion to capacity in the near future. The deployment of massive MIMO technology in this band will enable the use of spatial multiplexing. It is therefore expected to enable generally higher total capacity in terms of GB per MHz. While the chart above shows that, based on this metric, in 2016 capacity utilisation for H3A was around five times higher than for A1, utilisation was only twice as high by 2019, before the awarding of the new 3.5 GHz band. Capacity utilisation had therefore become somewhat similar. Overall, however, capacity utilisation is still rather asymmetric among the three MNOs. The higher this utilisation, the greater is presumably the interest in a timely award of additional spectrum. During the second 5G auction in autumn 2020, an additional 140 MHz (+15%) was awarded to mobile network operators.

International forecasts of demand for mobile services focus primarily on smartphone usage. Published in November 2020, the Ericsson Mobility Report[6] predicts, for example for Western Europe, an increased mass market proliferation of 5G smartphones, accompanied by an average annual growth rate of 26 per cent. This translates to a rise in data traffic per smartphone and month in Western Europe from 11.3 GB in 2020 to 46 GB by 2026. In Austria, the strong substitutional relationship between mobile and fixed broadband means that the traffic volume in wired broadband is also relevant for data traffic demand in relation to mobile services. Over the last two years— in 2019 and 2020—data traffic in wired broadband, as monitored by RTR based on the KEV, rose by an average of 21 per cent: this figure can also be used to estimate traffic growth in the years to come.

[6] See https://www.ericsson.com/en/mobility-report/reports/november-2020

1.1.5 Preliminary estimate by the regulatory authority

Utilisation of the spectrum resources assigned to the mobile network operators has risen significantly at all three MNOs since 2016. The first of the two 5G auctions worked to relieve this burden somewhat. However, it is to be expected that annual growth in data traffic will supersede the capacities these additional frequencies make available. Accordingly, the market will need to draw on additional spectrum resources over the medium to longer term. Beyond this, new use cases (e.g. vertical industries) are creating short-term demand for spectrum. The Spectrum Release Plan should set out an optimum strategy for responding to these trends.

Questions on market development

Question 1.1.: How do you see markets and traffic developing in relation to mobile and wireless broadband services over the next five years (what annual percentage increase in data volume do you expect to see over the next five years)? What average data transmission rates are you expecting for customers of mobile and wireless broadband services? Will home broadband services continue to drive demand in Austria? Which 5G services/5G use cases (such as eMBB or URLLC) will become more important within this timeframe? Are there any specific frequency bands that are essential for providing these services (e.g. 26 GHz band)? Please give reasons for your answer.

Question 1.2.: Do you expect to see capacity bottlenecks in your network over the next five years? If yes, in which areas do you expect such bottlenecks over the next five years? When would additional frequencies be necessary to avoid these capacity bottlenecks? Do you see 26 GHz spectrum as being suited to resolving expected capacity bottlenecks?

Question 1.3.: Are you expecting any new MNO entrants into the nationwide mobile telecommunications market during the next five years? Do you expect to see other regional wireless broadband providers enter the market in the next five years? In which regions?

Question 1.4.: How would you define 'vertical industries'? What significance will individual 5G vertical industries have over the next five years? Which players will take a leading role in terms of vertical industries (companies from the vertical industry sector, mobile network operators, wireless broadband providers, aggregators, equipment suppliers, tier one suppliers, other ICT companies etc.)? Which communications services/use cases/vertical industry solutions will become more important in relation to vertical industries? What role will be played by private 5G networks in this context?

Question 1.5.: Which of the communications services/use cases/vertical industries named in the previous question can be covered over the long term by conventional public communications network operators, such as MNOs/regional broadband providers, on the basis of nationwide/regional licences (e.g. by means of specific 'slices')? Which cannot? Please give reasons to explain your answer. Which specific requirements make a difference here (public versus private usage, technical requirements etc.)? Which geographical regions are relevant for these services (use

in buildings such as manufacturing plants, shopping centres, industrial production facilities, research campuses etc.)? Does this primarily concern indoor services (indoor campus) or also outdoor services (outdoor campus) that are restricted to the premises of the demand-side party (e.g. industries)? Could you please estimate the average area (e.g. in 100 x 100 metres) covered by a campus network? What is the maximum area to be covered by a campus network?

Question 1.6.: Which requirements in relation to future spectrum awards result from the needs of vertical industries? Are any frequency bands considered to be essential for these industry segments? When should this spectrum be awarded? Which of the frequency bands named in section 2 are irrelevant for these industry segments?

Question 1.7.: Do you see any need to develop an award procedure tailored to the needs of vertical industry solutions (e.g. local licensing, reservation of parts of the spectrum etc.)? If yes, in which band? What amount of spectrum should be used for this?

Question 1.8.: Should spectrum for vertical industries be awarded directly to industries or their partners, or should the award procedure be open to all interested parties?

Question 1.9.: Do any competition issues, including preventing access to spectrum, exist in relation to the bands mentioned in the Spectrum Release Plan? Who would be capable of causing such issues and have an incentive, and what would be the resulting impact on competition?

Question 1.10.: Are there any relevant issues in relation to infrastructure sharing? The position paper has been drafted primarily for bands falling under the most recent, 2016 Spectrum Release Plan, that is, for bands below 4 GHz. What arrangements do you view as appropriate for spectrum significantly above 4 GHz?

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2 Spectra

2.1 26 GHz band

2.1.1 Background and general conditions

In 2016 the RSPG identified the 26 GHz band as the European 5G pioneer band above 24 GHz for high-capacity and innovative new business models.

In its second opinion paper, the RSPG recommends focusing on the issuing of individual licences as part of the 26 GHz award procedure, as well as licensing flexibility—such as in relation to the geographical area (national, regional, urban or 'hyper-local', as in the case of factories, for example). The RSPG sees regulatory flexibility in freeing up and awarding the 26 GHz band incrementally as enabling the technically and economically efficient rollout of 5G, without creating any unnecessary adverse impact on the current users of this band. To secure the availability of this band for 5G, Member States should, in the event of co-existence difficulties, plan for the migration of fixed links while at the same time taking into account the geographic dimension of 5G market demand. Assuming corresponding market demand, an adequate portion of spectrum (e.g. 1 GHz) should be made available by 2020. The new European legal framework (EECC) envisages the awarding of at least 1 GHz where clear demand exists.

To better estimate demand for frequencies in the 26 GHz band, the regulatory authority carried out a consultation procedure in 2019. As this procedure did not identify a clear demand for these frequencies at the time of the consultation, the regulatory authority decided not to award the band in the near future. Over the medium to longer term, consultation participants nonetheless did expect demand for this spectrum. Here, up to 1 GHz per network operator was cited. A range of 100 MHz to 1 GHz was specified as a practicable minimum bandwidth. At the time, most consultation participants did not expect to see mature technologies on the market before 2022–2025. Potential usage types named in the consultation included: outdoor mobile broadband provided with highly restricted coverage (hotspots such as high streets, city centres), indoor mobile broadband (hotspots such as airports, railway stations, shopping centres), campus solutions (manufacturing, universities, logistics), infrastructure networks/connectivity (fixed service) and fixed wireless access (e.g. last mile to customers with external installation on customer building). In terms of fixed service usage at the time of the consultation, three options were recommended: co-existence, separation and refarming. A majority of consultation participants did not see the need for completely clearing the band. A number of consultation participants viewed freeing up sub-bands as justified under certain conditions. As regards the award procedure itself, a wide variety of proposals was submitted, ranging from the awarding of national licences, regional or local licences through to a general approval process (unlicensed usage).

For the 24.25–27.5 GHz frequency band, the European Commission has adopted a set of technical conditions (Commission Implementing Decision EU 2019/784/EC in the version EU 2020/590/EC).

This Commission Implementing Decision harmonises the technical conditions for terrestrial systems capable of providing wireless broadband electronic communications services (Art. 1).

Member States are accordingly called on to designate and make available on a non-exclusive basis the 24.25–27.5 GHz frequency band, and to evaluate the need for specifying any additional technical conditions (Art. 2). Member States should ensure that appropriate protection is offered to systems in adjacent bands, in particular the Earth Exploration Satellite Service, the Radio Astronomy Service (23.6–24.0 GHz), earth stations and satellite systems (Art. 3).

Where co-existence is possible, Member States may allow the continued operation of fixed services (24.25–27.5 GHz). This need for continued operation must be monitored regularly (Art. 4). Under certain conditions, Member States are to ensure the continued deployment of earth stations (Art. 5). Member States are also to facilitate cross-border coordination agreements (Art. 6). Member States are to report to the Commission and monitor implementation (Art. 7).

The Annex to this Decision specifies several technical parameters, including:

- The duplex mode of operation is time division duplex (TDD).
- Blocks are to be assigned as multiples of 200 MHz; special conditions apply where blocks are adjacent to other users (e.g. fixed service).
- A mask to avoid frequency block interference (block edge mask, BEM) is also specified, with particular attention being paid to synchronised operation.
- In the 23.6–24.0 GHz frequency range, specific out-of-band power limits apply for various periods to protect radio services using adjacent spectrum, in accordance with international agreements (effective date 1 January 2024).

2.1.2 Potential users and applications

To develop an efficient authorisation system, it is imperative to develop a sound understanding of potential users, their use cases and areas of use. As the scale of usage decreases in proportion to user/use case heterogeneity, the greater the flexibility required for the licensing model.

A number of use cases have been discussed in relation to the 26 GHz band:

- Mobile broadband with mobile usage: This category encompasses mobile broadband usage with ultra-high capacity and very high data transmission rates at hotspots. Examples cited include city centres, airports, railway stations, shopping centres or stadiums. This type of usage is primarily expected in urban areas or in locations where a great many people gather on a temporary basis (such as at festivals or concerts). The radio cells are very small. Outside of these hotspot zones, mobile usage is either non-existent or very low: these frequencies cannot be used to provide wide-area mobile network coverage.
- Mobile broadband with fixed or nomadic usage (fixed wireless access): This includes broadband connectivity for households and businesses, using wireless access technology. This type of usage should be seen as both a substitute for wired services and, in certain cases, as a complementary usage aimed at bridging the last mile of fibre-optic connections. This usage type is expected in suburban areas and (to a certain extent) in rural areas. Use of FWA to provide wide-area coverage is not expected. This demand could also be met by other bands, however, such as the 3.4–3.8 GHz band—a portion of which has now been awarded.

- Vertical industries/campus indoor and outdoor: These umbrella terms cover specific use cases for industry sectors with superior quality and security requirements, such as very high data transmission rates, low latency or critical communication systems subject to specialised requirements. These communications services can be provided by network operators, third parties or the industries themselves. In light of the superior communications specifications and data protection needs of Industry 4.0 applications, independent operation of local 5G networks is also required. The area of use is locally limited and restricted to the organisation's campus or premises. Often, licensing is therefore to be seen within the limited context of the owner of the property or the campus.
- Backhauling (in-band backhauling): The 26 GHz band is already in use for fixed services and therefore for base station connectivity in the vast majority of cases. The system used to date is based on FDD, i.e. separate bands are used for the send and receive components of the fixed link. 'In-band backhauling' is a concept first introduced with 5G. It refers to using one and the same radio interface both for subscriber connectivity and connectivity to the base stations. This model includes the concept of a 'central' base station that connects additional base stations as well as subscribers. These connectivity 'savings' come at the expense of increased latency. This may be acceptable for certain use cases, however, and render a cost-effective solution for additional base stations (such as hotspots or small cells).

2.1.3 Previous award procedures in Europe

To date, only a few countries in Europe have awarded 26 GHz spectrum. Award procedures will be held soon in several other countries. In Greece, Italy and Slovenia, 1 GHz was auctioned in the form of national usage rights. In Finland and Denmark, 2.4 GHz and 2.85 GHz were respectively auctioned in the form of national usage rights. Finland and Denmark plan to make the remaining spectrum available for private networks (campus solutions). In Italy, a special model for the shared use of frequencies by licensees in the band is envisaged (club use model). FWA using this band is now being rolled out in Italy.

In Germany, local licences for the entire band are being awarded within a single licence request procedure. The Czech Republic is also planning to award local licences.

In the UK, local licences are being issued (exclusively) for indoor usage with a portion of the band. The aim here was to enable early 5G indoor usage without introducing obstacles to later outdoor usage. The licence holder is permitted to set up indoor base stations within a radius of 50 metres, with multiple licences permitting a larger area to be covered. Subsequent licensing for outdoor usage is now in preparation.

Many other European countries have yet to specify a concrete award date. This has been justified by citing a lack of market demand as well as the absence of a (mature) ecosystem (e.g. Apple and other manufacturers have yet to integrate the 26 GHz band into their end-user devices in Europe). Trials are underway in several countries.

In the USA, regional licences have been acquired in the comparable 28 GHz frequency range in several auctions. South Korea has also awarded 28 GHz spectrum. Mobile and FWA use is already possible in the USA.

2.1.4 Current usage

Previous use of the frequency band has already been discussed in the 2019 Consultation[7]; in terms of non-terrestrial usage, the reader is referred to this consultation paper (e.g. protection zone around the Aflenz earth station). One important terrestrial usage is fixed services in the 25.081–25.445 GHz and 26.089–26.453 GHz sub-bands (referred to as the 'fixed service band' in the following).

Within this duplex band, just under 900 fixed links are in operation, primarily for base station connectivity. According to current licensing conditions, and assuming no further licences are issued, this existing usage expires no later than 2031. A further restriction results from the Commission Implementing Decision (see above), since this document specifies an especially low out-of-band limit at the lower edge of this frequency range. This has the specific aim of protecting the neighbouring passive frequency band and creates restrictions for systems at the lower edge of the band. Compliance with these restrictions can be achieved by the use of additional filters, power limits or limitations on use (e.g. indoor only).

The following diagram provides an overview of the frequency band:

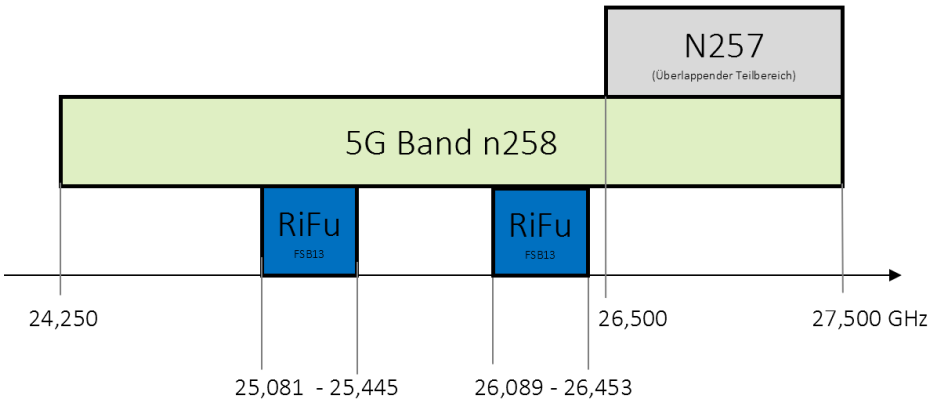

Figure 5: Overview of the 26 GHz band, including existing terrestrial usage

As a result of existing usage of the band, a number of restrictions apply to various sub-bands in relation to ECS usage in accordance with the harmonised technical conditions:

[7] 2019 Consultation, see https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/konsultationen/konsult26-ghz-2300-mhz.en.html

Frequency range/GHz	Status for ECS usage	Restrictions[a]
24.25–25.081	Available for ECS usage	Lower edge: Transmissions limited by restrictions on out-of-band emissions (the use of additional filters, power limits or limitations on the place of use (such as indoor only) can help to achieve compliance here). Upper edge: Protective measures in relation to adjacent channel usage with fixed services, as per ECC Report 303.[b]
25.081–25.445	Fixed service usage/ECS usage at most in regions not used by fixed links	Protective measures in relation to co-channel usage with fixed services, as per ECC Report 303.[c]
25.445–26.089	Available for ECS usage	Lower and upper edge: Protective measures in relation to adjacent channel usage with fixed services, as per ECC Report 303.[b]
26.089–26.453	Fixed service usage/ECS usage at most in regions not used by fixed links	Protective measures in relation to co-channel usage with fixed services, as per ECC Report 303.[c]
26.453–27.5	Available for ECS usage	Lower edge: Protective measures in relation to adjacent channel usage with fixed services, as per ECC Report 303.[b,d]

a The table does not list local restrictions resulting from satellite usage (e.g. Aflenz). See also the 2019 Consultation.

b Separation in space may be required at frequency ranges adjacent to fixed service usage (adjacent channel case). This depends on the protection distance. In the adjacent channel case, with a 20 MHz guard band, ECC Report 303 specifies a protection distance of 700–1,900 metres. See ECC Report 303; the specific distances result from the chosen band plan.

c If usage occurs in the same frequency range as the fixed service, ECC Report 303 specifies a separation in space depending on the actual conditions that apply. In rural areas, this distance could be from 20 to 70 km. See ECC Report 303.

d In the 26.5–27.5 GHz frequency range, certain areas may be excluded as a result of non-civilian usage (such as for military usages on training areas or other kinds of facilities and sites).

Table 2: Frequency ranges in the 26 GHz band

For co-existence with fixed services, protection and separation distances are necessary, according to ECC Report 303 (see table footnotes b and c). For adjacent channel usage, the distances result from the band plan chosen from 2.1.5.

One of the key questions in the context of awarding spectrum in this band is the question of the long-term significance of fixed service usage for base station connectivity. Currently, 1,080 links are in operation throughout Austria. The spectrum used by this service is only usable for ECS in

unused regions, in accordance with co-channel conditions of coexistence (see table). According to the current licensing situation, the last licences expire in 2031.

Fixed service usage significantly reduces the frequencies available for ECS over the short to medium term. In addition, existing usage gives rise in the award procedure to issues relating to long-term fragmentation of the band. The assignment of very wide, contiguous frequency blocks for extremely high data transmission rates cannot be guaranteed for multiple operators. If the current fixed service licences were to expire and no new licences were to be granted, then a band plan envisaging long-term, continuous ECS usage would be advantageous (see band plan 1 in the next section). The extent to which ECS can be used in this frequency range during a transitional phase largely depends on the exact date when the licences expire and on the protection required against existing fixed service usage. In the worst-case scenario, only some 60 per cent of potential frequency blocks will be usable for ECS services up to 2031.[8]

If, however, fixed service usage is to be maintained within the frequency ranges used to date (FDD usage) beyond 2031 as a cut-off date, then efficiency considerations would require selecting from the outset a band plan that does not envisage continuous ECS usage, because this would allow more spectrum to be used for ECS services (see band plan 2 in the next section). In this case, only 75 per cent of the frequency blocks would be usable for ECS services (over the long term).[9]

The traffic volumes to be handled by base stations increasingly require optical fibre connections. In addition, in-band backbone usage is potentially possible under the harmonised technical conditions at least over short distances, such as in urban areas. Depending on these developments, the sub-bands currently occupied by fixed service usage could potentially be made available for ECS usage earlier, at least in certain locations such as urban areas. The regulatory authority is unable on its own to provide an estimate of these developments and wishes to discuss this topic as part of the consultation. Answering this question will be crucial for the Spectrum Release Plan.

The regulatory authority wishes to propose a number of options for discussion as potential next steps. Apart from continuous further usage, there is also the option of allowing the current licences to expire and not issuing licences for any new fixed links. Alongside the largely theoretical option of freeing up the band in the short term, in areas of strong demand, having the band freed up (voluntarily) after an appropriate lead time (e.g. 2025) would be conceivable. This would support an efficient award procedure (e.g. more spectrum for ECS usage, potential avoidance of fragmentation, greater capacity by the assignment of wider frequency blocks) and could therefore potentially serve the interests of the current licence holders. In urban areas with a more extensive optical fibre infrastructure and the option for in-band backbone usage under the harmonised technical conditions, the situation should perhaps be assessed differently than in rural areas. The regulatory authority considers clearing the band earlier to be possible only on a voluntary basis, since this would otherwise create a high degree of legal uncertainty for the award procedure.

8 Individual blocks are subject to additional adjacent channel usage restrictions (see also Table 2).
9 Individual blocks are subject to additional adjacent channel usage restrictions (see also Table 2).

Conversely, the affected spectrum can be assigned for ECS services only if the fixed service licences for the corresponding frequencies expire soon after the award procedure (max. 2–3 years). These facts can be used to derive various scenarios for clearing the band and scheduling an award, each impacting the Spectrum Release Plan:

- No new fixed service licences would be issued—at least not beyond 2031. The last licences expire in 2031. The affected frequencies could only be awarded near this expiry date (no earlier than 2026; option R2 in the table).
- The timely assignment of the entire band would require legally certain, short-term clearing from fixed services by the award date (the tender, e.g. by 2022). The regulatory authority therefore considers this option (R3 and R4 in the table) to be unrealistic.
- In the event of corresponding demand for ECS usage, however, it is conceivable that the link operators would agree to an early termination of fixed service usage—at least partially, such as in urban areas, for example—before the fixed service licences expire (e.g. by 2025). Depending on timing, this spectrum could then be awarded within the schedule proposed by the Spectrum Release Plan (by no later than 2026). The regulatory authority does not consider it necessary to free up all of the spectrum currently used by fixed services. Several scenarios are conceivable here, including: freeing up the band in urban areas or early decommissioning of a portion of the links combined with a more economical usage of spectrum. In general, however, practicable ECS usage involving simultaneous co-existence with the remaining fixed links would need to be possible soon after the award procedure.

The table below summarises a number of options in this context.

Option	Description	Evaluation
R1	Continued permanent use of the fixed service band	• Spectrum remains permanently reserved for fixed services • Only 75% of blocks usable in the long term for ECS services • No contiguous frequency blocks guaranteed • Long-term restrictions due to adjacent channel use with fixed services
R2	Current fixed service licences expire/no new licences	• Current fixed service usage is maintained until the licences expire • All blocks are available for ECS only from 2031/2032 (worst case: only 60% of blocks usable by ECS) • No contiguous frequency blocks guaranteed • Temporary restrictions due to adjacent

Option	Description	Evaluation
		channel use with fixed services
R3	Freeing up the entire band from fixed services (in time for any award of the entire band)	• Having the band cleared in time while ensuring legal certainty is unrealistic • Operators are deprived in the short term of fixed service spectrum for base station connectivity • 100% of blocks available for ECS • Contiguous blocks can be guaranteed • No temporary restrictions due to adjacent channel fixed service use
R4	Freeing up the entire band from fixed services in urban areas in the short term (in time for any award of the entire band in urban areas)/current fixed service licences in rural areas expire/no new licences	• See R2 for an evaluation for rural areas • See R3 for an evaluation for urban areas
R5	Freeing up the entire band throughout Austria (before expiry of existing licences, e.g. 2025)	• Early availability of 100% of blocks for ECS • Contiguous blocks can be guaranteed • No longer-term restrictions due to adjacent channel fixed service use
R6	Freeing up the entire band from fixed services in urban areas in the short term (before expiry of existing licences, e.g. 2025)/current fixed service licences in rural areas expire/no new licences	• See R5 for an evaluation for rural areas • See R3 for an evaluation for urban areas

Table 3: Options relating to fixed service usage of the 26 GHz band

2.1.5 Possible band plans

If there were no fixed service (FS) use in the band, the band plan would be as shown below, when considering the harmonised technical conditions (200 MHz blocks, orientation on the upper band edge). A total of 16 blocks would be available in this case. Nonetheless, restrictions would continue to apply to the lower blocks (not marked in the band plan). Neither this table nor the ones below it take into consideration 24.25–24.30 GHz spectrum.

	A16	A15	A14	A13	A12	A11	A10	A09	A08	A07	A06	A05	A04	A03	A02	A01
Fu	24,30	24,50	24,70	24,90	25,10	25,30	25,50	25,70	25,90	26,10	26,30	26,50	26,70	26,90	27,10	27,30
Fo	24,50	24,70	24,90	25,10	25,30	25,50	25,70	25,90	26,10	26,30	26,50	26,70	26,90	27,10	27,30	27,50

Figure 6: Band plan for empty band

Depending on the long-term prospects for fixed service usage (see preceding section), either band plan 1 or band plan 2 should be selected.

2.1.5.1 Band plan 1

	ECS	ECS	ECS	RF+ECS	RF+ECS	RF+ECS	ECS	ECS	RF+ECS	RF+ECS	RF+ECS	ECS	ECS	ECS	ECS	ECS
	B16	B15	B14	B13	B12	B11	B10	B09	B08	B07	B06	B05	B04	B03	B02	B01
Fu	24,30	24,50	24,70	24,90	25,10	25,30	25,50	25,70	25,90	26,10	26,30	26,50	26,70	26,90	27,10	27,30
Fo	24,50	24,70	24,90	25,10	25,30	25,50	25,70	25,90	26,10	26,30	26,50	26,70	26,90	27,10	27,30	27,50

Figure 7: Band plan 1 (no long-term FDD FS usage)

This band plan would offer advantages if no long-term fixed service usage of the band were envisaged and the entire band were intended to be made available for ECS services during the planned license term (approx. 20–25 years). This would be the case if no longer-term fixed service licences (FDD usage) were issued, the current fixed service licences expired or the band were cleared in the short term (perhaps only in urban areas; see section 2.1.4 for a discussion of the various options). This band plan does not include portions of 200 MHz channels at the edge of fixed service ranges (blocks B14, B10, B09 and B05). These fragments could be used as guard bands, awarded in their own right or added to the adjacent full block.

Key features:

- 16x200 MHz arranged from the top downwards (B01–B16)
- Blocks B01–B05, B09, B10 and B14 to B16: available
  Blocks B06–B08 and B11 to B13 would be available only as part of a sharing model that enables interference-free co-existence between fixed services and ECS services. Corresponding protection zones would be required for co-channel usage (ECC Report 303 specifies compulsory separation distances of approx. 20–70 km around fixed service stations in rural areas).

2.1.5.2 Band plan 2

	C12	C11	C10	C09	RF	RF	C08	C07	C06	RF	RF	C05	C04	C03	C02	C01
Fu	24,260	24,460	24,660	24,860			25,470	25,670	25,870			26,500	26,700	26,900	27,100	27,300
Fo	24,460	24,660	24,860	25,060			25,670	25,870	26,070			26,700	26,900	27,100	27,300	27,500

Figure 8: Band plan 2 (long-term FDD FS usage)

This band plan would offer advantages if long-term fixed service usage were to be retained within the band.[10]

- 12 blocks of 200 MHz (C01–C12)
- All blocks are available
- Assignment of contiguous blocks cannot be guaranteed

[10] The block numbers in this band plan designate other frequencies.

2.1.6 Incremental/separate spectrum award

The vast majority of EU Member States that have awarded 26 GHz spectrum have assigned only a portion of the band to date (often the 1 GHz envisaged in the EECC). In some countries, a decision has already been taken to reserve a portion of the 26 GHz band for 'private' networks and to assign these frequencies at a later point in time as part of a separate licensing procedure.

In Austria, it could be considered whether to assign band spectrum incrementally, i.e. within separate licensing and award procedures. The following reasons favour such a move:

- The assignment of at least 1 GHz early on would be in keeping with the target set out in the EECC of awarding at least 1 GHz to meet a corresponding demand.
- However, there is also considerable uncertainty as to the types of long-term usage that would become established within the band. An incremental award process could result in a better alignment of services and licensing models with demand (use cases; see the points below).
- The regulatory authority expects to see demand for these frequencies varying strongly from region to region. For hotspot usage—such as in densely populated urban areas or heavily frequented public concourses—demand for these frequencies is expected to be significantly higher than in rural areas. Spectrum may become scarce in areas of strong demand, while little competition for use is to be expected in the remaining areas, where demand is weak. Several options for licensing procedures are conceivable for this reason. In high demand areas (HDAs), individual licences would be assigned for the frequencies by means of a selection procedure, while in the remaining areas (low demand areas, LDAs), local licensing and a request procedure would instead be utilised (cf. section 3). The UK Spectrum Policy Forum commissioned Real Wireless to complete a 26 GHz study, which concluded that areas of very high demand (HDAs) cover no more than approx. 1 per cent of the territory of the UK (HDAs account for 45% of total traffic).[11]
- A portion of the band is occupied by fixed service usage. The corresponding licences expire at various times in future, the last of these as late as 2031 (assuming no new licences are issued). Operators wishing to acquire the frequency blocks concerned must assess and pre-finance this spectrum many years before actual use.
- In the past, a number of user groups, each with discrete use cases and usage areas, have expressed an interest in this band. An appropriate division of the band into sub-bands for various uses could simplify the co-existence of disparate groups of users. The lowermost portion of the band could be allocated for private network use and mostly indoor usage (campus networks), for example. Frequency assignment could be linked to ownership of a building or a business premises (with owner consent as a prerequisite for this type of spectrum use). The uppermost portion of the band could, in turn, be reserved for use by mobile services and FWA.
- A 'partitioning' into sub-bands according to various aspects—such as usage type and time—would also be conceivable (cf. the recommendation made in the following table).

[11] Real Wireless 2021, 26 GHz – the opportunity for a fresh approach to licensing in higher frequencies, accessible from: https://www.real-wireless.com/news/publications/

- A parallel system of licensing for exclusively indoor use with reduced transmission power would also be conceivable, so as not to interfere with outdoor usage (an underlay model of this type has been chosen in the UK).

Blocks	MHz	Use
B14–B16	600 MHz	• Private networks (indoor and outdoor campus solutions) • Local licensing, explicitly tied to ownership of the campus, property, site etc.
B01–B05	1 GHz	• Primarily mobile services and FWA usage • Awarding of individual licences valid within Austria; or • Awarding of individual licences with a selection procedure in high demand areas and local licensing in low demand areas
B06–B13	1.6 GHz	• Medium-term reserve • Award timetable depending on availability • Licensing model would be adjusted to long-term demand (use cases) • For example: awarding of individual licences with a selection procedure in high demand areas and local licensing in low demand areas. • Reserve for private networks (indoor and outdoor campus solutions)

Table 4: Possible partitioning of spectrum (band plan 1)

Arguments against separate award and licensing procedures include that this would result in fragmentation (no contiguous frequency blocks) and an inefficient division of spectrum. However, the regulatory authority would ascertain which options are available in relation to the award procedure, thus avoiding any such inefficient fragmentation that might arise from incremental licensing (e.g. by considering earlier spectrum assignments in assignment rounds during later awards). Such rules are to be considered in the terms and conditions of awards scheduled earlier.

The following table once again summarises the options for separate licensing of the relevant frequencies:

Option	Dimension	Description
G1	Time	• Incremental authorisation depending on availability and demand

		• Early authorisation of frequencies that are already usable (e.g. blocks B01–B05, B14–B16 in band plan 1) • Later authorisation of the remaining blocks depending on clearing of the band and demand trends
G2	Area	• Division into areas in which spectrum amount is limited in quantity (high demand areas, HDAs) and areas in which frequencies are not scarce (low demand areas, LDAs). • Separate authorisation systems for HDAs (selection procedure) and LDAs (assignment procedure)
G3	Spectrum	• Division of spectrum according to usage type • Separate authorisation depending on the usage type • Dedicated spectrum for private networks/authorisation explicitly tied to campus ownership or ownership of the site/premises (e.g. blocks B14–B16) • Selection procedure or local licensing for the remaining frequencies
G4	Division by indoor/outdoor use	• Parallel licensing system for indoor-only use

Table 5: Options for separate authorisation models in the 26 GHz band

2.1.7 Preliminary position taken by the regulatory authority

The regulatory authority is currently of the opinion that the following division into sub-bands, with an incremental award of sub-bands according to the stated priorities, represents the best option for meeting the stated goals. It also considers the legal framework, current usage and market uncertainties. In particular, this option properly addresses the fact that, as a result of the first two 5G auctions (and especially the 3.4–3.8 GHz award in 2019), mobile and FWA services are not expected to experience any scarcity in the short to medium term. This option would therefore meet the stated goals even if only a portion of the band were made available for these services in the short to medium term. At the same time, there are indications of demand for spectrum for use with new business models (e.g. campus solutions). To meet the goals of innovation and efficient frequency usage, a flexible and low-barrier award (e.g. local licensing) at an early stage is preferred.

Blocks	MHz	Use
B14–B16	600 MHz	• Priority 1: Private networks (indoor and outdoor campus solutions) Local licensing, explicitly tied to ownership of the campus, property, site etc.

		• Priority 4: Licensing throughout the rest of Austria, where compatible with private network use
B01–B05	1 GHz	• Priority 2: Award of individual usage rights in high demand areas by means of a suitable selection procedure • Priority 2: Local licensing in low demand areas.
B06–B13	1.6 GHz	• Priority 3: Medium-term reserve • Award timetable depending on availability (freeing up of FS spectrum) • Authorisation model depends on longer-term demand • Reserve for private networks (indoor and outdoor campus solutions)

Table 6: Preliminary position taken by the regulatory authority on incremental award of the band

Questions on the 26 GHz band

Question 2.1.: Which business models and technologies will these frequencies likely be used for? What role will be played by in-band backhauling? Can in-band backhauling serve in certain areas (e.g. urban areas) as a substitute for FDD fixed links for base station connectivity (see above for details)? Please give reasons for your answer.

Question 2.2.: When do you expect terminal equipment and technologies/ecosystems to become available? For which portion of the band do you expect end-user devices and technologies, and at which point in time?

Question 2.3.: What role will be played by base station connectivity via fixed services (FDD FS) in urban and rural areas over the next few years? Does this mean long-term or longer-term usage of this band will be required by fixed services? In Austria as a whole or only in rural areas? Which of the options presented in Table 3 (R1 to R6) should be selected in relation to existing fixed service usage? If you select multiple options, please rank these in order of preference. Could you suggest a better option? Which band plan should be selected? Please give reasons for your answer.

Question 2.4.: When should this band be awarded in your opinion? Should the band be awarded in two or more increments and based on separate authorisation models (options G1 to G4)? Should the band be partitioned? Should separate authorisation procedures be used for high demand areas (HDAs) and low demand areas (LDAs) (individual usage rights with a selection procedure for HDAs and local licensing for LDAs)? Please give reasons for your answer.

Question 2.5.: What minimum amount of spectrum would a network operator need to obtain in order to use the spectrum in this band efficiently? Which use cases drive this minimum level of demand? Do you see any regional differences here (e.g. in high-traffic urban centres compared with rural areas)? Please give reasons for your answer.

Question 2.6.: Which operator-neutral synchronisation scheme do you consider appropriate for this band? Please give reasons for your answer.

Question 2.7.: What is the amount of spectrum a network operator should be allowed to acquire in this band, beyond which frequency use would no longer be efficient? Please give reasons for your answer.

Question 2.8.: Do you see in this band a risk of operators being isolated or prevented access to frequency usage rights? In which downstream services or in which markets might this be the case? Who would be capable of causing such issues and have an incentive, and what would be the resulting impact on competition? Please give reasons for your answer.

Question 2.9.: Are you interested in acquiring spectrum in this band? If yes, what (minimum/maximum) amount of spectrum do you plan to acquire? If yes, in which areas would you use the spectrum? Please give reasons for these requirements.

2.2 2600 MHz band

The 2.6 GHz band comprises the 2500–2690 MHz range. The frequency band was assigned as part of the F4/08 award in 2010 [12]; licences are set to expire on 31 December 2026. To avoid any disruptive effects, timely reassignment is to be pursued before these licences expire.

Currently, this spectrum tends to be used in urban areas. Accordingly, before the next award it should be clarified whether usage could be facilitated for alternative users in areas in which the spectrum is not being used by the licensees—by means of appropriate sharing models, for example (see section 3.3).

At the moment, the frequency band consists of paired spectrum (FDD usage) and unpaired spectrum in the middle of the band (TDD usage):

[12] Award procedure F4/08, see https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/Frequenzvergabe_2600MHz_2010/FRQ_2600MHz.en.html

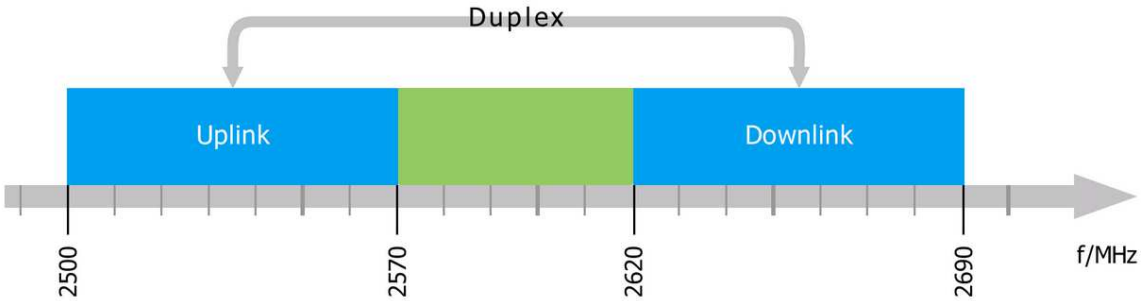

Figure: 2.6 GHz spectrum (current usage)

Although the 2010 award envisaged mixed usage between FDD and TDD, mixing TDD and FDD in one frequency band may well be considered as no longer compatible with good technical practice. At the FDD and TDD usage boundaries, a guard band (previously 5 MHz) is to be maintained in cases where both technologies are operated at the same location. This leads to inefficient utilisation of spectrum. In 2010 the clear focus was on FDD usage: the goal was therefore to provide FDD with the widest range of frequencies possible. However, as development turned towards TDD and massive MIMO (as used in the 3.4 GHz band, for example), this also changed framework conditions. It could therefore be asked whether mixing FDD and TDD in one band still represents good technical practice. While systems for FDD-only usage are still in existence today, these will have reached end-of-life as well as being legacy (4G only) systems at the time when the licences expire.

In the event of a TDD award, 3GPP band 41 (LTE) and n41/n90 (NR) will be usable. Frequencies would be assigned in 19 blocks (B1–B19), each of 10 MHz (smallest unit for n41/n90):

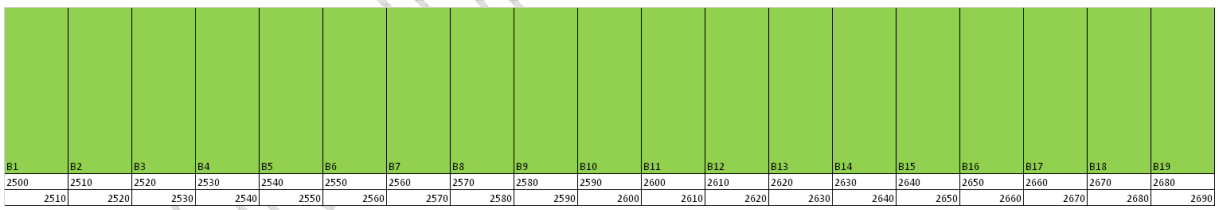

Figure: 2.6 GHz spectrum–TDD assignment

2.2.1 Preliminary position taken by the regulatory authority

To avoid disruptive effects, every effort should be made to award this spectrum before the expiry of the existing licences at the end of 2026. In the past, a lead time of one to two years has proven appropriate.

As stated, the regulatory authority is contemplating the option of assigning the entire band as a TDD band. A fundamental goal of spectrum award is to ensure its most efficient usage. The regulatory authority considers long-term TDD usage to be more appropriate for furthering this goal than the current mixed FDD/TDD usage with the guard bands needed for this configuration. The current spectrum agreements with neighbouring countries are based on the FDD/TDD usage

scenario, which underlay the award conditions in 2010. TDD usage is already possible in border areas where protection for FDD systems in spectrum sub-ranges can be assured. Any usage restrictions would continue to apply until the signing of amended agreements on the basis of recent technological advances. Depending on the transition date to TDD, a longer lead time may be needed for re-planning the band. Where requested by market participants, an earlier award procedure may therefore be conceivable, linked to voluntary transition at an earlier date. However, the award date cannot be considered in relation to this band in isolation but must be decided in the context of the other award procedures. See the commentary on the Spectrum Release Plan given in section 4.3. The regulatory authority also sees other questions as requiring clarification, namely whether the general focus of use for this spectrum will continue to be urban areas and whether appropriate spectrum sharing models could ensure more efficient usage.

Questions on the 2600 MHz band

Question 2.10.: Do you agree that the entire band should be reserved for nationwide usage in order to provide mobile services? Or should alternative usage options also be provided for in certain rural areas—where mobile network operators do not utilise these frequencies?

Question 2.11.: When should this band be awarded in your opinion? Please give reasons for your answer.

Question 2.12.: Should the entire band be assigned uniformly as a TDD band? Please give reasons for your answer.

Question 2.13.: In the event of an earlier award, should a transition to TDD take place before 31 December 2026?

Question 2.14.: In the event of a mixed FDD/TDD award: based on current practice, what guard bands would be needed between FDD and TDD at the same location? Please give reasons for your answer.

Question 2.15.: In the event of amendments being needed to existing spectrum agreements with neighbouring countries on account of changes to the usage situation (TDD-only usage), to what extent would a temporarily disadvantageous border situation impact operation and expansion activities in the respective border areas? To what extent could agreements between operators provide (at least temporary) solutions for usage scenarios in border areas?

Question 2.16.: What minimum amount of spectrum would a network operator need to obtain in order to use the spectrum in this band efficiently? Please give reasons for your answer.

Question 2.17.: What is the amount of spectrum a network operator should be allowed to acquire in this band, beyond which frequency use would no longer be efficient? Please give reasons for your answer.

Question 2.18.: Are you interested in acquiring spectrum in this band? If yes, what (minimum/maximum) amount of spectrum do you plan to acquire? If yes, in which areas would you use the spectrum? Please give reasons for these requirements.

2.3 Remaining 3.4–3.8 GHz spectrum

Spectrum in the 3.4–3.8 GHz range was auctioned off in early 2019 for use based on regional licenses. With demand for regional spectrum varying highly among regions, not all available frequencies were acquired in some regions. The table below gives an overview of the spectrum still available in these regions.[13]

Region label	Description	Available frequencies	Quantity (MHz)
A01u	Vienna+, St Pölten	3410–3450 MHz	40 MHz
A01r	Vienna, Burgenland and Lower Austria except A01u	3440–3450 MHz	10 MHz
A04u	Innsbruck+, Bregenz+	3410–3470 MHz	60 MHz
A04r	North Tyrol and Vorarlberg except A04u	3410–3470 MHz	60 MHz
A05u	Villach, Klagenfurt	3410–3470 MHz	60 MHz
A05r	East Tyrol and Carinthia except A05u	3410–3470 MHz	60 MHz
A06u	Graz+	3460–3470 MHz	10 MHz

[a] '+' indicates that the usage area additionally includes areas bordering on the particular city. Refer to the details of the award procedure provided on the RTR website at https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/5G_Frequenzvergabe_3_4-3_8GHz/5G-Auction.en.html

Table 7: Supply of remaining 3.4–3.8 GHz spectrum in specific regions

In each of the regions A01r and A06u, only 10 MHz are available, too little to be effectively used by one of the other providers bordering on the block.

Various potential usages could be considered for the spectrum still available in the other regions. These frequencies could be used for private networks or vertical industries, in addition to mobile communications and FWA.[14,15]

13 Details on the award procedure and the regions are available from the RTR website.
14 In several other countries including Germany, sub-bands have been allocated for private networks.
15 Refer to the references to vertical industries above.

2.3.1 Preliminary position taken by the regulatory authority

The regulatory authority's aim in this consultation is to survey spectrum demand trends in the specified regions and the usage options envisaged. This will depend on the time when the frequencies are awarded and on the authorisation model and/or award procedure chosen as the means for achieving the goals cited above. Where in a particular region a demand for local usage dominates, the remaining available spectrum could be approved for use together with the 26 GHz band. Where this is not the case, the remaining spectrum could be offered to MNOs and regional broadband providers through an award procedure that allows them to acquire (incremental) spectrum. The schedule could be coordinated with needs, for instance when other, such as 2.3 or 2.6 GHz spectrum is awarded.

Some of the issues raised in the context of the 26 GHz band might also have a bearing on the remaining spectrum in the 3.4–3.8 GHz range.

Questions on the remaining 3.4–3.8 GHz spectrum

Question 2.19.: In what ways, including business models and technologies, do you expect the remaining spectrum in the 3.4–3.8 GHz band to be used? Does demand exist for private network use (such as for campus networks) in the regions where such spectrum is available?

Question 2.20.: In your view, when should the remaining spectrum in this band be awarded? Please give reasons for your answer.

Question 2.21.: What minimum amount of spectrum would a network operator need to obtain in order to use the spectrum in this band efficiently? Please give reasons for your answer.

Question 2.22.: Are you interested in acquiring spectrum in this band? If yes, what (minimum/maximum) amount of spectrum do you plan to acquire in the various regions where such spectrum is available? If yes, in which areas would you use the spectrum? Please give reasons for these requirements.

Question 2.23.: Do you see in this band a risk of operators being isolated or prevented access to frequency usage rights? In which downstream services or in which markets might this be the case? Who would be capable of causing such issues and have an incentive, and what would be the resulting impact on competition? Please give reasons for your answer.

2.4 2300 MHz band

The 2300 MHz band has been allocated worldwide for IMT under TDD (NR band n40 or LTE band 40).[16]

16 The band was a previous consultation subject, in 2016 in the context of the SRP 2016–2020 and in 2019.

The band, already in use in Asia for some time, is now being awarded in Europe as well. Because of usage in numerous countries (including China and India), the band is supported by a variety of user devices. The band, or sub-bands within it, has already been assigned in several European countries. Examples of assignments include:[17]

- 60 MHz in Denmark in 2019
- 80 MHz in Sweden in 2021
- 40 MHz in the UK in 2018
- 70 MHz in Slovenia in 2021

The band has been previously used in Austria for wireless camera applications by broadcasting companies and public-sector organisations. Sub-bands have also been used for military telemetry. In the best case, the current prospect is to use the 2300–2360 MHz frequency range, or 60 per cent of the band, for broadband applications, based on a sharing concept (LSA or static geographic restrictions).

This frequency range could be awarded in 10 MHz blocks for TDD use:

Frequency blocks in 2300 MHz band	Frequency range/MHz
1	2300–2310
2	2310–2320
3	2320–2330
4	2330–2340
5	2340–2350
6	2350–2360

Table 8: Potential frequency blocks in the 2300 MHz band

17 Cf. for example Cullen International.

Question 2.24.: Presupposing a sharing plan that includes legacy use, would you agree to joint use of the band for mobile services?

Question 2.25.: What form of coexistence with legacy use would you consider practicable: (a) assignment only of the sub-band that could more or less be assigned to the whole country; (b) a static sharing model that provides for the additional assignment of frequencies subject to significant geographic restrictions (exclusion zones); or (c) dynamic sharing models (such as LSA)? Please give reasons for your answer.

Question 2.26.: When should this band be awarded in your opinion? Please give reasons for your answer.

Question 2.27.: If a static sharing model were chosen: Would a restriction be acceptable to you that would continue to allow—and require licensees to tolerate—temporary use of wireless cameras in areas where there are no 2300 MHz base stations? Would such a restriction lead to any disadvantages for mobile services use? If geographic use restrictions were introduced, in which areas would you in any case wish to use 2300 MHz spectrum?

Question 2.28.: If dynamic sharing models were chosen: What requirements would you have relating to temporary, local restrictions? How should such restrictions be specified and, when applicable, communicated? How quickly could a restriction of the usage area be implemented? What conditions for use would be realistic? Would exclusively 'indoor use', of individual channels or in restricted geographic zones, be an option for avoiding complex sharing conditions?

Question 2.29.: What minimum amount of spectrum would a network operator need to obtain in order to use the spectrum in this band efficiently?

Question 2.30.: What is the amount of spectrum a network operator should be allowed to acquire in this band, beyond which frequency use would no longer be efficient?

Question 2.31.: Are you interested in acquiring spectrum in this band? If yes, what (minimum/maximum) amount of spectrum do you plan to acquire? If yes, in which areas would you use the spectrum? Please give reasons for these requirements.

2.5 Other spectra

With a view to a time frame reaching beyond this Spectrum Release Plan, it is being discussed whether to allocate other spectra for ECS, to be used subject to harmonised terms and conditions.

The Federal Ministry of Agriculture, Regions and Tourism and the regulatory authority have ruled out the possibility of including these bands in the current Spectrum Release Plan, anticipating a spectrum award/authorisation by 2026 at the earliest.

2.5.1 42 GHz band

The 37.5–43.5 GHz frequency range was allocated worldwide for IMT use at the WRC-19. Based on current discussions within CEPT, the 40.5–43.5 GHz range, referred to as the 42 GHz band, is expected to become available in Europe for ECS and broadband. This band is currently used only to a marginal degree for fixed service (roughly 100 links).

2.5.2 6 GHz band

The range referred to as the 6 GHz band was recently allocated for wireless access systems in Europe (refer to ECC Decision ECC/DEC/(20)01). This band encompasses the 5945–6425 MHz frequency range. Under agenda item 1.2 at the upcoming World Radiocommunication Conference (WRC-23), a discussion is scheduled of possible broadband use of the 6425–7025 MHz range, which borders the WiFi band, in Region 1 (at least Europe and Africa), and the 7025–7125 MHz worldwide.[18] Depending on the outcome of the conference, a single band with a range of 100, 600 or 700 MHz could eventually become available. Yet, due to current fixed service and satellite use, the scope of potential restrictions on use of these two bands (for example, indoor only) cannot yet be anticipated.

This would make available spectrum resources with much more favourable propagation characteristics than the 26 GHz band. Consequently, we need to consider how potential availability of this band will impact future 26 GHz band use.

2.5.3 60 GHz band

Comprising the 57–71 GHz range, the 60 GHz band is available with a peak power capacity of 40 dBm EIRP (or 55 dBm EIRP) for applications including broadband, subject to certain restrictions.[19] The potential technical range of this band is limited by factors including the high frequency as well as resonance of oxygen molecules at approximately 60 GHz, causing additional attenuation of roughly 10 dB per kilometre.[20,21] This high level of decoupling attenuation favours co-channel use within short distances, while the available bandwidth supports extremely high transmission rates. Up to now, Europe has refused in this frequency range transmission power levels that exceed those specified in previous relevant harmonisation decisions. Any change of these thresholds was relegated to possible later discussion, now dominated by arguments centred on enabling and achieving the full potential offered by 5G applications.

2.5.4 Other potential spectra

The frequency bands listed above are currently being discussed in a broadband-related context. We at the regulatory authority nonetheless wish to invite consultation participants to propose additional bands, beyond those listed above, for potential ECS and mobile broadband use. In your view, which bands could or should be made available in future? For what types of use would these bands be especially appropriate (such as high capacity, particularly high technical range or special purposes)? For what reason might these bands become available?

[18] See Resolution 245, https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000D0002PDFE.pdf
[19] Refer to CEPT Recommendation 70-03, https://docdb.cept.org/download/25c41779-cd6e/Rec7003e.pdf
[20] See FCC, https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet70/oet70a.pdf
[21] See FCC, https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet70/oet70a.pdf

Questions on other spectra

Question 2.32.: Should one of our goals be to make the 42 GHz band available for ECS use (mobile communications and broadband), subject to harmonised terms? Please give reasons for your answer.

Question 2.33.: Should one of our goals be to make the 6 GHz band— or at least above 6425 MHz, depending on international developments—available for ECS use (mobile communications and broadband), subject to harmonised terms? When should this band be awarded? Please give reasons for your answer.

Question 2.34.: How would the award of a frequency band above 6425 MHz impact the 26 GHz band in terms of significance and use?

Question 2.35.: Under current conditions, what significance does the 60 GHz band have for potential broadband use, with non-exclusive availability (currently general authorisation applies throughout Europe)? For how long would the band be required? Please give reasons for your answer.

Question 2.36.: Should one of our goals be to make other spectra available for ECS use (mobile communications and broadband), subject to harmonised terms? Which bands? When? Please give reasons for your answer.

Question 2.37.: When should these bands be awarded? Do you agree with excluding these bands from the current 2021–2026 Spectrum Release Plan? Please give reasons for your answer.

3 Approval of frequency usage

3.1 Background

The frequency bands falling within the next Spectrum Release Plan will be assigned based on the Telecommunications Act (TKG) 2021. This legislation has not yet entered into force. Therefore, the following is based on the draft of the TKG 2021 (E-TKG) sent out for review, while also considering the provisions of the EECC, which underlies the TKG 2021.

Based on the legislation, the regulatory authority is responsible for awarding the harmonised ECS frequencies (for mobile telecommunications and broadband) that, based on the frequency usage plan, are not subject to general authorisation (non-licensed use). These frequencies are to be assigned on an individual basis. Assignment is to be objective, transparent, non-discriminatory and proportionate and based on transparent and objective procedures. It should observe the principles of technology and service-neutrality and take the form of an administrative decision. The regulatory authority initially has the task of issuing an ordinance ascertaining whether the amount of spectrum is limited, that is, frequencies are scarce. Where this is the case, the spectrum is to be assigned through a selection procedure pursuant to Art. 15 E-TKG, or in other cases based on a request procedure as referred to in Art. 13 E-TKG.

The question of whether spectrum quantities are limited cannot be isolated from the conditions under which the spectrum is awarded. The larger the area in which usage rights are to be assigned and the fewer usage rights available for the area, the more limited the amount of spectrum. With the quantity limited and competition for use strong, traditional low and mid-band mobile spectrum is usually awarded through a selection procedure. In contrast, the smaller the area of spectrum use, the less the likelihood of a scarcity (or competition for use), so that the spectrum can be awarded on request following a procedure. Such a procedure could be considered for the 26 GHz band, for example. The unfavourable propagation characteristics of frequencies in this range limit certain types of usage to very small local areas. This type of use may hardly interfere with other users.

Permitting unlicensed use is being discussed with a view to very high-frequency bands (for example, 42 GHz and beyond). A condition for unlicensed use of one or more of the bands under consideration here is an ordinance by the Federal Ministry of Agriculture, Regions and Tourism (BMLRT). The ordinance would set out the technical terms and rules of conduct applying when operating radio equipment without specific frequency assignment or operating permit. Under unlicensed use, conditions have to be met, including orderly operation not interfering with other users and efficient spectrum utilisation.

The BMLRT is also responsible for assigning frequencies that, based on the frequency usage plan, are not classified as harmonised ECS spectrum and are not limited in quantity.

One goal pursued in the new legislative framework is to promote spectrum sharing, meaning shared use of spectrum for various purposes and among various users. The aim here is a more efficient utilisation of spectrum, a scarce resource. The RSPG published a report on this subject in February, subsequently putting out to consultation a draft opinion that is slated to be adopted in

June.[22,23] The RSPG views spectrum sharing as playing a key role in efficient use of spectrum as an increasingly scarce resource. All harmonised ECS bands are considered potential sharing candidates.

Diverse models and technical solutions exist for shared spectrum use. Application of such models can require preparations well in advance on the part of the regulatory authority responsible. What is more, many such models are closely related to award procedures. The regulatory authority therefore wishes to discuss with market stakeholders early on the potential for shared spectrum use.

3.2 Usage areas

The spectrum included in this Spectrum Release Plan is suited only to a highly limited extent, or not at all, to supplying nationwide coverage. At the same time, various user groups have expressed interest in some of the frequency bands. Several interested parties wish to use spectrum at regional level or locally. In such situations, the regulatory authority has a statutory remit to evaluate whether the goal of achieving the most highly efficient use of spectrum might be better served by an option other than awarding exclusive, nationwide usage rights.

For the purposes here, we define a usage area as a defined area in which a designated user makes intensive use of spectrum, while this user makes no use of the spectrum in areas surrounding the usage area. The spatial distance from the next usage area of the relevant user is large enough to ensure that the other user can use the spectrum without interference. A usage area depends on the business model (whether nationwide, regional or local) and on the propagation characteristics/potential interference of the spectrum. In the case of conventional coverage spectrum for mobile communications (such as the 900 MHz band), the usage area equates to all of Austria's territory. This contrasts with the case of an MNO who uses designated frequencies (for example in the 2.6 GHz or 26 GHz ranges) only within urban areas but not beyond: the usage areas would be defined as these cities. Where an industrial company uses 26 GHz spectrum only on one campus, these premises define the usage area. One user might operate only isolated base stations spaced widely apart (for example to supply FWA in rural areas).

The following types of usage area are conceivable:

- Nationwide usage: intensive usage for blanket coverage of the entire country
- Usage in a larger region: intensive usage for blanket coverage of one region (for example, under a regional business model for one Austrian province)
- Urban usage (for example in major cities): intensive usage for blanket coverage of all or individual cities
- Urban and suburban usage: intensive usage for blanket coverage of all or individual cities as well as neighbouring municipalities

[22] Cf. RSPG 2021, Draft RSPG Opinion on Spectrum Sharing – Pioneer initiatives and bands. Available at: https://rspg-spectrum.eu/wp-content/uploads/2021/02/RSPG21-006final_Draft_RSPG_Opinion_on_Spectrum_Sharing.pdf

[23] Cf. RSPG 2021, RSPG Report on Spectrum Sharing. A forward-looking survey. Available at: https://rspg-spectrum.eu/wp-content/uploads/2021/02/RSPG21-016final_RSPG_Report_on_Spectrum_Sharing.pdf

- Municipalities or cadastral municipalities: intensive usage for blanket coverage of individual municipalities or cadastral municipalities
- Hotspot usage: intensive usage for blanket coverage of individual hotspots (such as city districts, stadiums, public spaces with regular gatherings of large numbers)
- Indoor and outdoor campus: usage within one building or on one company premises
- Indoor campus: exclusively indoor usage within one building
- Spatially defined sections: isolated instances of usage, spaced widely apart, for FWA (for instance in rural areas)

Questions on usage areas

Question 3.1.: For each band listed in the Spectrum Release Plan, estimate the usage area for the various applications under consideration (including mobile communications, FWA and private networks).

Question 3.2.: In relation to each of your business models in the specific case, what coverage areas are you planning for use with the various bands? Please also describe the business models.

3.3 Spectrum sharing

The following observations are based in part on the RSPG spectrum sharing report, referred to above. Consult the report for a more detailed discussion of the issue. This section is limited to a rough outline of potential business cases and models in relation to the frequencies listed in the next Spectrum Release Plan.

Spectrum sharing is intended as a means of more efficient spectrum use, with more than one user or service using one frequency. For example, several of the ECS frequencies assigned for nationwide use are hardly used in rural areas, or not at all. Other users could use these frequencies in those areas.

General distinctions are necessary: one case is intra-service sharing, where the same services share spectrum. One example of intra-service sharing is the joint and mutual use of mobile spectrum (spectrum pooling), as was stipulated in the 700/1500/2100 MHz award procedure. This type of spectrum sharing must meet the requirements set out in competition law. Another case is inter-service sharing, meaning the use of spectrum by different services. One example of inter-service sharing is seen in the sharing models developed to allow ECS services to coexist with previously existing applications (for instance, LSA in the 2.3 GHz band).

The RSPG generally distinguishes between single-tier sharing (or horizontal sharing) and multi-tier sharing (or vertical sharing). Under horizontal sharing, all sharing partners have the same spectrum access rights. Access can be authorised based on unlicensed or licensed use. In licensed sharing, access is based on individual usage rights, with access conditions defined under private law (as is the case for example with spectrum pooling in mobile networks) or based on a regulatory framework (for instance, the club use model defined for the 26 MHz band).

The single-tier approach is used more often in bands previously freed up. The multi-tier approach, described below, is applied mostly to bands that cannot be made available completely in the short or medium term due to existing usages.

Vertical or multi-tier sharing presupposes a hierarchy representing spectrum access priority. The lowest level is accorded the highest priority, and the higher the level, the lower the priority. Access at the lowest level is based on licensed use. Unlicensed access is additionally possible at higher levels. This type of sharing is often applied in inter-service settings involving incumbent use. Instead of waiting many years until the band is freed up, a spectrum sharing model makes earlier use for ECS services possible (an example is seen in the FCC's Citizens Broadband Radio Services).

A distinction is made between static sharing and dynamic sharing. An example of static sharing is found in geographic exclusion zones set up to guard existing applications. In the case of dynamic sharing models, spectrum access changes over time. One sharing model, including both static and dynamic variants, under discussion for one of the bands considered here, is licensed shared access (LSA) to the 2.3 GHz range.

Besides technical solutions, spectrum sharing requires an organisational framework, to regulate spectrum access and to coordinate its use with the aim of avoiding interference (sharing rules). Competent authorities can but must not necessarily provide such a framework. Providers may directly agree rules under private law among themselves, which is in fact the case with spectrum pooling. An independent third party may also be responsible for coordination. Where the competent authority is to provide the sharing framework, the rules should be kept simple and easy to implement.

Several (administrative) sharing models are presented below. Some might be applied in relation to frequencies listed in the Spectrum Release Plan, for varying reasons:

- This SRP focuses largely on the high-frequency spectrum that is mostly unsuitable for blanket coverage (for example, the 2.6 and 26 GHz bands). Suitable spectrum sharing models could enable more efficient spectrum usage in rural areas, for example.
- Spectrum within some of the bands is already in use (2.3 GHz for fixed service in the 26 GHz band). Use for ECS anytime soon would be impossible if the entire band had to be freed up. Suitable spectrum sharing models would enable ECS applications and previously existing ones to coexist. This will allow the bands in question to be used sooner for ECS.
- In the context of 5G, various types of usage are under discussion, while various users have expressed interest in using this spectrum. An example here is the interest shown by vertical industries in using 26 GHz spectrum in a private local environment. At the same time, due to the band's unfavourable propagation characteristics, it would not be cost-effective for MNOs to use this spectrum toward supplying blanket coverage. Predominately local use as well as the abundant supply of spectrum are factors facilitating the coexistence of varying user types within this frequency range. This nonetheless presupposes an appropriate model that enables shared spectrum use (possibly in conjunction with a suitable authorisation and award model).
- The more limited the area used for an application, the less likely it is that the spectrum resources will be used in their entirety at a given location or in the nearby surroundings. One provider at a particular location could use more spectrum than originally assigned, without interfering with another provider's use. Exclusive spectrum usage rights prevent other providers from using productively any unused spectrum. Nonetheless, all those holding licenses for spectrum should have the option of using those resources in the event of need. An appropriate sharing model, based on individual but not exclusive usage rights, can maintain this option, yet without threatening the long-term investment security of spectrum licence holders. One model that takes this trade-off into account is the club use model.

3.3.1 Unlicensed use

Under unlicensed spectrum use, providers have potential access to shared spectrum resources (such as WiFi frequencies) as long as they observe the defined technical standards as well as the terms and conditions of use. Alongside the 'pure' form of the regime, light-licensing methods are also in place that require potential users to first register, thereby enabling the compilation of information for users on degree of usage and potential interference.

Unlicensed use in Austria is based on general authorisation as referred to in Art. 28 Par. 10 of the E-TKG. Specifically, the Federal Ministry of Agriculture, Regions and Tourism (BMLRT) has the duty of issuing an ordinance to set out the technical terms and rules of conduct applying when operating radio equipment without specific frequency assignment or operating permit. In this case, operators must consider factors including: international standards, ensuring orderly operation of telecommunications equipment while not causing interference, the necessary protection from radio-wave interference, and efficient spectrum use.

It would be conceivable, for instance, to approve sub-ranges of the 26 GHz band for separate indoor use, apart from outdoor use, under such an authorisation regime (refer to OFCOM's spectrum sharing model for an example). Unlicensed use is generally being discussed for still higher frequencies such as the 42 GHz band. This might require correspondingly low power caps to minimise the likelihood of radio-wave interference. Nonetheless, under this authorisation regime, such interference cannot be ruled out, particularly in outdoor applications. With increasingly intensive use, coordination among users may become necessary. This could be facilitated through a requirement to register base stations in a public registry, for instance.

3.3.2 Use-it-or-share-it model

The model referred to as 'use-it-or-share-it' is an abstract sharing concept, with the goal of putting spectrum to use in areas where it is currently not in use. Providers have the option of acquiring individual but non-exclusive usage rights. In areas where these providers do not use—or cannot use—the spectrum assigned to them, other users are allowed to use these frequencies. The providers holding usage rights in each case still retain priority: in the event of need, they can exercise the right to use the spectrum throughout the area falling under the licence—possibly only after a specified period (comparable to 'prior notice'). This model is already specified in the current amendment of the TKG 2003 (under 'secondary usage'). To avoid harmful interference, and to allow access planning, sharing rules are required, which need to be clearly spelled out when usage rights are issued.

Unforeseeable (or opportunistic) access to spectrum means serious disadvantages for secondary users, in terms of marginal investment security and a lack of quality assurance. To prevent strategic spectrum hoarding, rollout obligations must be attached to usage rights, with fulfilment accordingly monitored.

The potential scope of application includes cases where individual usage rights granted for frequency bands are not used throughout the area falling under the licence, due to the propagation characteristics of the spectrum (for example, in the 2.6 GHz and 26 GHz bands).

Private networks (including campus networks and vertical industries) operating in the 26 GHz range represent another use case. The usage area is by definition limited in such cases to the premises or the campus building. Usage is often indoor-only. A spectrum licence holder may not, by definition, supply service to a campus or manufacturing facility via these frequencies without the consent of or a mandate from the property owner. Any risk of interference is minimised since the spectrum, with limited propagation characteristics, is used locally. Thus, a model based on the

use-it-or-share-it principle would be conceivable in the context of campus solutions utilising the 26 GHz band. Here, the campus solution would be the secondary user.

The club use model, applied to the 26 GHz band in Europe for the first time in Italy, is a special form of the use-it-or-share-it model.

3.3.3 Club use model

The original notion underlying the club use model is to allow a limited number of licensed operators to acquire individual but not exclusive rights to use one band. Parties holding usage rights are permitted to use not only the spectrum assigned to them, but also frequencies assigned to other rights holders, provided these frequencies are not being used by the particular spectrum holder. In other words, spectrum holders have priority usage rights. If they do not exercise their rights, the spectrum can be used by other parties holding spectrum rights in the same band. Accordingly, licensees can enter into commercial agreements or, to avoid harmful interference, delegate spectrum coordination as well as access planning to a trusted third party.

In contrast to the use-it-or-share-it model, in the club use model, the user group is limited to a club—as the name suggests. Limiting access to an 'exclusive' club facilitates coordination activities to avoid harmful interference as well as the planning of access to that particular spectrum. Irreversible investments are also avoided through limiting access to licensees of usage rights in the same band, as license holders will always have priority rights to use a sub-band. Nonetheless, the club need not be limited to licensees within the same band. The club could be expanded to include holders of spectrum usage rights in other bands, or other designated users (such as vertical industries).

This model is already being used for the 26 GHz band in several countries. It does render benefits, especially under certain conditions: when initially only a sub-band is awarded and operators are entitled to use only a relatively marginal amount of spectrum, thus unable to fully utilise the band's potential capacity and data rate. This sharing model enables operators to realise this potential in areas where other spectrum holders are currently not exercising their rights. Especially in the initial stages of band use, this will usually be the case in urban areas. As additional spectrum is awarded, shared use in urban areas could recede in the longer term, giving way to exclusive use of wider frequency blocks. In rural areas, where spectrum demand is weak and use is not that intensive relative to the coverage area, this model might even offer very good long-term prospects.

3.3.4 Use-it-or-lease-it model

Like the use-it-or-share-it model, the model referred to as 'use-it-or-lease-it' has the goal of putting spectrum to productive use in areas where it is currently not in use.

Where an operator has been assigned spectrum for a given area and does not intend (or is unable) to use the frequencies in the foreseeable future, in the event of corresponding demand, the operator has the obligation of leasing the spectrum to the demand-side party. The terms of the lease (including period and price) are to be stipulated in an assignment decision.

The use cases are similar to those for the use-it-or-share-it model.

3.3.5 Static vs. dynamic sharing

Static sharing is a tried and tested concept that is based on unchanging restrictions (relating to areas, frequencies and times) designed to protect other users within the same band (see the terms and conditions of use for the 3.4–3.8 GHz range for an example). Spatial restrictions (exclusion zones) might, for example, be stipulated to allow the co-use of the 26 GHz band for ECS and fixed service (until the latter use expires).

Similar, more innovative models are based on dynamic spectrum access. According to the club use model in place for the 26 GHz band in Italy, every licensee is entitled to use at one location all previously unused spectrum within that band. Dynamic spectrum access potentially draws on various technologies, including sensing or geolocation databases.

3.3.6 Licensed shared access (LSA)

Licensed shared access (LSA) is a regulatory approach that is currently under discussion in Europe in relation to the 2.3 GHz band. The main idea is to overcome the issue of unpredictable quality of service, a challenge inherent in purely opportunistic sharing models. This two-tier (vertical) sharing approach provides for shared use of spectrum on the basis of individual usage rights.

According to the model, MNOs and incumbent users share spectrum on the basis of individual usage rights. As set out under the terms for these rights, MNOs must observe defined rules and restrictions applying to spectrum use (for instance, in relation to times and locations). This is to ensure the capacity of all authorised users—incumbent users and MNOs—to provide their services while maintaining a predictable QoS level. The framework for shared use can be static (such as limited to defined areas), semi-static (during pre-defined hours in defined areas, for example) or dynamic (with availability varying in terms of time and location).

The 2.3 GHz band was harmonised for ECS use with reference to LSA in 2014. This model was previously a topic of consultation in the context of the first Spectrum Release Plan. Refer to the consultation document for a detailed description of the LSA model,

which has since been further developed to accommodate 5G (see here eLSA).[24] The RSPG has proposed verifying whether the LSA model might be used in the context of private networks operated by vertical industries: this would give industry companies access to spectrum without having to dedicate the spectrum for this type of application.

[24] Cf. RSPG 2021, Draft RSPG Opinion on Spectrum Sharing – Pioneer initiatives and bands. Available at: https://rspg-spectrum.eu/wp-content/uploads/2021/02/RSPG21-006final_Draft_RSPG_Opinion_on_Spectrum_Sharing.pdf

3.3.7 Organisational framework

Coordinating responsibilities result from many of the sharing models referred to above. Specifically, sharing rules have to be defined and enforced, relating to coordination of activities aimed at avoiding harmful interference as well as to access planning. This is to ensure interference-free operation, while correcting and sanctioning any abuse if necessary.

Authorities may be tasked with such responsibilities, for instance as part of local licensing activities (see below). Alternatively, network operators can stipulate agreements under private law, thereby committing to sharing rules (which is the case with spectrum pooling, for example). Another option is to delegate this role to third parties. In rare cases, the regulatory authority could award spectrum to a third party, or spectrum manager. Not directly authorised to provide mobile services, this party would merely lease the spectrum to the telecoms.

3.3.8 Preliminary position taken by the regulatory authority

One goal pursued in the new legislative framework is to promote spectrum sharing, meaning shared use of spectrum for various purposes and among various users. The aim here is the most efficient utilisation of spectrum, a scarce resource. In view of this, the regulatory authority sees the need to discuss early on with market participants various sharing concepts for the frequencies falling under this Spectrum Release Plan.

Whether any one particular sharing model will be useful for achieving goals will depend on the frequency band, the use and the licensing regime (see section below). Unlicensed use or general authorisation, for example, could suffice for very high-frequency spectrum with a short technical range and minimal interference potential, such as the 42 GHz band, in order to ensure interference-free operation. Another conceivable option would be unlicensed indoor use of the 26 GHz band.

Several sharing models provide for the option of making spectrum that has been assigned on the basis of (exclusive) nationwide or regional usage rights available to third parties. This would be the case in areas where the licensee does not exercise their usage rights—for example, due to business considerations; such models include: use-it-or-share-it, use-it-or-lease-it and secondary usage. Such models could be considered for all of those frequencies of the Spectrum Release Plan that are assigned on the basis of nationwide or regional usage rights (including, in the case of major regions, areas with marginal data traffic). Where local licensing is stipulated, such sharing models would not be necessary.

The club use model pursues a somewhat different focus. According to this model, operators are allowed, temporarily at least, to use more spectrum than acquired through the award procedure. This model would suggest itself in particular for the 26 GHz band if awarded in increments. The club use model gives network operators the possibility of utilising the full potential of the technology and of supporting very high bandwidths from the very outset. As additional spectrum is awarded in increments, network operators could directly acquire enough of their ‘own’ spectrum over time to fully utilise the technological potential.

The sharing models referred to above require an organisational or regulatory framework (including sharing rules) and possibly also technical solutions (such as databases). Such details are not the subject of this consultation but will need to be worked out at a later date (for example as part of the award procedure). We nonetheless need to schedule the time required for preparations. This implies clarifying early on the models to be used in future for the specific bands.

Questions on spectrum sharing

Question 3.3.: With regard to the frequencies falling under the Spectrum Release Plan, what potential do you generally see for spectrum sharing? What conditions need to be met in order to apply these models? What general barriers do you see?

Question 3.4.: For which bands and under what conditions could the sharing models described above (such as club use, use-it-or-share-it and LSA) be deployed? Of the sharing models mentioned, which should be used for which band, in your view? How should the general technical and economic conditions be framed? Please give reasons for your answer. When giving your answer, please consider the goals listed in chapter 1.

Question 3.5.: In your view, what organisational forms should be used to establish sharing (for example, a definition and implementation of sharing rules, coordination, or database implementation)? Who should be tasked with this responsibility: operators under private law, the competent authority or an independent third party (spectrum manager)? When giving your answer, please consider the goals listed in chapter 1.

Question 3.6.: Are you aware of any other sharing models that could potentially be used with the bands referred to? Please describe any such models. Indicate the bands and the purposes which they could be used for. When giving your answer, please consider the goals listed in chapter 1.

3.4 Licensing

3.4.1 Nationwide usage rights

As was the case with the 700/1500/2100 MHz bands, for example, usage rights will be awarded for all of Austria. Such rights do not necessarily infer exclusive use (refer here to section 3.3 on frequency sharing).

A block assignment for all of Austria enables planning and investment security, while allowing network operators to effectively manage interference and thus to locate base stations in close proximity if necessary.

It would be conceivable to award nationwide usage rights generally for all frequency ranges. However, the higher the frequency and the more varied the type of spectrum demand, the greater the risk of inefficient use. An example here is the 2.6 GHz spectrum, which is not used in many rural areas. In the case of high frequencies, such as in the 26 GHz band, there is a high probability of spectrum remaining unused in many areas. If other potential users of this spectrum existed in these areas at the same time, this would not constitute efficient use and contradicts the goals set out in legislation.

To avoid a situation where spectrum remains unused even though potential users actually exist, either appropriate authorisation procedures (for example, regional or local licensing) or appropriate sharing models are required.

3.4.2 Regional usage rights

Instead of awarding nationwide usage rights, rights could be awarded for predefined, non-contiguous regions. The choice of an appropriate regional model will depend on the frequency range (including its propagation characteristics) and on the potential users. While the advantages and disadvantages are basically the same as for nationwide usage rights, there is one important advantage, namely, any existing regional demand, for instance on the part of regional broadband providers, can be considered in the award procedure. Thus, depending on the valuations of those requesting spectrum, a more efficient distribution can potentially be achieved.

The areas need to be large enough in order to minimise any potential loss of service arising from interference management at regional boundaries. Relative to possible protection zones, the usage area should be large enough to preserve the advantage of regional usage. The higher the frequencies, the smaller the potential regions can be. In addition, regions need to be selected so as to align with potential users' business models. In the regulatory authority's view, potential regional models include the following:

- The nine federal provinces
- The twelve regions used in the 3.4–3.8 GHz award procedure (divided into urban and rural areas)
- Districts
- Municipalities
- Cadastral municipalities

In principle, it would also be conceivable to award regional usage rights for all frequency bands included in the coming Spectrum Release Plan, for example, for the remainder of the 3410–3800 MHz range. This band was auctioned off in early 2019. Because of the lack of demand, a portion of the total spectrum was not awarded in several of the regions. Any award of the remaining spectrum will have to be based to some degree on the regional plan used in the first 5G auction.

Awarding regional usage rights could also be considered for the 26 GHz band. Individual usage rights could, for example, be awarded for predefined high demand areas (HDAs) using a selection procedure, whereas in low demand areas (LDAs) the spectrum could be assigned based on a local licensing model.

This would allow MNOs to acquire large spectrum lots in HDAs, thereby enabling them to offer end users ultra-high data transmission rates and capacities. This would at the same time avoid 'sterilising' spectrum, that is, withholding it from users in other parts of Austria who would put it to productive use.

3.4.3 Local licensing

Awarding local usage rights for the 26 GHz band is an idea already found in the initial 5G reports by the RSPG.[25] In the Connectivity Toolbox Recommendation, the European Commission calls upon the Member States to promote a flexible authorisation regime for spectrum in the 26 GHz band where corresponding demand exists, while emphasising local licensing and spectrum sharing.

Yet, a clear definition is missing of what is meant by 'local licensing'. The regulatory authority proposes the following criteria:

- Licensing/authorisation covers a very small usage area (meaning either one base station or a very small area such as 100 x 100 m, or 1 km² in exceptional cases).
- Free choice of base station location or area.
- Usually, the frequency is used in adjacent areas by other users (users can accumulate several local licences, but no clear distinction is made between regional and nationwide usage rights).
- Competition for spectrum use is not strong (resulting from an interplay of factors including low technical range, marginal interference potential and spectrum supply relative to demand).
- Weak competition means a potential user can apply for authorisation at a (considerably) later point in time without the risk of spectrum becoming unavailable (either because ample spectrum is available or because a condition that highly restricts the group of potential users is attached to local usage—e.g. only the property owner).

[25] Cf. RSPG 2018, *STRATEGIC SPECTRUM ROADMAP TOWARDS 5G FOR EUROPE, RSPG Second Opinion on 5G networks*. Available at : https://circabc.europa.eu/sd/a/fe1a3338-b751-43e3-9ed8-a5632f051d1f/RSPG18-005final-2nd_opinion_on_5G.pdf

- Weak competition means that a procedure for selecting the most efficient user would offer no benefit (assignment based on the first-come-first-served principle would be sufficient for meeting the goals set out in the TKG).
- Demand can hardly be narrowed down to a specific period of time (in contrast to the situation in major award procedures for assigning usage rights).
- Authorisation is not granted through a major award procedure, allowing the acquisition of usage rights for a long period, but in ongoing manner over time.

The regulatory authority identifies two distinct local licensing models:

- Registration procedure
- Granting individual usage rights in a coordinated manner

In the case of a registration procedure, any applicant fulfilling all criteria and terms and conditions of use usually receives authorisation; the sole obligation is to register spectrum use in a publicly accessible database. A registration procedure will presumably be based on a general authorisation regime, although it could theoretically also be based on individual usage rights (without regulatory coordination). In cases of conflict, users must coordinate usage among themselves. This model is often equated to 'light licensing'. It could also be considered for private networks in the 26 GHz band, or solely on-campus or indoor use of such spectrum. This presupposes only a minimal likelihood of the frequency being used by another user in close proximity to the base station. This can be assumed, for example, where the licence is closely linked to property ownership of the campus or business site. This 'easy-to-administrate' procedure could be helpful when authorising spectrum use by private networks, for instance.

This contrasts with the granting of individual usage rights involving coordination. Here the regulatory authority evaluates, as a precondition for granting authorisation, whether interference-free spectrum use is possible (for the most part). Such a positive assessment can be achieved by observing conservatively defined separation distances or by coordinating individual cases. The regulatory authority identifies a need for such a procedure whenever spectrum is expected to be used intensively over a wide area, by different users with differing use cases.

3.4.4 Preliminary position taken by the regulatory authority

The following table reflects an initial assessment by the regulatory authority, showing the licensing procedures that would be potentially applicable for the various bands or sub-bands.

	Nationwide usage rights	Regional usage rights (e.g. 12 regions)	Local licensing including coordination	Local licensing including registration procedure	Unlicensed use	Other
2300 MHz	X	X	(X)	(X)		
2600 MHz	X	X				
Remaining 3.4–3.8 GHz spectrum (mobile services, FWA)		X	X			
Remaining 3.4–3.8 GHz spectrum (private networks)			X	X		
26 GHz high demand areas		X				
26 GHz low demand areas			X			
26 GHz private networks (campus)			X	X		
26 GHz indoor use only				X	(X)	
6 GHz	X	X	(X)			
42 GHz			(X)	(X)	X	

Table 9: Authorisation and licensing models for the various bands

Questions on licensing

Question 3.7.: Please give your opinion of the various authorisation models, referring to the spectrum included in the Spectrum Release Plan and the applications which, in your view, could play a role in the frequencies concerned. What are the pros and cons?

Please give reasons for your answer while referring to the specific applications. When giving your answer, please consider the goals listed in chapter 1.

Question 3.8.: Which of the authorisation models described above should be considered for the various bands and sub-bands (portions of frequency bands), in your opinion? What is your opinion of the position taken by the regulatory authority? Please give reasons for your answer. Please describe the main requirements and briefly outline the main components. When giving your answer, please consider the goals listed in chapter 1.

Question 3.9.: If you are in favour of regional usage rights for individual bands, please specify for each band the regional breakdown model you prefer (e.g. based on federal provinces, districts or municipalities). Please give reasons for your answer. When giving your answer, please consider the goals listed in chapter 1.

Question 3.10.: What other authorisation model not described above should be considered for the various bands, in your opinion? Please give reasons for your answer. Please describe the main requirements and briefly outline the main components of the proposed authorisation models. When giving your answer, please consider the goals listed in chapter 1.

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4 2021–2026 Spectrum Release Plan

4.1 Time framework

The Spectrum Release Plan should take into account the key items listed below:

- How long previously assigned spectrum will continue to be fully utilised, and the need for new spectrum to avoid any capacity shortages (as a function of end-user demand).
- The requirements set out in the EECC, specifically that a minimum of 1 GHz within the 26 GHz band be awarded at an early date, given corresponding demand.
- Where new business models depend on spectrum availability, the frequencies concerned should be awarded soon. This might be the case with the 26 GHz band, or a sub-band of it, as well as the remaining spectrum within the 3.4–3.8 GHz band in conjunction with specific use cases, such as involving vertical industries.
- Usage rights for the 2.6 GHz band will expire in 2026. In the interests of investment security and of avoiding any disruption, the band should be newly awarded at an early stage.
- Past experience demonstrates that at least a two-year interval should be allowed between two award procedures, in order to allow the regulatory authority and potential participants sufficient opportunity for preparations (including consultations, hearings and spectrum valuation).

4.2 Joint and separate spectrum award

There are advantages and disadvantages to awarding more than one band in a multiband award procedure. Two main reasons would speak for a joint award procedure:

- Particularly when spectrum is auctioned off, it is useful to hold a simultaneous auction of frequencies that are related—whether in terms of potentially substituting for or complementing one another. A suitably designed simultaneous auction can avoid or minimise major risks confronting bidders (such as substitution risk, aggregation risk and fragmentation risk).

- In the authority's past experience, it takes between one and a half and two years to prepare an award procedure pursuant to the TKG 2003, including consultations as requested by the industry. The new legal framework (TKG 2021) will probably add additional steps to procedures. Awarding each of the bands in sequence would not be feasible, even due to the time required.

- Participation in an award procedure ties up resources within companies. Merging several award procedures eases the burden on participants.

Conversely, other reasons oppose a joint award:

- Award complexity and the risks entailed for participating companies increase with the number of frequency bands assigned, ultimately leading to a 'one shot game'. Unsuccessful bidders have no opportunity to acquire spectrum in the foreseeable future.

- Bidders with restricted budgets are potentially at a disadvantage in large auctions.

- Separate procedures are necessary in any case if varying authorisation regimes and award models are to be applied. An example would be where one band or sub-band is to be assigned using a selection procedure (such as through auctioning off regional usage rights) and another after several request procedures (as in local licensing).

The following tables contain the bands and groups of bands which in the regulatory authority's view could substitute for or complement one another, based on current technology and the expected use.

Table 10: Possible (narrower) substitutes

Band 1	Band 2	Note
26 GHz	Remaining 3.4–3.8 GHz spectrum	Substitute in specific uses cases and business models (e.g. vertical industries); capacity spectrum at hotspots; indoor service (e.g. campus solutions)
2.3 GHz	2.6 GHz	Spectrum little suited for wide-area coverage; capacity spectrum in densely populated areas (mid-band)
2.6 GHz	Remaining 3.4–3.8 GHz spectrum	Spectrum little suited for wide-area coverage; capacity spectrum in densely populated areas (mid-band)
2.3 GHz	Remaining 3.4–3.8 GHz spectrum	Spectrum little suited for wide-area coverage; capacity spectrum in densely populated areas (mid-band)

Table 11: Possible complements

Band 1	Band 2	Note
26 GHz	Remaining 3.4–3.8 GHz spectrum	Complementary bands in specific use cases and business models (vertical industries, campus solutions)

4.3 Options for the 2021–2026 Spectrum Release Plan

Based on these provisional assessments, the regulatory authority wishes to propose for discussion the following options for the 2021–2026 Spectrum Release Plan (see table below).

Option	Awards/ spectrum	Time period	Note
SRP 1	26 GHz	Late 2022	• Early award of the entire 26 GHz band • Various authorisation procedures are conceivable, depending on the chosen options (see sections □, 3.3 and 3.4)
	2.3 GHz[a] 2.6 GHz Remaining 3.4–3.8 GHz spectrum	2024/2025	• Award in time before expiry of the usage rights for the 2.6 GHz band • Multiband award: 2.6 GHz, available 2.3 GHz spectrum and remaining 3.4–3.8 GHz spectrum
SRP 2-1	26 GHz sub-band	Late 2022	• Early award of available 26 GHz sub-band spectrum • Various authorisation procedures are conceivable, depending on the chosen options (see sections □, 3.3 and 3.4)
	2.3 GHz[a] 2.6 GHz Remaining 3.4–3.8 GHz spectrum Remaining 26 GHz spectrum	2024/2025	• Award in time before expiry of the usage rights for the 2.6 GHz band • Multiband award: 2.6 GHz, available 2.3 GHz spectrum, remaining 3.4–3.8 GHz spectrum and remaining 26 GHz spectrum • Various authorisation procedures are conceivable for the 26 GHz spectrum, depending on the chosen options (see sections □, 3.3 and 3.4)
SRP 2-2	26 GHz sub-band	Late 2022	• Early award of available 26 GHz sub-band spectrum • Various authorisation procedures are conceivable, depending on the chosen

Option	Awards/ spectrum	Time period	Note
			options (see sections , 3.3 and 3.4)
	2.3 GHz[a] 2.6 GHz Remaining 3.4–3.8 GHz spectrum	2024/2025	• Award in time before expiry of the usage rights for the 2.6 GHz band • Multiband award: 2.6 GHz, available 2.3 GHz spectrum and remaining 3.4–3.8 GHz spectrum
	Remaining 26 GHz spectrum	Need and availability (after 2026)	• Award based on need and availability (freed up after fixed service use) • Various authorisation procedures are conceivable, depending on the chosen options (see sections , 3.3 and 3.4)
SRP 3	26 GHz Remaining 3.4–3.8 GHz spectrum	Late 2022	• Early award of the entire 26 GHz band and remaining 3.4–3.8 GHz spectrum • Various authorisation procedures are conceivable, depending on the chosen options (see sections , 3.3 and 3.4)
	2.3 GHz[a] 2.6 GHz	2024/2025	• Award in time before expiry of the usage rights for the 2.6 GHz band • Multiband award: 2.6 GHz and available 2.3 GHz spectrum
SRP 4-1	26 GHz sub-band Remaining 3.4–3.8 GHz spectrum	Late 2022	• Early award of 26 GHz sub-band spectrum and remaining 3.4–3.8 GHz spectrum • Various authorisation procedures are conceivable, depending on the chosen options (see sections , 3.3 and 3.4)
	2.3 GHz[a] 2.6 GHz Remaining 26 GHz spectrum	2024/2025	• Award in time before expiry of the usage rights for the 2.6 GHz band • Multiband award: 2.6 GHz, available 2.3 GHz spectrum and remaining 26 GHz spectrum • Various authorisation procedures are conceivable for the 26 GHz spectrum, depending on the chosen options (see sections , 3.3 and 3.4)
SRP 4-2	26 GHz sub-band Remaining 3.4–3.8 GHz spectrum	Late 2022	• Early award of 26 GHz sub-band spectrum and remaining 3.4–3.8 GHz spectrum • Various authorisation procedures are

Option	Awards/ spectrum	Time period	Note
			conceivable, depending on the chosen options (see sections , 3.3 and 3.4)
	2.3 GHz[a] 2.6 GHz	2024/2025	• Award in time before expiry of the usage rights for the 2.6 GHz band • Multiband award: 2.6 GHz and available 2.3 GHz spectrum
	Remaining 26 GHz spectrum	After 2026	• Award based on need and availability (freed up after fixed service use) • Various authorisation procedures are conceivable, depending on the chosen options (see sections , 3.3 and 3.4)
SRP 5	2.3 GHz[a] 2.6 GHz Remaining 3.4–3.8 GHz spectrum 26 GHz	2023	• Simultaneous joint award of all spectrum • Multiband award conditional on a uniform authorisation regime • Various authorisation procedures are conceivable for the 26 GHz and the remaining 3.4–3.8 GHz spectrum, depending on the chosen options (see sections , 3.3 and 3.4)

[a] Where an adequate amount of 2.3 GHz spectrum is available.

Table 12: Options for the 2021–2026 Spectrum Release Plan

The options are subject to the consultation input, the TKK's specific award objectives, as well as timely availability of the spectra in each case and the specific conditions of use. The condition of availability applies in particular to the 2.3 GHz band and 26 GHz sub-band spectrum.

The regulatory authority currently assumes that spectrum in the 2.3 GHz and 2.6 GHz ranges will be awarded based on individual usage rights and through a selection procedure. Several options are available for the 26 GHz and 3.4–3.8 GHz ranges. Specifically, one sub-band of the 26 GHz range could be awarded based on regional or nationwide usage rights, and another as part of local licensing procedures. Accordingly, the scheduling information given in the table above does not mean that the spectrum could be awarded jointly in a multiband award procedure. Rather, it merely indicates the period when the award might take place or the authorisation procedure might begin.

In the case of local licensing upon request (based on the first-come-first-served principle), authorisation is not granted at a particular point in time but over an extended period, that is, as long as spectrum continues to be available.

4.4 Preliminary position taken by the regulatory authority

The regulatory authority preliminarily takes the position that Spectrum Release Plan SRP 4-1 or 4-2 would best accommodate the set objectives, the legal framework, current usages and any uncertainties in the market. This would depend on freeing up the 26 GHz band from FDD fixed service use. This position takes into account two circumstances in particular: the two initial 5G auctions—and here especially the 3.4-3.8 GHz award in 2019—have made ample spectrum available for mobile telecommunications and FWA services in the short and medium term; and the short-term need for spectrum to fuel new business models. If the consultation were to reveal no short-term need for the remaining 3.4–3.8 GHz spectrum, we would recommend Spectrum Release Plan 2-1 or 2-2 instead.

Questions on the Spectrum Release Plan

Question 4.1.: What is your assessment of the interdependencies between individual frequency bands in terms of value? Which frequencies are (close) substitutes, and for which frequencies or bands are there complementary relationships? Please give reasons for your answer. When giving your answer, please consider the goals listed in chapter 1.

Question 4.2.: Which Spectrum Release Plan should be chosen? Refer to one or more of the options described above (in order of preference) or briefly outline the key items of a Spectrum Release Plan. What is your opinion of the preliminary position taken by the regulatory authority? Give reasons for your answer. When giving your answer, please consider the goals listed in chapter 1.

5 Statements

Statements (in German or English) must be emailed by 9 August 2021 to:

tkfreq@rtr.at

Please use the cover sheet below.

RTR will publish a list of the organisations/individuals that submitted statements.

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

Cover sheet: Statement in response to the Consultation on Future Spectrum Awards

General information

Statement submitted by:

Represented by (if applicable):

Postal address:

Email address:

Confidentiality

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

No confidential content ☐

Statement content is confidential ☐

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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.

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