

# **ANNEX 2**

## **to the Consultation**

**for the Award of Spectrum Use Rights**

**in the 2300 GHz and**

**2600 MHz Ranges**

## **Competition analysis**

Vienna, 9 December 2024

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## 1 Introduction

Pursuant to Art. 23 Par. 1 of the Telecommunications Act 2021 (TKG 2021), the regulatory authority is to ensure that frequency awards also promote effective competition, and may use appropriate measures to achieve this goal. The authority may limit (cap) the quantity of frequency bands to be assigned to a frequency user, for example, or require the frequency user to comply with certain ancillary provisions, such as granting wholesale access. In choosing such measures, the authority must take an objective and long-term view of competitive conditions. The decision-making process must establish a rationale for using measures to maintain or facilitate effective competition. This rationale must account for the impact on current and future investments from market participants, particularly in network rollout.

Pursuant to Art. 23 Par. 4 TKG 2021, the regulatory authority is to make use of the market analysis methodology that is defined in Art. 87 Par. 5 TKG 2021, analysing the developments to be expected in the absence of the envisaged measures. This analysis should assess the probability of a trend towards more effective competition in the market. Key factors to be considered here are the internal and external competitive pressure experienced by the respective markets, as well as the impact of regulation and of measures imposed within or outside these markets.

The provision of mobile telecommunications services necessarily involves the usage of spectrum. The amount of spectrum is limited while the economies of scale achieved through spectrum use and provision of such services are high. The prerequisites to providing mobile services nationwide in Austria include a corresponding number of broadcasting locations. Establishing this kind of network takes at least several years. As a result of high barriers to entry and expansion, it is particularly important for the spectrum award procedure to ensure that the use of this spectrum creates effective competition, thereby generating the greatest possible macroeconomic benefit.

The 240 MHz of usable spectrum in the 2300 MHz (60 MHz) and 2600 MHz bands (2x70 MHz FDD + 40 MHz TDD) will be deployed primarily as capacity spectrum.<sup>1</sup> In the long term, the regulatory authority considers the overall quantity of 240 MHz to be a substitute; this applies regardless of whether migration to TDD throughout the entire 2600 MHz band takes place at a later point in time. Overall, a total of 1180 MHz will be available in the 700 to 3600 MHz bands after the award, so that approximately 21% of this spectrum will be reassigned. For both bands, suppliers to the market offer antenna technology for spatial multiplexing (massive MIMO). If antennae are correspondingly deployed with a high number of antenna elements, capacity can be increased more than reciprocally with the amount of spectrum—assuming demand exists and propagation characteristics are able to support this demand. For lower frequencies, this kind of active antenna with a large number of antenna elements is not typically offered on the market.<sup>2</sup> The size of the antenna is an important aspect

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<sup>1</sup> Of the 50 MHz available within the TDD range of the 2600 MHz band, 10 MHz can be used only with significant limitations. This spectrum is therefore not considered here.

<sup>2</sup> A comparable ecosystem is also at least partially available for 1800 and 2100 MHz. A number of difficulties apply to spatial multiplexing based on multiple antenna elements. First, the size of antenna required can present an obstacle to deployment. Second, the spectrum in question is permanent FDD whereas TDD spectrum is more suitable for spatial multiplexing (see main consultation document).

here. The lower the spectrum band, the greater the distance required between antenna elements. In the bands to be awarded, antenna size is not yet prohibitively large: a deployment will therefore be possible at many existing locations. Within the capacity spectrum suitable for massive MIMO, these bands offer the best propagation characteristics, relatively speaking—better than in the 3600 MHz band, for example. A corresponding amount of spectrum with such properties is not expected to be awarded in the foreseeable future. Accordingly, it is especially important that this award ensures that effective competition would emerge within the award period.

The following section presents and analyses the current state of competition in retail mobile services and private customer broadband products. Caps are proposed as a measure to safeguard competition. Noting a possible wholesale access obligation, the mobile services market and the role of MVNOs is analysed while requesting a forecast of future developments.

Confidential data have been used for some parts of the analysis. These data are omitted from or redacted in the publicly available annex to the consultation.

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Third, at least one network operator is using these bands for nationwide coverage and thus deploying them to provide baseline capacity.

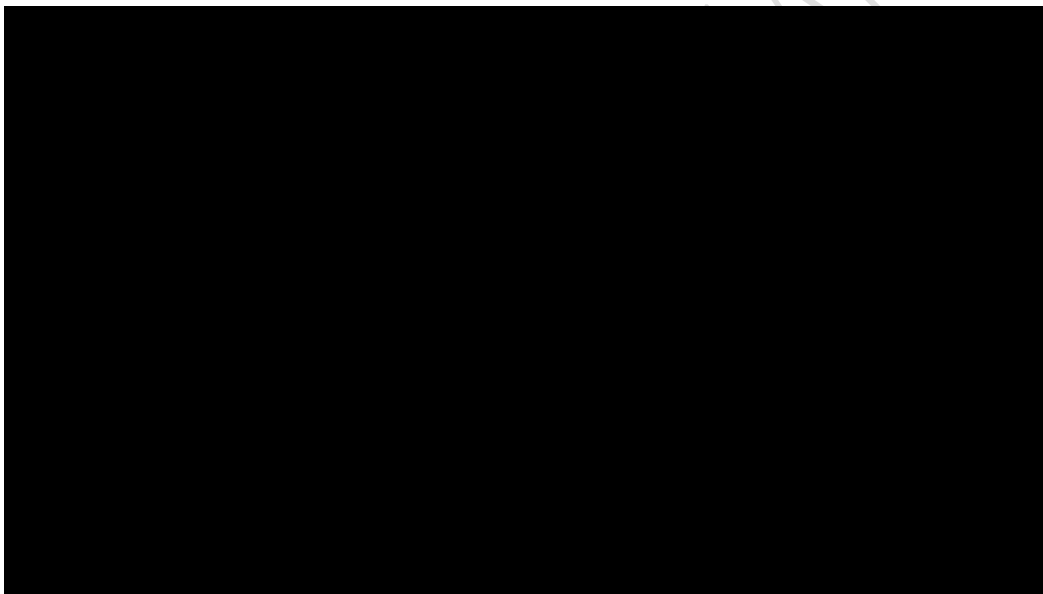
## 2 Relevant background

### 2.1 Mobile telecommunications market

This subsection investigates competition in the mobile services market while also taking a closer look at the role of MVNOs. Operating systems as well as the EU Roaming Regulation are also considered with reference to MVNOs, with the aim of clarifying how these aspects create particular challenges for MVNOs in comparison with larger MNOs who operate their own networks.

#### 2.1.1 Overview

Conventional mobile services comprise national and international calls, SMS/MMS, data services and international roaming services. In accordance with established international decision-making practice, this market is considered to be a relevant market in terms of general competition law.<sup>3</sup> In Austria, this market is a nationwide market.

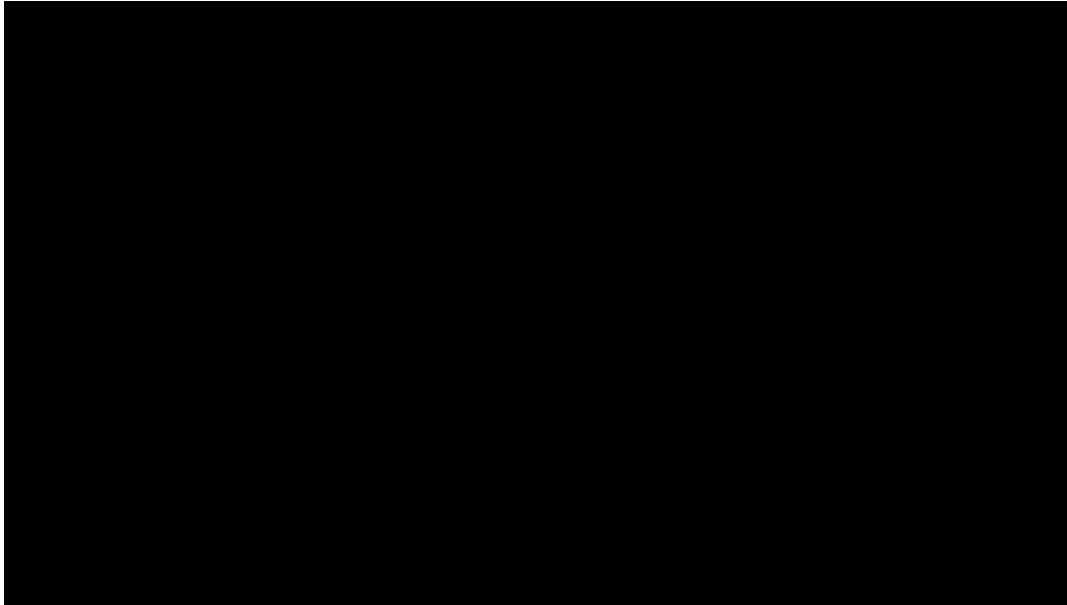


**Figure 1: Market share of retail mobile services (sales): left axis (bar) in %, right axis (line) in EUR millions**

Figure 1 presents quarterly revenues for retail mobile services since 2019 (total revenue, i.e. including data-only subscriptions). The market leader is A1 Telekom Austria AG (A1) with a share of 35–45%. T-Mobile Austria GmbH (TMA) and Hutchison Drei Austria GmbH (H3A) each have a market share of 25–30%. Since 2019, all MNOs have lost market share, with MVNOs now accounting for 5–10% of total revenues. Key market players, each with a 0–5% share of market revenues, include HoT Telekom and Service GmbH (HoT, a Ventocom GmbH subsidiary that owns several smaller brands), MASS Response Service GmbH (MR, whose Spusu brand is especially popular) and MTEL Austria GmbH (MTEL). Overall, quarterly revenues have risen from around EUR 600 million in 2019 to just under EUR 700 million. One reason is the index-linking clauses used by major network operators. These clauses raise basic monthly fees for

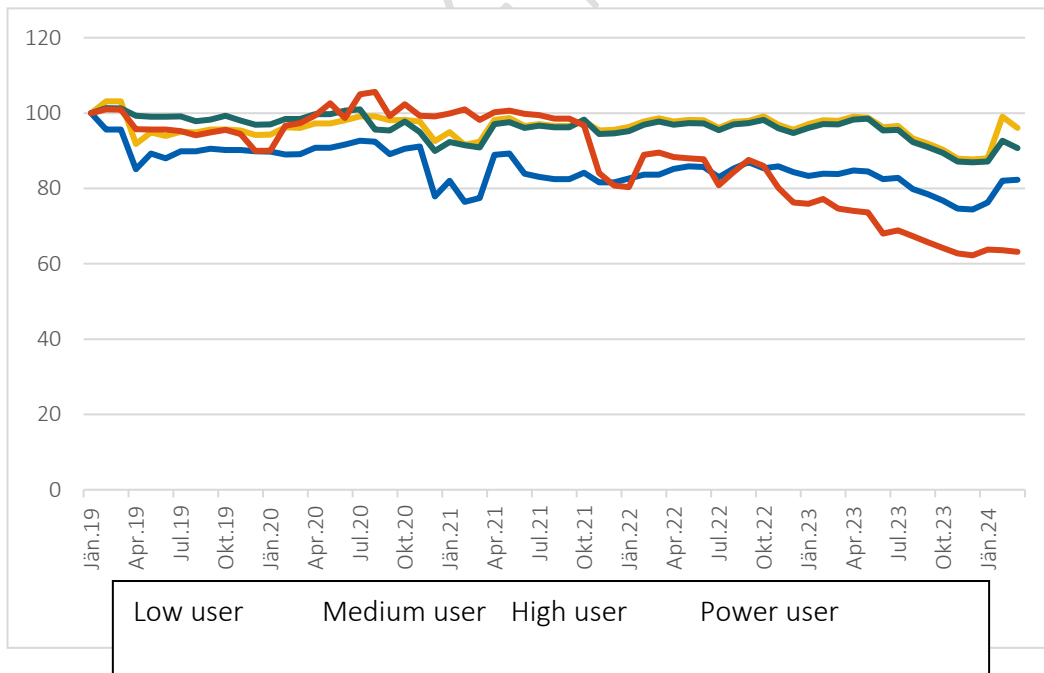
<sup>3</sup> For recent case law, see e.g. M.10896 – ORANGE/MASMOVIL/JV, Par. 173–186.

existing customers in line with inflation and are increasingly used by the MNOs' main brands.



**Figure 2: Market share (SIM cards other subscriptions <sup>4</sup>)**

Figure 2 shows the changes in market share for other subscriptions by SIM card. The competitive pressure exerted by MVNOs can be seen clearly here, as they now provide 15–20% of SIM cards for other subscriptions.



**Figure 3: Mobile telecommunications index<sup>5</sup>**

<sup>4</sup> 'Other subscriptions' are all subscriptions that are not data-only, i.e. subscriptions bundled with phones or voice-/text-only subscriptions.

<sup>5</sup> To calculate the average monthly expense for new customers, the subscription information published monthly by the Austrian Chamber of Labour is used to determine the average monthly expense for four different user categories. For each category, the index is based on the five cheapest rates per brand.

Figure 3 draws on several calculated and interlinked expenditure indices to illustrate changes in mobile service expenses since 2019. For new customers, expenses have fallen by 4% to 37% (depending on user type) since the beginning of 2019. Users with smaller data volumes have seen a more moderate decline in prices over the last few years. This index does not take technology type into account. Accordingly, potentially higher fees for 5G would be excluded if there were five less expensive 4G subscriptions per brand.

### 2.1.2 Role of MVNOs

Over the last ten years, MVNOs have exerted considerable competitive pressure on the market. To understand the role of the MVNOs since 2014, the previously applying obligation for MVNO access is crucially important. The basis for MVNO market entry was H3A's commitment (obligation), given as part of the 2012 Hutchison/Orange merger.<sup>6</sup> H3A is required to offer a contract with a term of up to 10 years. As a permanently available alternative, the reference offer by H3A and the corresponding prices had improved this provider's negotiating power as compared with other MNOs. With the merger resulting in a rise in prices in 2013/2014,<sup>7</sup> the MVNOs then entered the market, created competitive pressure and gained market shares.

MVNOs are an important factor for competition in many respects. As one example, most MVNOs and the sub-brands from MNOs that compete with them offer contracts that are not automatically adjusted for inflation. In contrast, the MNOs and their main brands have used such index-linking clauses to introduce in April of each year significant increases in nominal prices—by just under or over 10% in 2022 and 2023, respectively. Some MVNOs also field highly effective sales teams or offer first-class customer service with features including prompt availability, or the option in individual cases of automatically upgrading existing subscriptions to include higher data volumes. Individual MVNOs also offer very inexpensive subscriptions for roaming outside the EU and cheap rates for international calls. Regulatory intervention as part of the merger was instrumental for early MVNO market entry and expansion. Since then, the market has been monitored continuously with the aim of assessing the need for further regulatory action.

MVNOs receive access to the wholesale market. In this market, TMA (Ventocom host) is currently the largest provider for independent MVNOs/resellers and H3A (host for MR and others) the second-largest. A1 (host for MTEL and others), the market's smallest provider, directly operates many sub-brands and in this way services the low-end segment. While not operating their own brands, major retail chains such as Lidl and Spar also influence the market. An MNO serves as the provider for each of these

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<sup>6</sup> COMP/M.6497 – HUTCHISON 3G AUSTRIA. / ORANGE AUSTRIA

<sup>7</sup> See RTR (2016): Ex-post analysis of the merger between H3G Austria and Orange Austria. Available from [https://www.rtr.at/TKP/aktuelles/publikationen/publikationen/Analysis\\_merger\\_H3G\\_Orange.en.html](https://www.rtr.at/TKP/aktuelles/publikationen/publikationen/Analysis_merger_H3G_Orange.en.html) and the Federal Competition Authority (BWB) (2016). The Austrian Market for Mobile Telecommunication Services to Private Customers. An Ex-post Evaluation of the Mergers H3G/Orange and TA/ Yesss! Sectoral Inquiry BWB/AW-393, Final Report, Vienna. Available at [https://www.bwb.gv.at/en/news/news\\_2016/detail/bwb-and-rtr-present-reports-on-the-telecom-sector-inquiry](https://www.bwb.gv.at/en/news/news_2016/detail/bwb-and-rtr-present-reports-on-the-telecom-sector-inquiry).

chains (H3A for Lidl, TMA for Spar), although the subscriptions offered are determined jointly by the chain and the MNO.

As part of preparations for the 2020 multiband spectrum auction, the regulatory authority examined several competitive challenges faced by MVNOs. These included rising demand for data and a decline in competitiveness among MVNOs, as well as the expiry at the end of 2022 of H3A's obligation to provide a reference offer. Looking to the future, the authority identified a potential competition deficit in the retail markets, along with a significant risk that MVNOs would lack sufficient demand-side power in the absence of a mandatory wholesale access offer.<sup>8</sup> While the authority was floating the idea of a measure to safeguard competition, significant improvements to offers were made by individual MNOs during the multiband auction consultation period. Reductions to data prices and extensions to contractual terms were agreed in some cases. A 5G partnership was also concluded.<sup>9</sup> In light of these developments, the regulatory authority chose not to impose a competition measure to safeguard the ability of MVNOs to exert competitive pressure.

Following the regulator's decision not to pursue this intervention, MNOs subsequently exhibited little interest in negotiations aimed at securing 5G access. Complaints were received both by the regulatory authority and the Federal Competition Authority (BWB) concerning uncompetitive sales prices, pressure on virtual mobile network operators and other wholesale customers to change their business models, and relating to refused access. Following the involvement of the competition authority, further talks were held, with a round table being hosted by the BWB and RTR in early 2021.<sup>10</sup> Although some MVNOs had been offered products for 5G that included unlimited data at a flat rate, leading MVNOs had not received a wholesale offer with a competitive wholesale price per GB for smartphone subscriptions. In February 2022, the TTK initiated a market analysis procedure in response to the lack of competitive wholesale access to 5G for smartphone subscriptions and a general loss of negotiating power on the part of MVNOs, following the expiry of the mandatory wholesale access offer.

In 2023, concurrently with the market analysis procedure, the regulatory authority was also required to review network cooperation as requested by TMA and H3A pursuant to Art. 85 TKG 2021. As MVNOs and their customers were to be excluded from any benefits accruing from the proposed partnership, this partnership would have created a potential competitive restraint by worsening the competitive position of MVNOs, who constitute a key driver for competition in the retail market. Specifically, the partnership would have excluded access to additional coverage and capacity. The oversight authorities for competition law also expressed corresponding concerns. At this time, full MVNOs were also excluded from access to VoLTE, that is, voice traffic over 4G technology. VoLTE access is significant, as this provides an

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<sup>8</sup> Refer to [https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/konsultationen/Consultation\\_Award\\_700\\_1500\\_2100\\_MHz\\_Appendix\\_Competition.pdf](https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/konsultationen/Consultation_Award_700_1500_2100_MHz_Appendix_Competition.pdf)

<sup>9</sup> In the following, '5G' refers to 5G non-standalone, i.e. the use of the 5G access network in conjunction with a 4G core network. As of this writing, this primarily means the use of the 3600 MHz band alongside one or two other bands, depending on the network operator.

<sup>10</sup> [https://www.bwb.gv.at/fileadmin/user\\_upload/Roundtable\\_BWB\\_RTR\\_Mobilfunkbetreiber.pdf](https://www.bwb.gv.at/fileadmin/user_upload/Roundtable_BWB_RTR_Mobilfunkbetreiber.pdf) (in German)

alternative to 3G voice services. In the regulatory authority’s opinion, network cooperation would accelerate reductions in 3G network coverage, which could only be mitigated by future provision of VoLTE access. The regulatory authority considered a lack of access to VoLTE and the expiry of 3G network cooperation as sufficient evidence of a lack of negotiating power on the part of MVNOs. Accordingly, the applicants for cooperation granted access to VoLTE and access to additional network coverage as part of their existing agreements. With these conditions met, cooperation was duly approved. The lacking availability of 5G wholesale offers for smartphones was not seen as related to cooperation.<sup>11</sup>

Independently of this and the market analysis, the two largest MVNOs, Ventocom (with its HoT brand) and Mass Response (with its Spusu brand), were able to negotiate 5G access for smartphones, although with higher wholesale prices than for 4G. The first 5G subscriptions were launched by several MVNOs in January 2024, with major MNO sub-brands following suit. 5G subscriptions for smartphones are now also offered by MTEL, the third major independent MVNO.

**Table 1: Least expensive 5G product offered by major network operators and brands (20 November 2024)**

Subscription plan	Base fee	Effective monthly price	GB included	Note
Spusu 5G legendär	EUR 14.90	EUR 14.90	60	
yesss! Complete L (brand of A1)	EUR 15.00	EUR 15.10	55	5G option for EUR 5
Lidl Connect XL 5G (brand of H3A)	EUR 14.50	EUR 14.70	55	
HoT Fix 5G	EUR 14.90	EUR 15.200	54	5G option for EUR 5
bob Flex bob (brand of A1)	EUR 14.90	EUR 14.90	50	5G option for EUR 5
MTEL Sweazy 5G	EUR 11.40	EUR 10.00	59	
A1 B.Free M	EUR 14.90	EUR 16.60	60	
Drei Up3 Unlimited	EUR 19.90	EUR 19.90	Unl	
Drei SIM Unlimited M	EUR 22.90	EUR 21.20	Unl	
Magenta Klax M	EUR 14.90	EUR 16.00	60	

Least expensive products as of 20 November 2024 (no user device, no youth subscriptions, source and calculation: Tarife.at). The base fee is calculated either monthly or every 30/28 days; the effective price is calculated by using a standardised month of 30.4 days.

Since the entry of MVNOs in January 2024, the 5G base fee for MVNOs and sub-brands has settled around a new monthly price point of about EUR 15. This figure is below the price point of the MNO main brands (previously around EUR 18–23). For youth tariffs, there are sometimes lower basic fees. On closer examination, these ‘15 euro’ offers differed considerably in terms of other aspects, such as the volume of data or number of free months included. The latter aspect reduced the effective price, which is calculated for a contractual period of two years. Free months are now no longer being offered. As of the market review date, MTEL’s ‘Sweazy’ was the first 5G subscription to be offered well under EUR 15. MTEL is a minor and relatively unknown operator,

<sup>11</sup> Cf. [https://www.rtr.at/TKP/aktuelles/entscheidungen/entscheidungen/C\\_1\\_23\\_Bescheid.pdf](https://www.rtr.at/TKP/aktuelles/entscheidungen/entscheidungen/C_1_23_Bescheid.pdf) (in German)

however, so this move is unlikely to usher in a long-term trend towards 5G subscriptions below EUR 15. 5G subscriptions do include very high data volumes. An analysis of 2023 data consumption yields 21 GB at the 87.5% quantile: accordingly, although only 12.5% of users consume more data, most 5G subscriptions include 50 GB or more.

In the broader market, 5G is therefore still being sold at a EUR 5 markup, as MVNOs and sub-brands typically charge around EUR 10 for similar 4G data volumes.<sup>12</sup> Indeed, many industry players refer explicitly to a 5G markup.

Overall, however, a 5G subscription markup is consistently observed, with subscriptions costing at least EUR 15 per month in the broader market. Austria also continues to lack 5G uptake: fewer than one in five SIM cards for other subscriptions (mostly smartphones) can use 5G as part of the subscription while the MVNO share is also substantially lower here compared with a technology-neutral analysis.

At the moment, 5G users are those who are willing to pay more, being primarily customers of major MNO brands. It remains to be seen if and when 5G subscriptions will also be offered at a lower base fee for users with lower data requirements and whether or not the 5G markup then disappears entirely. MVNOs have been largely responsible for long-term price reductions in the last decade. Yet it is questionable whether the wholesale agreements allow MVNOs and provide them the incentive to launch 5G products on the market with base fees significantly under EUR 15.

### **2.1.2.1 Forecasting the future role of MVNOs**

Looking to the future, it is questionable whether MVNOs will be able to indefinitely exert competitive pressure based on their existing (or potentially renegotiated) agreements, and if not, for how long. This is an overarching issue that affects both 5G prices (per unit and potentially per SIM card) and data prices in general. Individual cases of an effective—and at least temporary—barrier to access have been observed, either to individual technologies (5G), specific functions of a technology (e.g. VoLTE) or to benefits from network cooperation. Such factors may also weaken competitive pressure from MVNOs in the future.

In terms of size and negotiating power compared with MNOs, MVNOs may fail to prevail in areas such as access to 5G-SA, VoNR, slicing and competitive usage classes, resulting in a decline in their competitive pressure. This could produce price increases similar to those seen in 2013/2014.

### **2.1.3 Role of operating system developers**

User devices and their operating system developers also influence competition in the mobile services market. The mobile operating system market is dominated by Google's

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<sup>12</sup> MNOs and their low-end brands have since taken the market lead with subscription prices at or under the EUR 10 mark. This summer, the up<sup>3</sup> Smart Tarif from H3A, priced at EUR 4.90 for 50 GB, massively undercut these EUR 10 subscriptions. At one point, Georg was offering 100 GB and thus significantly more than any MVNO. In general, however, other aspects—such as international calls or automatic data upgrades, or simply a strong brand reputation—tend to drive the appeal and popularity of MVNOs' EUR 10 subscriptions.

Android at 62% market share and Apple's iOS at 36%.<sup>13</sup> Some smartphone functionality depends on the settings configured for the device's operating system. Some of these settings are also configured out of the box by device manufacturers such as Samsung. Specific services can then only be used if they are compatible with the settings as configured for the operating system. Certain services may remain entirely unavailable, while others may be usable only after the end user has changed the default settings, which can constitute a significant barrier to use.

Although these are general problems that affect all mobile service providers, MNOs are typically large enough as sales partners to have relevance to operating system developers and can therefore conclude the necessary agreements for unlocking specific operating system functions.<sup>14</sup> In some cases, MVNOs without a core network can benefit from the agreements concluded by their wholesale partner. In contrast, MVNOs with their own core network lack business weight for operating system developers and therefore find it harder to conclude such agreements.

Operating systems will play a larger role in the future. As one example, 5G network slicing usually requires interaction between the network and the device for the correct identification and transmission of traffic according to the specifications of the slices set up by the network operators. This interaction is not standardised and therefore requires corresponding settings in the operating system.<sup>15</sup>

While this is not directly relevant for the award, it does constitute a competitive disadvantage, particularly for full MVNOs. Indirectly, this can impair the capability of smaller providers (including but not limited to MVNOs) to build up a corresponding degree of competitive pressure in segments where these functions are relevant.<sup>16</sup>

#### **2.1.4 Role of roaming**

'Roam-like-at-home' (RLAH) legislation removed additional charges levied on end users while outside their home country, up to a specified upper limit. Since then, mobile usage has risen significantly. Although retail providers must purchase these services from the respective foreign network operators, they do not receive additional revenue from end users for service usage.

Purchase prices for roaming are generally subject to an upper limit at the wholesale level. In practice, however, MVNOs and network operators in general experience cost disadvantages if they only purchase roaming services but do not offer such services themselves. Such providers cannot exercise negotiating power and therefore often buy up to the specified upper limits. In turn, these purchase prices are above the

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<sup>13</sup> Source: Statcounter, <https://gs.statcounter.com/os-market-share/mobile/austria#monthly-202308-202407>, retrieved on 27 August 2024

<sup>14</sup> As one example, Apple names the three MNOs under 'Support and services for iPhone from mobile network operators' <https://support.apple.com/de-at/108048>, which implies the existence of an agreement.

<sup>15</sup> Refer by way of example to BoR (24) 51: "BEREC Report on the entry of large content and application providers into the markets for electronic communications networks and services" (unpublished).

<sup>16</sup> Refer by way of example to BoR (23) 41, "Study on wholesale mobile connectivity, trends and issues for emerging mobile technologies and deployments - FINAL REPORT", <https://www.berec.europa.eu/en/document-categories/berec/reports/study-on-wholesale-mobile-connectivity-trends-and-issues-for-emerging-mobile-technologies-and-deployments>

effective sale prices per unit offered by one MNO to another. The RLAH margin for MVNOs is therefore often negative. For MVNOs, higher usage levels therefore mean a rise in additional costs. In contrast, a greater use of roaming typically benefits MNOs because of their existing domestic networks. This balances out the higher level of usage abroad and its associated costs (although this can also require greater investment in network capacity). Although MVNOs are theoretically free to levy a surcharge for their roaming services, market competition makes this option untenable in practice. Greater use of roaming therefore implies a greater cost disadvantage for MVNOs.

## **2.2 Broadband market**

In Austria, mobile services are a significant driver of competition in the broadband market. An evaluation or analysis of this market is therefore indispensable.

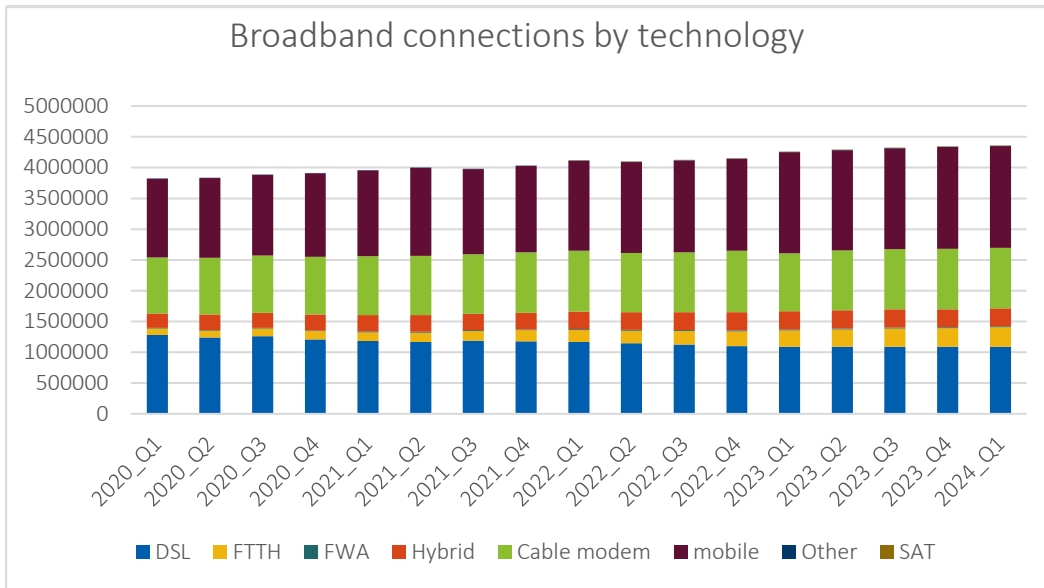
According to the market analysis procedure concluded in 2022,<sup>17</sup> the broadband market for private customers encompassed the following types of technical products: DSL products (including hybrid products) for private customers, cable broadband products for private customers, fibre products (FTTH) for private customers and flat-rate mobile data subscriptions for private customers. The regulatory authority currently sees no indication of any material changes—present or future—to this technical market delineation. For business customers, the market therefore comprises the following technical products: DSL products for business customers, cable broadband products for business customers and fibre products (FTTH) for business customers. In future, 5G SA products with guaranteed bandwidth could potentially be a new source of competitive pressure here. Otherwise, the regulatory authority currently sees no indication of any material changes—present or future—to this technical market delineation.

From a geographical perspective, a nationwide analysis is relevant, as the frequency usage rights will be awarded on a nationwide basis. Regional differences in existing infrastructure and in market share will be examined on a case-by-case basis.

Alternative technologies include connectivity via satellite and other types of connections. Such products are usually substantially more expensive. Even when these connections are included in the analysis, their significance is not sufficient to alter the overall competitive picture.

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<sup>17</sup> See decision M 1/20-312 and M 1.1/20-123 of 10 December 2022



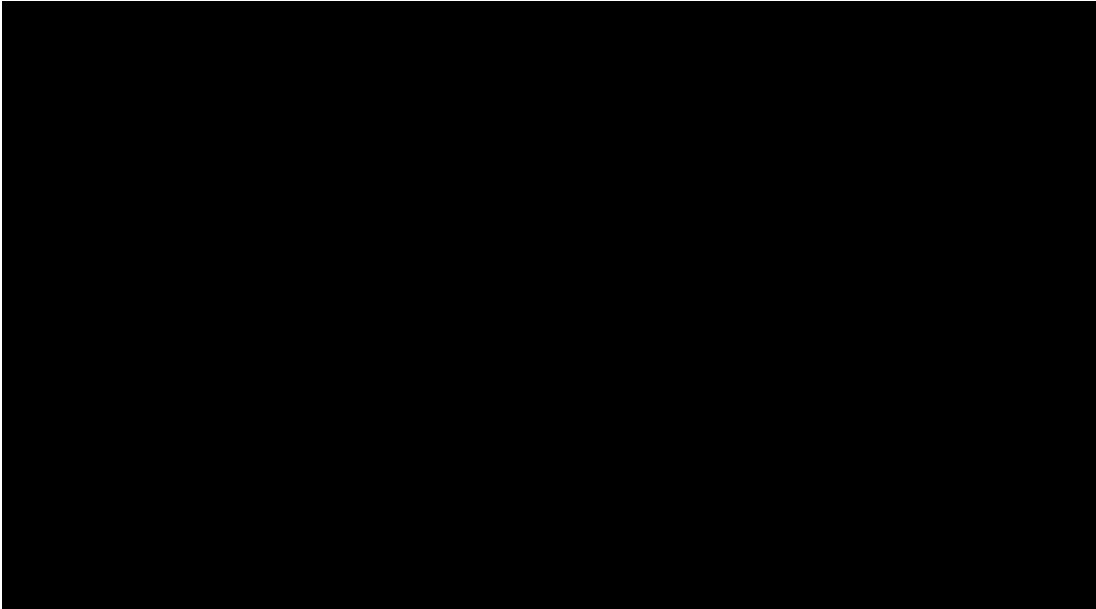
**Figure 4: Broadband connections by technology (source: ZIB)<sup>18</sup>**

Figure 4 presents the number of broadband connections by technology. In Q1/2024, more than a third of broadband connections were mobile data subscriptions with unlimited data volumes. Hybrid connections are also a significant factor: A1 in particular combines DSL and mobile broadband with the aim of offering higher bandwidths to its end customers. According to recent figures (e.g. from the KEV in Q1/2024), data volumes handled by mobile networks now make up about 43% of the total mobile/fixed data volume, with the fixed network handling a share of around 57%.<sup>19</sup> Most of this mobile data volume is itself accounted for by data-only subscriptions with unlimited data volumes. This points to strong competitive pressure and significant capacity in mobile telecommunications. While A1 and TMA each operate a wired broadband network and a mobile network, H3A only operates a mobile network, offering wired broadband only via the wholesale products provided by other network operators (A1 and providers of optical fibre). Although an increase in revenues from mobile broadband can be associated with a loss of revenue from

<sup>18</sup> Abbreviations: DSL stands for digital subscriber line, with data being transmitted over traditional copper-wire lines. FTTH stands for fibre to the home. FWA stands for fixed wireless access and refers to wireless connections that do not use a mobile network. SAT means satellite.

<sup>19</sup> Refer to <https://www.rtr.at/TKP/aktuelles/publikationen/publikationen/Datenvisualisierung/telekom-monitor-q12024-daten.de.html> (in German) Chart 1.6.

wired infrastructure for A1 and (regionally) for TMA, this is not typically the case for H3A.<sup>20</sup>



**Figure 5: Market share of private customer broadband (connections, source: ZIB)**

Figure 5 presents the market share of private customer broadband. A1 is the market leader, thanks to its nationwide fixed and mobile network, followed by TMA, which operates a nationwide mobile network and a hybrid fibre/coaxial cable network in Vienna and other regions. H3A is the only provider that operates a nationwide mobile network but does not have any wired infrastructure running to the consumer. Locally, A1 or TMA is often the market leader, sometimes with a market share significantly above 40%. TMA, for example, operates a hybrid coaxial cable network in Austria's two largest cities of Vienna and Graz, and has a broadband market share of [REDACTED] in Vienna (in Q1/24).

Considering mobile services in isolation, H3A is the market leader for flat-rate data-only subscriptions and has [REDACTED] of the retail market in this category. Measured in terms of data volume for these subscriptions, H3A's market share is [REDACTED]. In addition, [REDACTED]

[REDACTED] are handled by the H3A network. At network level, this increases market share both by the number of such subscriptions and by data volume. Revenue data are collected for all data-only subscriptions, whether or not these are offered at a flat rate. H3A is also the market leader here.

H3A has been exerting competitive pressure on wired broadband for many years. This operator has offered unlimited data packages since 2010. TMA followed suit in 2013 with their own unlimited data plan. A1, which also offers unlimited broadband products via wired infrastructure, only joined these ranks in 2016. A1 and TMA have therefore also greatly expanded their mobile offering of unlimited broadband tariffs. As a result, H3A's share of total mobile data volume fell [REDACTED]

<sup>20</sup> Any revenues at consumer level with wholesale sourcing are associated with a substantially lower margin for H3A and therefore play only a minor role.



### 2.3.3 Competition for services

Competition for consumer services constitutes another competitive dimension. MVNOs are also a key player at this level in Austria, driving innovation in subscription models and sales in general.

Innovative services in the broadband market form another aspect of this competitive dimension. Historically, Austria has been a pioneer in terms of the competitive pressure exerted by mobile networks on wired broadband. All MNOs have offered corresponding products for many years. H3A has typically pioneered such products and was the first network operator to offer unlimited data subscriptions at a fixed monthly rate.

Leveraging its 5G SA network, H3A is now offering unlimited data subscriptions combined with a bandwidth guarantee. These products compete aggressively with wired broadband products. Availability is currently limited to base stations using 3.6 GHz frequencies and local households, preferentially with outdoor routers. The TDD bands to be awarded could enable similar types of subscriptions with slightly reduced bandwidth but improved propagation characteristics.

In the USA, for example, T-Mobile US has gained swathes of 5G FWA customers in recent years and this segment continues to show the strongest growth.<sup>22</sup> Decisive aspects here include the benefit of a larger amount of spectrum in the TDD mid-band 2.5 GHz range, coupled with the deployment of a 5G SA network and massive MIMO for beam-forming and capacity expansion.<sup>23</sup> Figure 6 shows the importance of FWA for the US broadband market and the pioneering role assumed by T-Mobile US, especially with spectrum similar to that being offered in this award.

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<sup>22</sup> Cf. the presentation by T-Mobile US for its Capital Markets Day, slide 50, [https://s29.q4cdn.com/310188824/files/doc\\_presentation/2024/TMUS-CMD-Presentation\\_Final.pdf](https://s29.q4cdn.com/310188824/files/doc_presentation/2024/TMUS-CMD-Presentation_Final.pdf), (retrieved on 2 November 2024)

<sup>23</sup> Ibid., slides 59–77

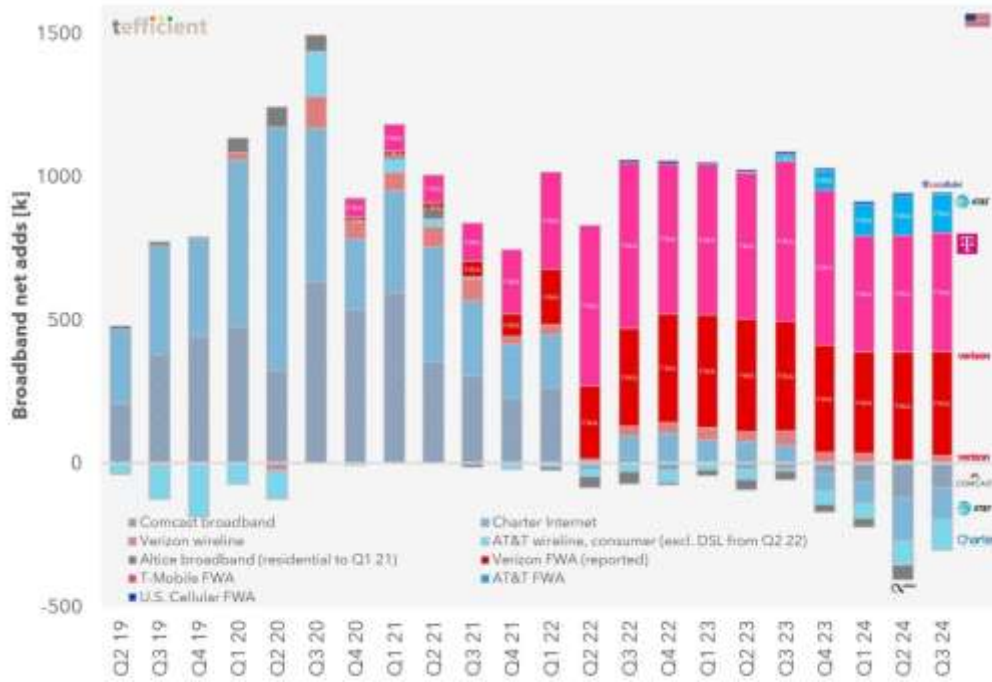


Figure 6: Net growth in broadband connections in the USA<sup>24</sup>

<sup>24</sup> Source: Tefficient Account on LinkedIn; retrieved on 20 November 2024

### 3 Spectrum assignment and infrastructure deployment

#### 3.1 Spectrum assignment

Table 2 lists the current spectrum assignments in the frequency bands to be awarded. The 26 GHz band is not included here, on account of its significantly poorer propagation characteristics.<sup>25</sup> Spectrum in the 3600 MHz band, variously awarded by region, has been weighted by population to achieve a nationwide amount.<sup>26</sup>

**Table 2: Spectrum portfolio (excluding 26 GHz)**

	A1	TMA	H3A	Other	FDD/TDD/SDL	Total
700	0	40	20		FDD	60
800	40	20	0		FDD	60
900	30	30	10		FDD	70
1500	30	30	30		SDL	90
1800	70	40	40		FDD	150
2100	50	30	40		FDD	120
2300					TDD	60
2600	25	0	25		TDD	50
2600	50	40	50		FDD	140
3600	100	110	100		TDD	310
3600 reg (weighted by population)	34	12	0	35	TDD	80
Current spectrum	429	352	315	35		1130
	38%	31%	28%	3%		100%
Spectrum—minimum after award	354	312	240	35		1190
	<b>30%</b>	<b>26%</b>	<b>20%</b>	<b>3%</b>		
Current capacity spectrum	209	162	175	35		580
	36%	28%	30%	6%		100%
Capacity spectrum—minimum after award	134	122	100	35		640
	<b>21%</b>	<b>20%</b>	<b>16%</b>	<b>4%</b>		

As shown by the table, A1 currently has 429 MHz (38%) of the 1130 MHz of total spectrum awarded, while TMA has 352 MHz (31%) and H3A has 315 MHz (28%). Regional network operators have a weighted 35 MHz in the regionally assigned 3600 MHz band. If no MNO were to acquire spectrum in the forthcoming award, for example, then the smallest network operator H3A would have 240 MHz or 20% of the spectrum.

For the 2300, 2600 and 3600 MHz frequency ranges, an excellent ecosystem is available, featuring active antennae for use with spatial multiplexing (massive MIMO). Relative to the amount of spectrum deployed, this enables a much higher level of data

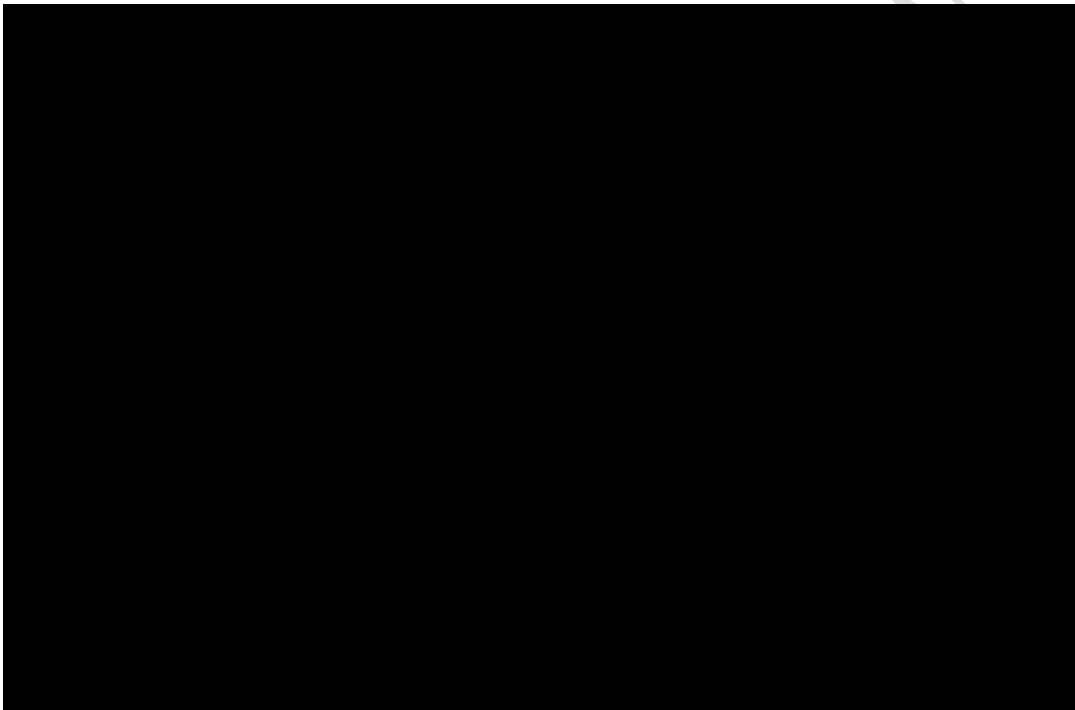
<sup>25</sup> A1 and TMA each have 400 MHz in the 26 GHz band, while H3A has 600 MHz here. Refer to [https://www.rtr.at/TKP/was\\_wir\\_tun/telekommunikation/spectrum/bands/26GHz/26GHz-band.en.html](https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/bands/26GHz/26GHz-band.en.html)

<sup>26</sup> See Figure 8 for details of spectrum assignments in the 3600 MHz band

transmission.<sup>27</sup> Accordingly, these bands are especially suited to high capacities and are considered separately. A1 has 36% of the amount of spectrum in these capacity bands, with TMA having 28% and H3A 30%. These figures may change sharply if one operator were to acquire no spectrum usage rights in the forthcoming award. As a result, the smallest network operator afterwards (H3A) could end up with only 16% of the assigned capacity spectrum.

### 3.2 Infrastructure expansion

One metric for the efficient use of spectrum and medium-term competitive pressure is supplied by infrastructure investment in the respective bands, which is examined in greater detail in the following section.



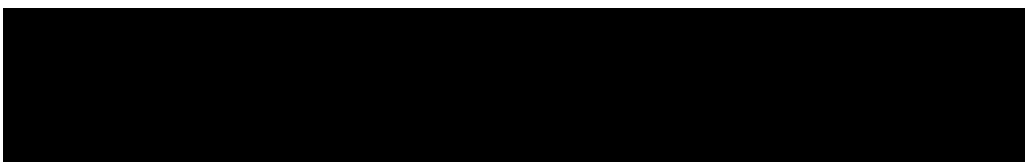
**Figure 7: Installed locations per band (source: operational status report 30 June 2024)**

Figure 7 shows the installed locations per band, where at least one sector at each location transmits the respective band with a minimum frequency of 1 MHz. Background information on the data-generating process is relevant for interpretation here.<sup>28</sup> Several points are useful for understanding which bands are used more or less frequently by a network operator.

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<sup>27</sup> A comparable ecosystem is also at least partially available for 1800 and 2100 MHz. However, these two bands are not included with the capacity bands. First, the size of antenna required can present an obstacle to deployment. Second, the spectrum in question is permanent FDD whereas TDD spectrum is more suitable for spatial multiplexing (see main consultation document). Third, at least one network operator is using these bands for nationwide coverage: these bands are therefore deployed to support

<sup>28</sup>



First of all, the respective (historical) strategy for nationwide network deployment is especially significant. A1 and TMA possess spectrum in the 800 MHz band, for example, and have used the 900 MHz band to deploy their networks. In these sub-1 GHz bands, long since awarded, both of these operators have installed a relatively large number of locations when compared with the other bands they have been assigned. In contrast, H3A entered the market in 2000 with its acquisition of 2100 MHz of spectrum, which it used to establish nearly nationwide coverage.<sup>29</sup> Most of H3A's locations make use of the 1800 and 2100 MHz bands. In the major award held in 2013, H3A acquired only 2x5 MHz in the 900 MHz band and [REDACTED]. [REDACTED] With the acquisition of 2x10 MHz in the 700 MHz band in 2020, H3A is now expanding its deployment of sub-1 GHz bands.

Second, capacity demand also plays a key role here—especially in the case of deployment decisions for bands without nationwide coverage. The first band, which was deployed by all operators only to a limited extent, was the 2.6 GHz band (FDD and TDD) initially awarded in 2010. As a condition of the award, coverage with a specified minimum data rate was required in the FDD band for at least 25% of the population.<sup>30</sup> While all three network operators fulfilled this obligation, their deployment strategies reveal significant differences. [REDACTED]

The 2.6 GHz band was the most important capacity band above 2.1 GHz for 4G, and its deployment occurred mostly during this period—i.e. before the 5G deployment that began in 2019. With the corresponding licence expiring at the end of 2026, however, and the auctioning of new bands, this spectrum subsequently lost this role and saw only sporadic further deployment.

Within the 2.6 GHz band, A1 and H3A were each awarded 25 MHz in the TDD range. [REDACTED]

The most important capacity band for 5G is the 3600 MHz band. The significance of this band for capacity competition was analysed prior to the award. Taking into account the competition analysis conducted in 2017<sup>33</sup> and the takeover of UPC (and

<sup>29</sup> [REDACTED] Initially, H3A also made use of the A1 network and then the TMA network in the context of national roaming agreements. In the spectrum assigned from 2019 onwards, active sharing—and thus also roaming—among the three MNOs was essentially prohibited in Austria's three largest cities. Cooperation as recently agreed in 2023 is restricted to regions outside these cities and was also subject to a preliminary review pursuant to Art. 85 TKG 2021. See C1/23, [https://www.rtr.at/TKP/aktuelles/entscheidungen/entscheidungen/C\\_1\\_23\\_Bescheid.pdf](https://www.rtr.at/TKP/aktuelles/entscheidungen/entscheidungen/C_1_23_Bescheid.pdf) (in German)

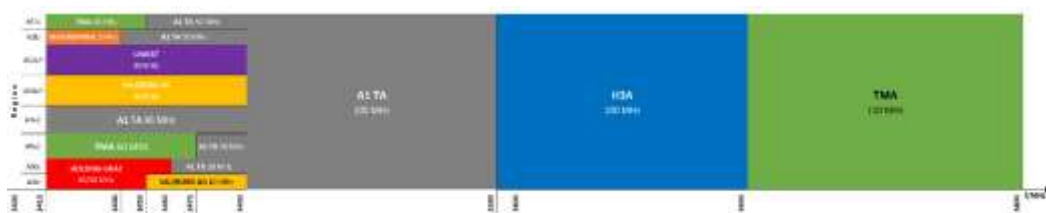
<sup>30</sup> Refer to F4/08-76, Annex 1, [https://www.rtr.at/TKP/aktuelles/entscheidungen/entscheidungen/F\\_4\\_08\\_Anlage\\_1.pdf](https://www.rtr.at/TKP/aktuelles/entscheidungen/entscheidungen/F_4_08_Anlage_1.pdf), Art. 8 (in German)

<sup>31</sup> [REDACTED]

<sup>32</sup> In the forthcoming award, this band is to be awarded as a package of 40 MHz of effectively usable spectrum, with the aim of ensuring a more efficient use of frequencies.

<sup>33</sup> Refer to [https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/konsultationen/Appendix\\_competition\\_measures.pdf](https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/konsultationen/Appendix_competition_measures.pdf) to

therefore the largest nationwide coaxial cable network) by TMA,<sup>34</sup> the TKK restricted A1 and T-Mobile to 150 MHz of the 390 MHz of the spectrum to be awarded, and all other network operators to 170 MHz.<sup>35</sup> In so doing, the regulatory authority ensured that at least 90 MHz could be awarded to a third competitor at nationwide level. The regulatory authority justified this decision as follows: *“As described in the competition analysis, there is a potential incentive for an integrated mobile and fixed network operator to purchase more spectrum in the auction than needed, in order to curb competition in the broadband market.”*<sup>36</sup> With most of this spectrum awarded during the 2019 auction, the remaining frequencies in the 3600 MHz band were awarded together with 26 GHz and without caps in 2024. The final assignments were as follows:



**Figure 8: 3600 MHz spectrum assignment**

Key: A01u: Vienna+, St Pölten; A01r: Vienna, Burgenland and Lower Austria except A01u; A02u: Linz+, Wels+; A02r: Upper Austria except A02u; A03u: City of Salzburg+; A03r: Salzburg except A03u; A04u: Innsbruck+, Bregenz+; A04r: North Tyrol and Vorarlberg except A04u; A05u: Villach, Klagenfurt; A05r: East Tyrol and Carinthia except A05u; A06u: Graz+; A06r: Styria except A06u

As can be seen from Figure 8, A1 acquired up to 180 MHz, TMA up to 160 MHz and H3A 100 MHz. A1 operates a fixed network nationwide in Austria. TMA also typically has a fibre/coaxial cable network at its disposal in cities in urban regions (Klagenfurt, Vienna and some parts of Villach), where it acquired more than 110 MHz.

Figure 7 presents the variations in deployment also seen in this band.

Since 2022, H3A has been offering minimum bandwidths for flat-rate mobile internet subscriptions at these locations (if technical conditions are met). The quality of this service makes it a close competitor with wired broadband connections. Yet this type of service does require the reservation of corresponding mobile network capacity and availability is therefore limited. This type of subscription was conditional on the rollout of 5G standalone (5G SA). This technology allows minimum bandwidths to be offered for mobile services

<sup>34</sup> Refer to the discussion in the Consultation on the Tender Document, section 4.5, [https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/Konsultation\\_Ausschreibungsbedingungen\\_3410\\_bis\\_3800\\_MHz.pdf](https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/Konsultation_Ausschreibungsbedingungen_3410_bis_3800_MHz.pdf) (in German)

<sup>35</sup> Refer to [https://www.rtr.at/TKP/was\\_wir\\_tun/telekommunikation/spectrum/procedures/Procedure\\_3600MHz\\_2019/Tender\\_Documents\\_3\\_4\\_-\\_3\\_8\\_GHz\\_EN.pdf](https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/Procedure_3600MHz_2019/Tender_Documents_3_4_-_3_8_GHz_EN.pdf), section 4.4

<sup>36</sup> [https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/Konsultation\\_Ausschreibungsbedingungen\\_3410\\_bis\\_3800\\_MHz.pdf](https://www.rtr.at/TKP/aktuelles/veroeffentlichungen/veroeffentlichungen/Konsultation_Ausschreibungsbedingungen_3410_bis_3800_MHz.pdf), pages 10–11 (in German)

at certain locations where certain conditions are met. H3A is currently the only operator with a 5G SA core network.

The 1500 MHz band was also awarded in 2020. [REDACTED]

The deployment of capacity bands as presented in Figure 7 underlines H3A's role—measured by deployment status—as the driving force in infrastructure and capacity competition for mobile services. [REDACTED]

Considered by number of locations, H3A leads in all bands above 1 GHz, and is the [REDACTED]

NON-BINDING TRANSLATION

## 4 Questions relevant for competition

Frequency awards involve decisions about the assignment of an essential input for mobile services: spectrum. At network level, mobile telephony is an oligopoly, with only three operators nationwide. Strategic interaction between these operators is therefore a significant factor. Alongside mobile services, the broadband market must also be accounted for, as the capacity for mobile services associated with these bands will also be utilised in the broadband market.

### 4.1 Scope of analysis

As the first step in a competition analysis, consideration is to be given to the frequency distribution that could result from the auction, as well as any concerns with relevance for competition that may be associated with these results. In a second step, the potential impact on competition is then to be analysed in more detail and its magnitude assessed.

The risk of the competition challenge materialising in the auction is analysed in a third step. Competition challenges occur as a result of strategic spectrum acquisition that forecloses spectrum from competitors or at least increases its cost, thus imposing restrictions on competitors. The risk of strategic spectrum-buying that would adversely affect competition is high if the strategic value for the buyer exceeds the intrinsic value of the thereby foreclosed MNO. Within this step, the risk of strategic spectrum-buying needs to be assessed based on two criteria. First, whether it is possible in principle to actually foreclose spectrum. Second, whether any incentive to foreclosure exists—and thus an opportunity to make good on this investment.

The first criterion is the capability of foreclosing spectrum. Given the three MNOs in the market, any capability of foreclosing spectrum completely is essentially limited by the fact that all three MNOs have already acquired spectrum and are able to enjoy unrestricted use of a large portion of that spectrum—both now and in future. As such, foreclosure is therefore possible only in individual bands and/or by in some way working to limit the volume of frequency usage rights, i.e. by affecting total capacity. When looking at capability, a distinction must be made between two specific options, as shown in Table 3. A capability of this kind can exist either for a single MNO (case 1 and 2 in the top row) or collectively (case 3 and 4 in the bottom row) for multiple MNOs together. Because of the coordination necessary in an auction, collective strategic spectrum-buying is in general always more difficult than unilateral action on the part of one company.<sup>37</sup> Were one or more MNOs to be thus foreclosed, they would also have the option of compensating for the lack of spectrum by increasing capital investments in other areas. Investments could be made for example in additional locations and newer technologies, such as sectorisation or MIMO). Ultimately, no one-to-one relationship exists between the usage rights for spectrum and the quality and quantity of the mobile services offered.

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<sup>37</sup> Opportunities for coordination during the award also depend on the auction design (e.g. transparency level).

**Table 3: Foreclosure capability in the auction and incentive to recoup costs in downstream markets by exercising market power**

		Recouping costs (market power in downstream markets)	
		Unilateral	Collective
Foreclosure strategy in the auction	Unilateral	Case 1	Case 2
	Multilateral	Case 3	Case 4

The second criterion—the incentive to foreclose and thus for strategic spectrum-buying—depends on an opportunity to recoup the (potentially considerable) costs incurred by exerting market power within downstream markets (e.g. by forcing higher prices). Only then will there be an economic incentive for strategic spectrum-buying. A distinction must be made between unilateral market power (case 1 and 3) and collective market power (case 2 and 4) within the oligopoly in the downstream markets.

The incentive and the associated intention to exert market power is discussed in more detail below. First, however, it is important to understand that a capability for multilateral foreclosure in the auction can be linked to either unilateral (case 3) or collective (case 4) market power in the downstream market, or a combination thereof. Accordingly, multilateral foreclosure—i.e. a multilateral spectrum-buying strategy—need not require the exertion of collective market power on competition in the downstream market (case 4). The prospect of each party to a multilateral strategic spectrum-buying acquiring unilateral market power can also offer the individual participants sufficient incentive (case 3).

Such an incentive arising from unilateral market power (case 1 and 3) is created if one or more companies use strategic spectrum-buying to secure unilateral market power (for each party), which allows them (each) to operate with a certain degree of independence from market competitors and customers, and therefore recoup the costs of strategic spectrum acquisition. This is conditional on spectrum distribution being sufficiently asymmetric, at the cost of the other MNO(s). In addition, a significant role may be played here by additional asymmetric capacity provided by wired broadband infrastructure, and its corresponding and complementary options for recouping costs.

An incentive resulting from collective market power in the downstream wholesale and retail markets (case 2 and case 4) requires focal points for collusion (i.e. specific, coordinated behaviour, such as defined prices, separation by volume/product, refusal of access) when operating in these markets, within which spectrum as a resource is an essential input for competitors. Furthermore, it must be possible to closely and reliably observe the behaviour of other participants, as well as to sanction as effectively as possible any deviation from the coordinated strategy—i.e. by minimising one’s own

losses while ensuring penalties are targeted. A role may also be played here by the broadband market (wholesale and retail), where no more than two providers typically operate a wired infrastructure. In these markets, it is possible that the preconditions for exerting collective market power are again fulfilled in the context of two wired providers competing for subscriptions.

Exerting collective market power is not a precondition for multilateral foreclosure (case 3). Independent unilateral market power in the retail market may make a coordinated foreclosure strategy in the auction worthwhile for multiple MNOs and can therefore also constitute an incentive. The role of wired broadband should be taken into account here, because existing infrastructure for wired broadband may indeed facilitate an alignment of interests between otherwise competing parties. Typically, an individual customer will be able to choose between at most two wired infrastructure providers. Even if two infrastructures are available, one provider may well enjoy dominance as a result of high bandwidths, for example. If competitive pressure from mobile broadband weakens, this will result in a greater number of customers switching to the existing wired infrastructures. The associated sales volumes, revenues and profits will then simply increase because of this shift. Unilateral incentives for multiple MNOs on the broadband market may also result from a situation where it is profitable to increase prices—whether nationwide or for local campaigns—in the event of a weakening of competitive pressure from mobile broadband.

Generally speaking, multilateral foreclosure in the auction can also result from a combination of unilateral (case 3) and collective (case 4) market power in the downstream markets.

Finally, the analysis must also account for potential external competition, meaning competitive pressure exerted by third parties, especially as a result of the deployment of wired infrastructure. Third parties, who source certain wholesale products from an infrastructure provider, can only exert competitive pressure in situations where a wholesale offer exists for the individual customer, and this therefore facilitates competitive pressure both in terms of pricing and in terms of capacity. The use of the infrastructure provider's wholesale products to expand the third-party portfolio ultimately increases the revenues and thus the profits achieved by the wired infrastructure provider. A third party who uses the wholesale products from an MNO seeking to foreclose another thus has only a limited influence on the MNO's foreclosure incentive.

In a fourth step, the most relevant concerns must be identified in relation to the question of using measures to safeguard competition. Since only three MNOs with their own access network are currently active in the mobile telecommunications market, it is likely that restricting the competitiveness of one or more MNOs could negatively impact effective competition in the relevant markets. The same applies to the broadband market, where the number of effective competitors at local level is often limited to the three MNOs.

Lastly, various options in relation to measures to safeguard competition are to be subjected to an initial evaluation in terms of the typical criteria relevant for regulatory

measures. Because of potentially constituting intervention in users' freedom to acquire spectrum, measures safeguarding competition have to meet the following requirements:

- 1) The measure must be effective. This means the measure must be suitable for remedying current challenges to competition or hindering potential challenges, which can be caused, for example, by overly strong concentration of frequency usage rights.
- 2) The measure must represent the mildest form of intervention. The measure must not intervene more than is absolutely necessary, and if several measures are possible, then the one that is the least invasive must be chosen.
- 3) The measure must be proportionate and trigger no unjustified, detrimental effects for individual network operators. Disproportionately tight caps, for example, can mean that a network operator is exposed to unreasonable growth barriers—owing to too little spectrum—or unjustified restrictions in quality competition. Measures are also not proportionate if they result in unsold lots or a disproportionate expense for the authority or the bidders (due to an overly complex design for example). Measures that are effective and represent the mildest form of intervention are essentially considered proportionate.

The regulatory authority will focus on these requirements when identifying suitable measures.

## **4.2 Competition deficit in the consumer mobile services market**

Regardless of the significance of specific frequencies for competition, the regulatory authority must also anticipate the future state of the overall mobile services market and apply corresponding safeguarding measures to address any concerns relating to competition. Although all MVNOs have now launched 5G products, the regulatory authority is currently unable to estimate the long-term competitiveness of MVNOs in this segment. The frequency award procedure includes provisions for imposing corresponding obligations. Accordingly, the regulatory authority is using this consultation to seek feedback and estimates of whether such a competition deficit is expected and, if so, which measures should be imposed.

## **4.3 Asymmetric distribution of the capacity spectrum awarded as part of this auction**

### **4.3.1 Significance of bands for competition**

According to statements from industry players, which differ slightly in detail, all three bands have a well-developed ecosystem with a large number of user devices—both smartphones and cubes. The bands, which are capacity bands with good propagation characteristics, are primarily used for mobile services and for stationary broadband services (FWA) in particular.

Before examining distribution and potential competition problems for the bands to be awarded, their substitutability needs to be assessed. According to statements from

network operators, the 2300 MHz TDD and 2600 MHz TDD bands are close substitutes. As the ecosystem for 2600 MHz TDD is slightly more well-developed, more user devices are available for this band. Accordingly, network operators could see this band as being more valuable than the lower frequency band. The bands are nonetheless close substitutes. In addition, however, the regulatory authority also considers the 2600 MHz FDD band to be a long-term substitute, regardless of whether any migration of the entire 2600 MHz band to TDD takes place. Existing network operators can substitute FDD spectrum at least partially with TDD spectrum (while accounting for existing investments), while any new market entrants would have full flexibility. In the long term, all bands to be awarded are therefore substitutes for greater capacity with similar propagation characteristics. As a result of existing deployment and current usage, however, the FDD band is associated with specific competitive concerns, which are addressed later in this document.<sup>38</sup>

As of this writing, these bands are predominantly used for the broadband market. Accordingly, cubes or routers (customer premises equipment) are often the terminal device used by the customer, rather than smartphones. Existing cubes may face potential restrictions in use for some bands. In a few years' time, however, network operators will be able to offer new and future customers newer cubes that are capable of using these bands.

With reference to international practice, the TDD bands are considered to offer considerable potential as capacity bands. One network operator considers both TDD bands to be niche bands. Deployment to date has been low in the 2600 MHz TDD band already awarded. Interference with FDD spectrum has been cited by individual operators as an obstacle here. The 2600 MHz TDD band has been deployed to macro stations only by one network operator [REDACTED]

[REDACTED] In the regulatory authority's opinion, a root cause for these problems is the low bandwidth in conjunction with the above-mentioned interference problem.

Accordingly, the two TDD bands are now being awarded in large blocks to ensure a minimum amount of spectrum per operator. A band-specific competitive analysis is not considered expedient. If operators each acquire one band, they can use it more efficiently. Ultimately, all three bands are capacity bands, with TDD able to deliver even more capacity, particularly as a result of the more advanced massive MIMO technology and its stronger weighting of the downlink.<sup>39</sup> The overall capacity of all three bands is therefore analysed, and the auction assessed for potential competitive concerns and the need for measures to safeguard competition.

#### **4.3.2 Statements from operators about asymmetric distribution**

During the consultation on the 2021 Spectrum Release Plan and talks conducted in 2024, operators provided substantial feedback on the necessary minimum amount in the TDD bands, stating that 30 to 40 MHz would be required for a deployment beyond selective hotspot usage. One operator stated that 20 MHz would be the lower limit for

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<sup>38</sup> See section 4.3 below

<sup>39</sup> See the corresponding section in the consultation document

restricted usage in hotspots, but did not consider a widespread rollout to be cost-effective. Band-specific questions for the 2600 MHz FDD band are addressed further below in section 4.4. A collective cap for all bands was not mentioned explicitly. A specific request to protect existing investments was not made in the case of the TDD bands.

### 4.3.3 Possible distributions in the auction context

Table 4 presents a potential distribution after the auction for one network operator. In the planned scenario, two 30 MHz blocks and one 40 MHz block are available in the TDD bands. In the columns, 0, 30, 40, 60, 70 or 100 MHz can therefore be acquired in the TDD bands. In the rows, up to 2x70 MHz (i.e. 140 MHz) can be acquired in the 2600 MHz FDD band. As a result of the band-specific measures to safeguard competition for the FDD band (see section 4.4 below), only 2x30 MHz (60 MHz) of FDD spectrum can be acquired, in accordance with the preferred option 2.<sup>40</sup>

**Table 4: Potential theoretical distributions**

		FDD														
MHz		0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
TDD	0	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
	30	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
	40	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
	60	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
	70	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210
	100	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240

As seen here, one operator could acquire up to 160 MHz. Conversely (and with no further measures), individual operators could acquire as little as 2x10 MHz in the FDD band. As can be seen from Table 2 on page 18, a total of 640 MHz of capacity spectrum is available. Of this, 35 MHz (with weighting by population) has been awarded to regional operators. Network operators could therefore see their shares fall to between 19% (H3A) and 24% (A1).

In the award model with the MVNO obligation, one network operator could easily acquire 2x40 MHz in the FDD band for a total of 180 MHz. As a consequence, individual operators could see their shares decline further. The following results are therefore even more applicable to this award model.

### 4.3.4 Magnitude of potential negative impact

A highly asymmetric outcome to the auction could produce a large potential impact. On the one hand, the excessive acquisition of spectrum by one network operator could lead to a lack of competition (as only one operator can then offer high-quality services). On the other, a lack of spectrum for one network operator could restrict this operator's competitive opportunities (low capacity and coverage).

<sup>40</sup> See the annex on product and auction design

Ultimately, one operator could thus obtain control of large parts of the spectrum—namely up to 160 MHz (180 MHz in the auction model with the MVNO obligation)—with an ecosystem for active antenna systems of reasonable size, spatial multiplexing and optimum propagation characteristics. This operator could hoard the spectrum, deploying it only restrictively. For their part, other operators would lack the amount of spectrum needed to achieve (widespread) deployment of the technology possible with these bands and would also be unable to exert adequate competitive pressure. As a result, an exclusive position with spectrum of corresponding capacity in conjunction with optimum propagation could result in a significant price markup or other behaviour, independently of competition in the retail market.

Alongside safeguarding competition, the outcome should also enable the efficient use of frequencies. Accordingly, excessive fragmentation can also be associated with potential negative impact. Inefficient distribution could result from a failure to acquire the full amount of 60 MHz in the 2300 MHz band, for example. Such a package enables a comprehensive, band-specific implementation of economies of scale, thus facilitating a very wide-ranging deployment with corresponding customer benefits. This also applies if an operator could not acquire at least 2x20 MHz in the FDD band.

Also relevant for competition is a situation where the auction effectively results in a frequency portfolio downgrade for one or more operators, even though an additional 60 MHz are being awarded. This could restrict the capacity and therefore the competitiveness of the respective operator in the mobile services market and the broadband market in particular.

#### **4.3.5 Risk of such negative impact occurring**

To clarify the probability of such an impact occurring, the strategic value to the strategic spectrum buyers must be contrasted with the intrinsic value of the spectrum itself. An occurrence is deemed plausible if the strategic value to the buyer exceeds the intrinsic value of the foreclosed party.

##### Strategic value

The strategic value of foreclosing a party results from another operator possessing little to no spectrum.

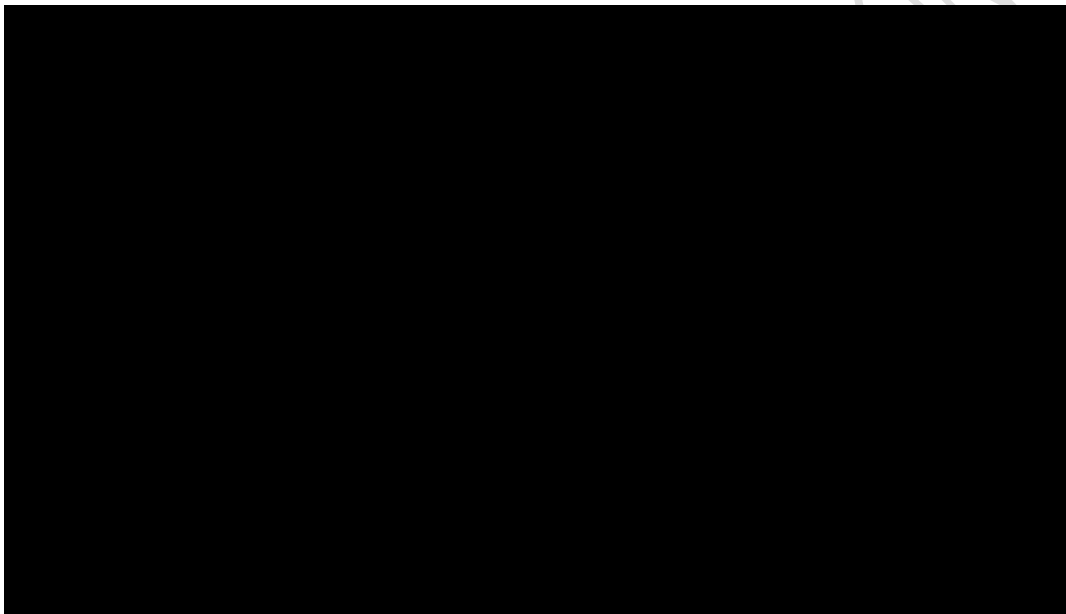
In an oligopoly with three network operators, all operators have a certain degree of market power. This has relevance for the mobile services market. Each of the three MNOs would benefit from a situation where competitor capacity could be restricted by (even partial) foreclosure from these bands. This strategic value is directly proportional to the restrictions placed on competitor capacity.

The strategic value—and therefore the additional benefit obtained—also depends on the potential effects of frequency distribution in the broadband market, including wired infrastructure. Wireless broadband services (cubes) form part of the broadband market in Austria and exert a constrictive effect. Accordingly, restrictions to capacity in mobile broadband for one operator are inversely proportional to the potential revenue growth through competing wired broadband infrastructure. It also needs to

be seen that wired broadband infrastructure yields a significant contribution margin, with correspondingly higher profits. This is because wired broadband is predominantly associated with high fixed costs. The wired broadband networks operated by A1 and TMA are relevant in this context.

A1 possesses varying degrees of market power in the nationwide broadband market. Market power is weakened in particular by the coaxial cable and fibre networks operated by other competitors, yet strengthened in situations where A1 is the only broadband network operator.

TMA has market power in regions where it operates its own fibre/coaxial cable network. The situation is well illustrated by Vienna. Market share of the private customer broadband market in Vienna is presented in Figure 9.



**Figure 9: Market share by connections in the private customer broadband market in Vienna (source: ZIB for Q1/24)**

Figures from the ZIB reveal a market share [REDACTED] for TMA in the private customer broadband market in Vienna for Q1/2024. The market share for TMA share rises [REDACTED] if mobile services are excluded (data for wired broadband only). Mobile-only connections make up roughly 36% of the Viennese broadband market for private customers. Within this segment, H3A has a market share of [REDACTED] with its cubes in Vienna. In the 3600 MHz capacity band, TMA and A1 acquired 150 and 140 MHz respectively in Vienna, with H3A taking only 100 MHz. Vienna is relevant for the forthcoming auction as capacity bands will be required and deployed in this region. H3A, for example, has deployed [REDACTED] of its capacity in Vienna, in both the 2600 MHz FDD band and the 3600 MHz TDD band, measured by the number of sectors times the amount of spectrum used for transmission. If TMA were to acquire strategic capacity spectrum and so restrict H3A, the latter could see the competitive pressure it exerts in Vienna weaken significantly and TMA could acquire more customers—not only in mobile broadband but especially in wired broadband. TMA could then raise its prices.

Accordingly, A1 and TMA each have stronger market power in various regions, with this power primarily resulting from existing infrastructure. As discussed above, TMA would accrue a greater benefit from a potential restriction to competitive pressure from H3A in Vienna. A1, as the nationwide market leader with a [REDACTED] share of the broadband market (cf. Figure 5), would benefit more strongly from a reduction of competitive pressure from H3A, particularly in the case of households lacking a wired alternative to the wired broadband network operated by A1.

Specifically, the existing infrastructure from A1 or TMA can be associated first and foremost with dominance exerted over individual customers. The customer may have access to only one infrastructure (particularly in the case of A1) or only one infrastructure may provide the required capacity. In the latter case, for example, the need for high bandwidth may force a customer to use a fibre/coaxial cable network, as A1's DSL network may be unable to supply this level of bandwidth. If the competitive pressure exerted by H3A in mobile broadband is weakened, this offers A1 and TMA an incentive to increase prices unilaterally, as a result of local market power. Even if pricing is uniform nationwide, there may nonetheless be an incentive to increase prices nationwide by a certain margin. In the case of promotions, for example, greater local market power can also impact competition over regional price components in an otherwise nationwide price competition. An incentive towards implicit coordination may also be strengthened by a weakening of competitive pressure on the part of H3A.

Whether unilateral or coordinated, such an opportunity to exercise market power presupposes the absence of effective third-party constraints on competition. Third-party competitive pressure may vary at local level. Nationwide, independent third parties have [REDACTED] share of the broadband market (see Figure 5). In some cases, however, they purchase wholesale access, to the A1 fixed network or the mobile broadband offered by H3A or TMA. For their part, A1 and TMA benefit from the increased revenues in the retail market provided by these wholesale buyers. A1 and TMA would only fail to benefit from foreclosing H3A in the case of a switch to broadband products offered by third parties with their own wired infrastructure. This is a distinct possibility in the cities of Linz (especially with Liwest), Salzburg (Salzburg AG) or Innsbruck (fibre products from Innsbrucker Kommunalbetriebe). Alongside the presence of wired infrastructure, effective competition also typically depends on successful sales and marketing—whether directly by the company or outsourced to a third party. Except for the above-mentioned providers (with merely local relevance), this is not to be expected for other third parties (independent of MNOs) considering their marginal market share.

Accordingly, A1 and TMA can both profit from foreclosing H3A. Apart from a direct increase in customer numbers and revenues if prices are maintained at current levels, enhanced market power could also encourage price hikes.

As can be seen, this spectrum possesses for all three operators a certain strategic value that exceeds the intrinsic value of these frequencies. The strategic value is especially high for A1 and TMA, as foreclosing H3A could also help to boost profits and market power in existing wired broadband.

No strategic value is apparent for new market entrants. Ultimately, these bands are also unsuited to the deployment of a wide-area mobile communications network that features significant in-building coverage.

In the medium term, this assessment is materially relevant for the total capacity of 240 MHz to be awarded. Only in the short term could foreclosure of the 2600 MHz FDD band have appreciable impact, because the band is already deployed and immediate capacity can therefore be restricted. This issue is addressed by a separate analysis presented below.

In particular, foreclosing an operator from directly available TDD spectrum would produce a situation prohibiting an operator from utilising the associated ecosystem for active antennae, multiplexing and optimum propagation characteristics. This operator would thus be unable to offer services such as those with a guaranteed minimum bandwidth in households further away from base stations and in buildings where the 3600 MHz band offers inadequate coverage.<sup>41</sup> Generally speaking, this could prevent an expansion of capacity supplementary to the 3600 MHz band, while also entirely prohibiting the deployment of TDD spectrum with spatial multiplexing in the bands to be awarded.

#### Intrinsic value

Essentially, the intrinsic value of spectrum stems from the fact that additional spectrum can be used as part of a deployment to increase capacity. This capacity can then be used to service additional demand or offset reductions in capacity that have resulted from spectrum losses (which would otherwise require separate investment in alternative, capacity-boosting measures). While these circumstances apply in general to all operators, the specific intrinsic value may vary for each operator. To date, the TDD bands have seen little significant use.

As of this writing, only H3A has existing band-specific equipment in the 2600 MHz TDD band. This means that H3A might put somewhat greater value on the 2600 MHz TDD band.

All network operators will need to complete corresponding investment in band deployment to ensure its effective use. In the medium term, this is to be expected as part of healthy competition.

#### Risk of negative foreclosure impact

In conclusion, the strategic value for the buyer(s) would appear to most probably exceed the intrinsic value for any foreclosed party (or parties). Accordingly, within the auction as a whole, there appears to be a real risk of both unilateral and multilateral spectrum foreclosure. Measures to safeguard competition should therefore be examined.

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<sup>41</sup> Expanding location density is often associated with significantly higher costs and therefore uneconomical.

#### **4.3.6 Relevant risks for competition**

As discussed in section 4.3.4, highly asymmetric frequency distributions can be associated with potential negative impact on competition. The hoarding of spectrum by a single network operator can lead to a situation where this operator is neither exposed to adequate competition nor directly exerts adequate competitive pressure.

Conversely, an operator who lacks an adequate amount of spectrum may for economic reasons decide to postpone the deployment of a band or deploy it to a significantly smaller extent. This operator would thus have less capacity and be able to exert less competitive pressure.

Constraints on the overall capacity of H3A for mobile services—and for intermodal broadband competition in particular—is seen as a significant risk here.

##### Role of coverage requirements

To prevent the hoarding of spectrum, appropriate coverage obligations are envisaged. A portion of deployment must also take place outside major urban regions. Overall, per TDD band 1500 locations must be installed by 2036. If one block is acquired in 2300 MHz TDD and one block in 2600 MHz TDD, then 1500 locations must be installed for each by the end of 2036. If the entire 2300 MHz band is acquired—for a total of 60 MHz—then 2000 locations must be installed for this band by 2036. These coverage obligations making hoarding more expensive while increasing the costs of foreclosing a competitor by means of strategic spectrum-buying. At the same time, operators who wish to acquire more than one TDD block are given an incentive to concentrate on a single band—namely 2300 MHz.

#### **4.3.7 Options for competition measures**

In the medium to long term, the bands to be awarded are considered to be substitute bands. The capability and incentive to foreclose an operator from spectrum usage rights (and therefore from capacity) are the same for all bands. Accordingly, the following analysis considers total caps for all bands.

These caps may not (necessarily) affect all operators to the same degree. Considering the proposed auction formats, a joint cap would be associated with a high degree of complexity.<sup>42</sup> This type of cap is therefore not considered further.

In the event of differentiation, an asymmetric cap is therefore being considered. The following basic options are available for measures to safeguard competition.

Option 1: Cap of 130 MHz or more

Option 2: Cap of 120 MHz

Option 3: Cap of 110 MHz

Option 4: Cap of 100 MHz

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<sup>42</sup> A similar joint cap was imposed in the 2020 multiband auction.

These caps are examined separately for each network operator.

Option 1, a cap of 130 MHz or more, would permit one network operator to acquire 54% or more of the spectrum to be awarded. The other two operators would then in total be able to acquire an amount of only 110 MHz or less. This could lead to a situation where at least one operator would lack the spectrum for corresponding capacity deployment. If a second operator were to acquire a third of the spectrum, i.e. 80 MHz, then the third operator would then be left with only 30 MHz or less, such as 2x15 MHz FDD or a single TDD block. Regardless of how the remaining spectrum is distributed, at least one network operator could be inhibited from expanding capacity. At the same time, the operator with 130 MHz or more would be exposed to only limited competitive pressure in terms of capacity. This would be the case especially in regions or buildings where the 3600 MHz band does not provide adequate coverage as a supplementary capacity band. Accordingly, a cap of 130 MHz or more does not appear effective.

Option 2, a cap at 120 MHz, would allow A1 and TMA a multilateral foreclosure strategy against H3A. The latter would then be foreclosed from spectrum, with the exception of the amount protected in the 2600 MHz FDD band by the competitive measure (see later). Unilaterally, a single operator with wired broadband could acquire the entire TDD spectrum—and thus an immense amount of capacity—by limiting themselves to 2x10 MHz in the FDD band. A strategy of this kind could be profitable for A1 and TMA. Thus, a cap that permitted this outcome for A1 and TMA would not promote healthy competition. Under a 120 MHz cap, H3A could also acquire exclusive rights to both TDD bands by limiting itself to 2x10 MHz in the FDD band. Nonetheless, the regulatory authority does not see this as constituting a competitive risk. This is because the A1 and TMA portfolios in the 3600 MHz band (and in total), while showing regional variation, are superior overall, and A1 and TMA also operate regionally varying wired infrastructure. Instead, H3A could use these frequencies to drive greater competition in the broadband market, also having incentives to do so. An expansion of the customer base would almost exclusively increase revenues and H3A would be incentivised to deploy these bands until incremental costs equal the marginal yield. The acquisition of this amount of spectrum by H3A would, in the regulatory authority's opinion, be driven by an intrinsic rather than strategic evaluation. In conclusion, option 2 is considered ineffective for A1 and TMA but highly effective for H3A.

Option 3, a cap of 110 MHz, also enabling the multilateral foreclosure of H3A by TMA and A1 and leaving H3A with only 2x10 MHz of spectrum, therefore appears ineffective to address the two operators. As a result of their existing wired infrastructure, both operators would proportionally benefit from foreclosure, to a considerable degree even without any further coordination. In the broadband market, wired infrastructure and the local capacity it provides is typically a decisive factor for regional market share. Only through expansion by another operator could this change to any degree. As expansion of this kind is not foreseeable and would take at least several years, it thus has no relevance for the strategic assessment of spectrum. In

many urban areas, there is neither alternative wired infrastructure available nor is any significant expansion of an independent operator to be expected.<sup>43</sup>

For H3A, however, such a cap would restrict acquisition to a maximum of 2x25 MHz and 60 MHz in the 2300 MHz FDD band or 2x20 MHz and 70 MHz in the TDD range. In comparison with option 2, a cap of 120 MHz, such a cap would not be the mildest form of intervention against H3A and is thus considered disproportionate.

Option 4, a cap of 100 MHz, would permit each operator to acquire a significant proportion of spectrum, such as 2x20 MHz in the FDD band as well as the sum total of 60 MHz in the 2300 MHz TDD band. At the same time, this cap would offer sufficient protection against foreclosure. If both operators with wired broadband were to make full use of such a cap, H3A would then be limited to 2x20 MHz. Such a multilateral foreclosure strategy would incur significant costs for both operators (see coverage obligations) while at the same time potentially proving ineffective. Options for recouping costs would be associated with serious uncertainties. The two operators would only benefit from foreclosure in the medium term future, if indeed at all, since H3A would still be able to make use at least of its current capacity. The resulting asymmetry in relation to spectrum portfolios would also be taken into account as part of the competition analysis for future awards, for example of the 800/900/1800 MHz bands. Achieving this kind of coordination would also be difficult in the auction, given the expected level of transparency. Accordingly, the regulatory authority expects H3A to be able to acquire significantly more than 2x20 MHz if they were interested. This cap alone therefore makes foreclosure unlikely. This would therefore appear to be an effective measure for TMA and A1 to prevent them from foreclosing H3A. For H3A, no further examination is needed, as such a measure would not be justified on competition grounds. This measure would not be the mildest form and is thus considered disproportionate.

In conclusion, a cap of 100 MHz for A1 and TMA along with a cap of 120 MHz for H3A would appear to be effective, proportionate and the mildest form of intervention to safeguard competition.

#### **4.4 Asymmetric distribution with 2600 MHz FDD**

The regulatory authority generally views all three bands as long-term substitutes, while varying somewhat in terms of how they are assessed. In the short term, however, the 2600 MHz FDD band plays a key role. As this band is extensively used, a loss of spectrum would mean an immediate loss of capacity for an operator. The 2600 MHz FDD band must therefore be examined on a band-specific basis, in view of potential competition problems as well as any necessary competitive measures.

##### **4.4.1 Statements from operators about asymmetric distribution**

During the consultation on the 2021 Spectrum Release Plan and talks conducted in 2024, all three operators cited a frequency portfolio of at least 2x20 MHz in the

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<sup>43</sup> The regulatory authority is aware of existing coaxial cable networks or planned deployments by individual operators under public ownership, including Salzburg AG, Liwest, Innsbrucker Kommunalbetriebe and Kabelplus.

2600 MHz FDD range as a precondition for cost-effective deployment. Only one operator stated that existing equipment could continue to be used in this band if necessary with 2x10 MHz. The operators also stated that whether band could be used cost-effectively would directly depend on the amount of spectrum acquired. This means that the operators are interested in more than 2x20 MHz. One operator gave 2x50 MHz as its upper limit, while another suggested that 2x30 MHz would be a satisfactory outcome.

In terms of potential caps, two operators expressed an interest in a cap of 2x30 MHz, with one of these operators then lowering this figure to 2x25 MHz in subsequent talks. When asked to justify such a narrow cap, these operators cited the existing use of the band and the related investments made in equipment. Without compatible spectrum, the equipment would need to be taken off the balance sheet and written off; capacity would also be irreplaceable in the short term. One operator stated that there was no need for a cap.

#### **4.4.2 Possible distributions in the 2600 MHz FDD band**

A total of 2x70 MHz is available in this band. The regulatory authority wishes at all costs to avoid distributing any portfolio under 2x10 MHz. Two operators called a portfolio of less than 2x20 MHz undesirable. With three network operators participating, a cap of 2x25 MHz would guarantee 2x20 MHz as the minimum amount of spectrum for each operator. A cap of 2x30 MHz would guarantee at least 2x10 MHz for three network operators. Higher caps would not guarantee spectrum in this band for every operator.

#### **4.4.3 Magnitude of potential negative impact**

If an operator were to lose all of its spectrum in this band, this would mean a loss of immediate capacity equalling the operator's deployment of the band. Substitution with new spectrum, e.g. in the 2.3 GHz band, would not be possible in the short term. If the amount of spectrum held in a band dropped, the operator would lose a proportional amount of spectrum and the fixed costs for operating the band would be spread over less band-specific capacity. For future deployment decisions, the targeted level of deployment could shrink significantly. Or, if the amount of spectrum were to be too small, it would not be deployed at all and existing equipment would merely continue to be used. On the other hand, an operator could increase capacity more effectively through partial substitution with TDD spectrum in the medium to long term.

Thus, in the first few years, the magnitude of the potential impact, in terms of loss of capacity and devaluation of existing equipment, would especially depend on the deployment level. Figure 7 presents the locations in the 2.6 GHz band currently set up. As can be seen, H3A has deployed a more substantial number of locations than A1, who in turn has many more than TMA. The magnitude of impact is also clear from a map of deployment. Figure 10 presents deployment by all three operators. Note that TMA locations overlap those of A1 and H3A, while A1 locations overlap those of H3A in this figure. The locations run by H3A are therefore only visible in places where other operators do not directly run a location nearby. Similarly, A1's locations are visible only

where there are no TMA locations in the vicinity. The number of locations and their geographic distribution indicates that potential negative impact is greatest for H3A, followed by A1. Also relevant for H3A is its relatively modest portfolio of spectrum having at least equivalent or better propagation characteristics,<sup>44</sup> together with its leading market share in terms of data volume, which requires a high level of capacity. In contrast, A1 has a significantly superior spectrum portfolio and would find it easier to deploy other bands as alternatives.

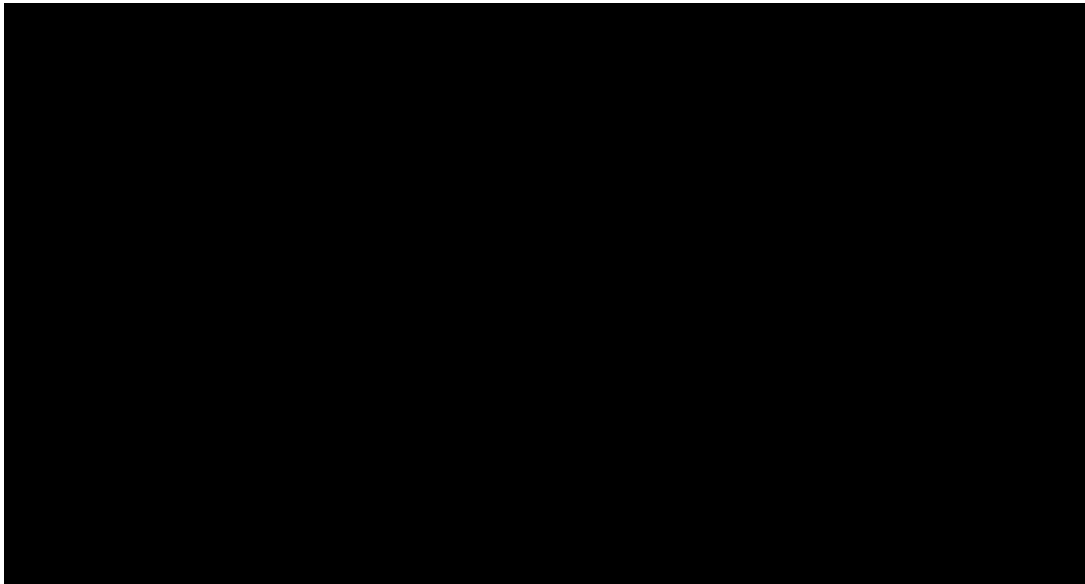


Figure 10: Map with locations in the 2600 MHz FDD band (operational status report as of 30 June 2024)<sup>45</sup>

#### 4.4.4 Risk of such negative impact occurring

To clarify the probability of such an impact, i.e. loss of spectrum or less than 2x10 MHz (or 2x20 MHz), the strategic value to the strategic spectrum-buyers must be contrasted with the intrinsic value of the spectrum itself.

##### On the strategic value

In an oligopoly with three network operators, all operators have a certain degree of market power. This has relevance for the mobile services market. Each of the three MNOs would benefit from a situation where competitor capacity could be restricted by (even partial) foreclosure from the 2.6 GHz FDD band. This strategic value is directly proportional to the restrictions placed on competitor capacity. This depends in particular on the degree to which competitors rely on this band. Current band usage provides a direct indicator of this reliance.

##### On the intrinsic value

<sup>44</sup> See Table 2, frequency distribution—especially with reference to 700/800/900/1500/1800/2100 MHz  
<sup>45</sup> Key: one H3A location is shown as a blue dot and forms the bottommost layer. Locations run by A1 are shown in green. These dots overlay H3A's. TMA locations are shown as purple dots. These dots overlay those of A1 and H3A. Accordingly, if all three operators have deployed locations, this region is shown in purple—such as Vienna, for example.

Existing deployment, indicating the investment in band-specific equipment, as well as current usage are significant factors contributing to intrinsic value. These investments will lose their value if no spectrum is acquired. Accordingly, an intrinsic value is attributed to H3A that is relatively high compared with its two competitors.

All three operators are likely to assign a high value to the spectrum because of their investments in band-specific equipment. The intrinsic value is presumed to be much lower for a new market entrant.

#### Risk of occurrence

Existing usage is significant and all three network operators are therefore prone to a risk of foreclosure. This is especially true in the case of H3A as a result of the latter's more intensive usage. The spectrum has additional strategic value for A1 and TMA because of these operators' wired broadband infrastructure. This value depends on the (local) level of wired infrastructure deployment.

As the entire FDD band can be acquired outright by one or two network operators, this creates a risk of unilateral or even multilateral strategic spectrum-buying. This outcome can work to restrict competitor capacity with immediate effect, thereby creating options for recouping costs by the exertion of unilateral or collective market power (see above). This creates a potential incentive for strategic spectrum-buying. Measures to safeguard competition should therefore be assessed.

#### **4.4.5 Relevant risks for competition**

Without a measure to safeguard competition, an auction outcome whereby one of the three competitors acquires no spectrum appears plausible. It is also conceivable that one operator could only purchase 2x5 MHz in the auction and thus acquire less than the required minimum amount of spectrum. In either case, the outcome would mean a capacity restriction for one network operator. If that were H3A, the negative impact on both the mobile services and broadband markets would be significant. Therefore, an appropriate measure to safeguard competition is required here.

If one network operator acquired 2x10 MHz, that party should at least be able to continue operating at existing locations. That operator could simultaneously acquire TDD spectrum to expand overall capacity.

#### Role of coverage requirements

An outcome is also possible in which one competitor would acquire no more than 2x10 MHz (and potentially more TDD spectrum). As this would limit the operator's economic viability, less stringent coverage obligations would be applied in this case.

However, a situation should certainly be avoided where one competitor acquires only 2x10 MHz with the aim of using strategic spectrum buying (hoarding) to foreclose other operators. This particular auction outcome, with one operator acquiring only 2x10 MHz, would in fact result if least one other operator acquired 2x30 MHz or more of spectrum. To prevent such hoarding, and to reduce strategic buying incentives and

thus the likelihood of a competitor being constrained to 2x10 MHz, more stringent coverage obligations are envisaged for scenarios in which one operator would acquire at least 2x30 MHz.

#### **4.4.6 Options for competition measures**

When reviewing the proposed auction formats, a joint cap is seen to entail a high degree of complexity; this potential option is therefore not further considered here.

An asymmetric cap specific to the 2600 MHz band would not appear appropriate. This band has already been awarded: each operator has deployed spectrum to a certain degree and has therefore invested in band usage. If such an asymmetric cap were to be imposed, then it would be to the advantage of H3A. Of all operators, H3A uses this band to the greatest extent. Conversely, this level of usage also makes it easier for H3A to meet coverage obligations. An asymmetric cap is already being considered as a preferred option applying to the total amount of spectrum to be acquired in the auction.

The following options therefore exist for an award model excluding any MVNO obligation (see annex on product and auction design):

- 1) Symmetric cap  $\geq$  2x35 MHz
- 2) Symmetric cap of 2x30 MHz
- 3) Symmetric cap of 2x25 MHz

Option 1 does not entirely exclude the complete foreclosure of a competitor from spectrum. Nonetheless, for example with a cap of 2x35 MHz, two network operators would have to select such a coordinated strategy during the auction. If one operator were to acquire less than 2x35 MHz, the unilateral strategy of a second operator could still constrain the third operator to an exceptionally low amount of spectrum. For this reason, this option is not effective.

Option 2, a symmetric cap of 2x30 MHz, guarantees at least 2x10 MHz for all three network operators. This appears appropriate in light of existing investments. The stringent coverage obligations applicable to the acquisition of 2x30 MHz also help prevent spectrum hoarding, which would also entail high deployment costs. If two operators were to acquire 2x30 MHz, the third operator would be left with only 2x10 MHz. The obligatory deployment investments required for the two operators with 2x30 MHz significantly weaken any incentive to constrain the third operator to only 2x10 MHz and therefore make this scenario less likely. Accordingly, this appears to be an effective measure, especially together with coverage obligations preventing purely strategic acquisition.

Option 3, a symmetric cap of 2x25 MHz, significantly restricts how much spectrum network operators can acquire. With three bidders in the auction, each operator would be able to acquire at least 2x20 MHz without competition. However, the regulatory authority believes this would too severely restrict operators' flexibility during the auction to substitute spectrum across the various bands. An operator would not only be unable to acquire more than 2x25 MHz, it would also prevent that party

from limiting themselves to 2x15 MHz while compensating by acquiring more TDD spectrum. Accordingly, this measure does not appear to be the mildest form of intervention and is thus considered disproportionate. Spectrum acquisition by an operator would be excessively restricted.

The regulatory authority therefore proposes option 2, a cap of 2x30 MHz for all participants in the auction, in the 2600 MHz FDD band.

For the award model with the MVNO obligation, adequate FDD spectrum will be assigned in stage 1 to each winner (for details, see the annex on product and auction design).

NON-BINDING TRANSLATION