



PUBLIC HEARING

**ON PLANS REGARDING THE FREQUENCY
BANDS AVAILABLE FOR THE PROVISION
OF WIRELESS BROADBAND SERVICES
AND THE FUTURE USE
OF THE VHF III BAND**

10 November 2017

Contents

I.	Introduction.....	2
II.	Overview of frequency bands.....	4
A.	5G pioneer bands	4
1.	700 MHz frequency band	4
2.	3400-3800 MHz frequency band	7
3.	26 GHz frequency band.....	8
B.	Not-yet-sold bands affected by the harmonisation	11
4.	Utilisation of the 1500 MHz frequency band.....	11
5.	2300-2400 MHz frequency band	12
C.	Already-sold bands affected by the harmonisation	13
6.	2100 MHz frequency band	13
7.	2600 MHz frequency band	14
III.	MFCN-related general regulatory solutions affecting multiple bands.....	15
A.	Regulation of the spectrum maximum	15
B.	LSA concept	16
IV.	Issues concerning the future use of the VHF III band	17

I. Introduction

One of the main objectives of the Europe 2020 strategy is to enable all EU citizens to access a broadband service of at least 30 Mbps speed by 2020. Due to increased demands for a frequency spectrum that can be used for broadband mobile services, investigations have started, at international level, on how to release for mobile purposes those frequency bands that have been designated for other service providers and are currently used by them. A primary goal is to increase spectrum use efficiency. To this end, firstly, the unutilised spectrum must be integrated in the digital economy network and, secondly, new technologies and regulatory solutions must be applied in order to increase spectrum utilisation.

The RSPP¹ aims to promote the wider availability of wireless broadband services for the benefit of citizens and consumers in the Union. To this end, the RSPP has stipulated in respect of a number of already harmonised bands that, subject to a market demand, bands on which high-speed data services can be provided to the population must be made available to wireless broadband systems, furthermore, the RSPP also defined the identification of the 1200 MHz frequency for wireless broadband purposes as a task.

Meanwhile, with the accelerated technological developments, the idea of the new, 5th generation mobile services emerged. The appearance of the 5G systems does not only represent a new generation of mobile technology but also a whole new concept that integrates all the previous technologies and enables the use of a whole new set of applications. Accordingly, the principles underlying the technology have been elaborated so as to equally serve high-speed data transfer applications, high-reliability critical applications as well as devices that operate at low data transmission speeds but are installed in very large numbers.

At the World Radiocommunication Conference 2015² it was decided that item 1.13 in the agenda for the next WRC (WRC-19) would be the identification of frequency bands suitable for the use of 5G systems. In this context, within the range of the specified possible frequency bands it is necessary to examine, which frequency bands may be the most suitable for introducing 5G systems. By the end of 2016 an EU mandate was elaborated³, in which, based on the RSPG's⁴ opinion on issues related to the 5G spectrum,⁵ CEPT was requested⁶ to study the feasibility of a 5G introduction in respect of the bands specified in the document, taking into account the current spectrum uses. The mandate, in line with the RSPG's opinion, specified the 700 MHz and 3400-3800 MHz and the 26 GHz (24.25-27.5 GHz) bands as the bands identified for the early 5G introduction (5G pioneer band).

In this document we primarily focus on the frequency bands identified for the early 5G introduction. As a result of the process launched jointly with the RSPP, the EU regulation on the 700 MHz band (2016-2017) has already been elaborated. The 3400-3800 MHz frequency band is already available for

¹ Decision No 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme

² World Radiocommunication Conference 2015, Geneva, 2-27 November 2015

³ <https://ec.europa.eu/digital-single-market/en/news/radio-spectrum-cept-mandates-0>

⁴ RSPG: Radio Spectrum Policy Group (Pursuant to 2002/622/EC Commission Decision of 26 July 2002 establishing a Radio Spectrum Policy Group (RSPG), the RSPG acts as an advisor in European strategic issues on radio spectrum.)

⁵ http://rspg-spectrum.eu/wp-content/uploads/2013/05/RPSG16-032-Opinion_5G.pdf

⁶ CEPT: Conférence européenne des Administrations des postes et des télécommunications – European Conference of Postal and Telecommunication Administration

MFCN⁷ systems, without restrictions on the type of application. The BEM⁸ values applied to 5G systems may, however, differ from those applied to systems currently in use. In relation to the 26 GHz frequency band, several Member States have reported a significant degree of fixed use.

From a national regulatory point of view it is necessary to take into account those frequency bands that are already allocated and used for MFCN purposes but still contain non-allocated sub-bands or where the licenses are due to expire in the near future. Thus, an at least 2x15 MHz still allocable bandwidth within the 2100 MHz frequency band and a 15 MHz TDD sub-band within the 2600 MHz frequency band remains to be examined.

The wireless options available for broadband services are further extended by the 1.5 GHz frequency band (the already harmonised 1452-1492 MHz frequency band and its planned extension, in the near future, with the 1427-1492 MHz and 1492-1518 MHz bands) and the 2300-2400 MHz frequency band.

Technological progress forces the regulators to review their available tools as well. We should also examine, as a general issue,

- the techniques that would yield an increase in the efficiency of frequency use, such as the licensed shared access, or
- possible regulatory measures concerning competition, such as regulatory practices related to the width of the spectrum that can be acquired, or
- a possible legal solution for both purposes, that is, the regulation of the secondary trade.

⁷ Mobile/Fixed Communications Networks (With regards to the convergence of the fixed and mobile wireless communication services, the CEPT regulation introduced the umbrella term 'MFCN' (Mobile/Fixed Communication Networks). This also includes the IMT (International Mobile Telecommunication) systems used in ITU terminology.)

⁸ Limit values for out-of-block emissions (block edge mask)

II. Overview of frequency bands

A. 5G pioneer bands

1. 700 MHz frequency band

The Radio Regulations, adopted by WRC-15 in 2015, allocated the 694-790 MHz band (700 MHz band) currently used for broadcasting, to both broadcasting and mobile services (except for aeronautical mobile services), on a co-primary basis. The band below the 700 MHz frequency range (694-790 MHz) will continue to be allocated solely to the broadcasting service on a primary basis and, on a secondary basis, to wireless audio equipment and applications related to programme making and special events (hereinafter: PMSE applications).

The 700 MHz band is of particular importance in 5G implementation as well. The 5th generation mobile technology introduced in ITU terminology as 'IMT-2020'⁹ opens up new horizons for mobile communications. The 700 MHz band is one of the 5G pioneer bands. Service providers also agree that, in order to fulfil 5G user demands, they equally require both lower and higher frequency ranges, and therefore, of all the bandwidths below 1 GHz, the 700 MHz band is exceptionally suitable for this purpose, considering that this band is globally usable, it may become widely available to the mobile market even by 2020, and is suitable for covering large areas cost-effectively.

The European Commission's Digital Single Market Strategy has already highlighted the importance of the 700 MHz band in the provision of broadband services in rural areas, and stressed the need for the release of a harmonised spectrum bandwidth that would also be suitable for fulfilling the specific needs of audiovisual media broadcasting, in order to promote investments affecting the establishment of high-speed broadband networks and to enhance the spread of advanced digital services. With regard to the future mobile broadband utilisation of the 694-790 MHz frequency band, a Commission Implementing Decision containing the harmonised conditions for the use of the band¹⁰ (hereinafter: "Commission Implementing Decision") was adopted, and a Decision of the Parliament and of the Council was elaborated¹¹, which, in respect of the further utilisation of the full 470-790 MHz band currently used for broadcasting, stipulates the Member States' obligations, including the related deadlines, as well as expectations regarding the future of TV broadcasting.

The Commission Implementing Decision provides a flexible framework for Member States to regulate the use of the 700 MHz band. Within this regulatory framework, the 2×30 MHz bandwidth within the 700 MHz band must be made compulsorily available to mobile and fixed communications networks (MFCNs) suitable for providing wireless broadband communication services, while in other sub-bands the use options should be available at national level, subject to fulfilment of the specified technical conditions. Such optional usages include: broadband radio applications for public protection and disaster relief (hereinafter: BB-PPDR), supplemental downlink (hereinafter: SDL) communications necessary for increased downlink traffic, applications related to broadcasting, programme making and special events (hereinafter: PMSE) and machine-to-machine communication (hereinafter: M2M).

⁹ International Mobile Telecommunications 2020

¹⁰ Commission Implementing Decision (EU) 2016/687 of 28 April 2016 on the harmonisation of the 694–790 MHz frequency band for terrestrial systems capable of providing wireless broadband electronic communications services and for flexible national use in the Union

¹¹ Decision (EU) 2017/899 of the European Parliament and of the Council of 17 May 2017 on the use of the 470–790 MHz frequency band in the Union

The issue of utilising the 700 MHz frequency band affects a number of strongly interrelated processes of frequency management and a number of frequency-using industries (e.g. media, emergency organisations, healthcare, transportation). A typical key issue is the roll-out of BB-PPDR networks in the 700 MHz band, for which there are several options considering, for example, the available frequency bands (availability of the 400 MHz band besides the 700 MHz band) or the nature of the implementation (operation of a dedicated government network, use of services provided on a commercial basis or a hybrid solution combining both).

In line with international efforts, the provision and the licensing, as required, of the radio spectrum necessary for the further development of mobile broadband services is one of the key strategic goals of the NMHH for the period between 2016-2020, and in this context it has been specified as a specific goal, that the conditions for mobile band usage in the 694-790 MHz band must be prepared and the sale must be completed by the date specified in the EU legislation for clearing the band. The fundamental decisions on the future of the band are set out¹² in the National Roadmap.

The frequency usage right for the operation of the broadcasting networks also affecting the 700 MHz band will expire on 5 September 2020, after which date the band may become available for mobile service applications. The National Roadmap determined the date of the tender for the operation of the new multiplex for the subsequent period (which no longer covers the 700 MHz frequency band) in an effort to ensure continuity of the broadcasting service.

In order to make possible the use of the 700 MHz band for broadband communication purposes, a number of national law amendments are required. As a first step, NMHH decree 7/2015 (XI.13.) on the national frequency allocation and the rules of using frequency bands (hereinafter: NFFF) was amended through the implementation of the mandatory technical harmonisation criteria.

The 700 MHz band is currently used by most countries – including Hungary – to operate terrestrial television broadcasting (DTTV) and wireless audio frequency PMSE equipment. Since 2015, the 700 MHz band has, in addition to broadcasting, also been available for mobile broadband applications, on a co-primary basis.

Some Member States have already begun, or even completed, the licensing process for the use of the 700 MHz band for terrestrial wireless broadband electronic communications services, although most European countries, including Hungary, are still in the strategy development phase.

Hungary has also begun the international coordination process for redesigning broadcasting to make the band available for systems stipulated by EU Decisions and to create the conditions for the introduction of new areas of usage.

The minimum harmonisation of technical issues has been completed through the amendment of the latest¹³ NFFF.¹⁴ Since the NFFF amendment related to conceptual issues of the tender procedure is still to be completed, the regulation of secondary trading options (Article 2 of the Decision (EU 2017/899 of the European Parliament and of the Council) and the definition of the coverage and quality requirements (Article 3 of the Decision (EU) 2017/899 of the European Parliament and of the Council) with due regard to national market demands is planned to be implemented, as foundation for the tender procedure, by the end of 2018.

¹² National Roadmap for the utilisation of the VHF III (174-230 MHz) and UHF (470-790 MHz) frequency bands, published by the NMHH after prior public consultation, on 8 September 2017 on its http://nmhh.hu/dokumentum/189921/uhf_nemzeti_utemterv.pdf website.

¹³ Amendment entered into force through NMHH decree NMHH Decree 11/2017. (IX. 25.) on 10 October 2017

¹⁴ NMHH decree 7/2015 (XI.13.) on the national frequency allocation and the rules of using frequency bands

Considering that broadcasting service cannot be switched off simultaneously in the countries concerned, and that the clearance of the 700 MHz band also requires strategic and especially media-policy decisions affecting the future of communication, audiovisual media and broadcasting in each affected country, only after the protection requirements pertaining to broadcasting and other stations in the countries concerned are known will it be possible to clearly identify the period and the geographic area in which restrictions in the use of the national MFCN networks can be expected. Since we are not fully familiar with the neighbouring countries' 700 MHz national roadmaps, we can not yet rule out the possibility of restrictions during the transition period, especially in the interest of protecting the broadcasting stations that are still operating in the neighbouring countries. Reliable information on the extent and the timing of any restrictions applied during the transition period will only be available after the completion of the international coordination process necessary for the use of the band for MFCN purposes and the publication of the national roadmaps.

One of the main goals of radio spectrum regulation is to protect various services or applications from interference. When introducing new technologies, particular attention must be paid to the protection of radio applications operating in the same or adjacent bands and to avoid any interference between them, at the same time taking precautions to avoid any disturbances in landline technologies as well.

Please explain your opinion regarding the statements below.

- a) *The NMHH plans to distribute the 2x30 MHz spectrum for MFCN purposes in FDD access mode in a competitive procedure by the end of December 2019.*
- b) *According to the plans, the date of acquiring rights of use will be different from the possible initial date of use, which the NMHH will take into account during the competitive procedure.*
- c) *In determining the duration of the frequency usage rights, the NMHH will take into consideration the investment-protection criteria and the provisions of Act CXCVI of 2011 on National Assets, that is, it will make possible the acquisition of rights for not more than 15 years.*
- d) *By making the 700 MHz band available, the possibility for secondary trading will be permitted in the 700 MHz band as well, in terms of both transfer and lease, with due regard to the principles prevailing at the time of the sale process related to mobile market competition.*
- e) *Regarding the obligations pertaining to national geographical and demographic coverage, the contracts signed as a result of the tender announced in the matter of "Frequency usage rights related to broadband services" and closed successfully in 2014 provide for the demographic and geographical coverage in a ratio of 90 and 99%, respectively. In the process of utilising the 700 MHz frequency band, it is necessary to provide for the coverage of all those additional areas for which priority management is required, including railways and priority road transport routes.*

2. 3400-3800 MHz frequency band

The 3400-3800 MHz frequency band offers a significant opportunity for the installation of high-density and high-speed broadband wireless networks, that can provide innovative electronic communications services to end-users on this network.

Both fixed and mobile systems can be operated in the band.

During the 2016 sale of the 3400-3800 MHz band Vodafone gained a 2 × 30 MHz FDD spectrum in the 3400-3600 MHz band, and DIGI Távközlési és Szolgáltató Kft. acquired a 20 MHz TDD spectrum in the 3600-3800 MHz band.

In the 3400-3600 MHz band we have modified the access mode from FDD to TDD. The related NFFF amendment was announced on 28 July 2017¹⁵.

Due to the transition from FDD to TDD, the authority has allocated the user blocks that have been generated from the basic block acquired during the auction to the lower part of the band. In summary, regarding the full 3400-3800 MHz band, 110+200, i.e. a total of 310 MHz coherent spectrum is still available for the operation of TDD systems, which means that sufficient spectrum can be provided to a large number of broadband MFCN applications.

¹⁵ NMHH Decree 8/2017 (VII.28.) on the amendment of NMHH decrees concerning certain spectrum management issues

This band is currently available for MFCN systems without restrictions on the type of application, the BEM values may, however, be different for 5G systems compared to the currently used systems. The results of the 5G IMT studies are due to arrive by June 2018.

According to Annex 2 of the NFFF, the 3400-3800 MHz frequency band is allocated to fixed, fixed satellite (space-Earth direction) and mobile (except for aeronautical mobile) services on a primary basis. Within these services only civil applications are allowed to operate. In addition to this, the 3400-3410 MHz sub-band has a secondary allocation for the radiolocation service, which allows only non-civil applications.

According to the latest effective NFFF, the entitled operator can use the awarded frequency band to build nationwide networks, and the frequency blocks can be used for providing public electronic communications services. Terminal stations may be either fixed or transportable.

Please explain your opinion regarding the statements below.

- f) *On demand, the NMHH plans to distribute the 310 MHz spectrum for MFCN purposes in FDD access mode in a competitive procedure by the end of December 2019.*
- g) *Under the NFFF, the NMHH only plans to modify the technical conditions related to the introduction of 5G, which will be mandatory, as a result of the harmonisation process.*
- h) *In determining the duration of the frequency usage rights, the NMHH will take into consideration the investment-protection criteria and the provisions of Act CXCVI of 2011 on National Assets, that is, it will make possible the acquisition of rights for not more than 15 years.*

3. 26 GHz frequency band

The 26 GHz (24.5-26.5 GHz) frequency band is currently used to operate fixed point-to-point and point-to-multipoint systems. The licensees obtained their frequency use rights in the course of a competitive procedure conducted in two different periods (in 2008/2009 and 2011/2012), and therefore the dates of expiry of the various frequency usage rights are considerably different, moreover, the expiry dates vary even in the case of individual licensees within the same procedure, the earliest being 15.05.2019, and the latest is 20.04.2027.

Service providers mainly implement backhaul network connections in this frequency band. During previous sales, the 26 GHz proved to be suitable for the purpose of relieving the overcrowded 23 GHz and 38 GHz bands.

The EU's 5G mandate specified the 24.25-27.5 GHz frequency band as one of the bands identified for the early introduction of 5G. Several countries have reported that there is a significant fixed use in this band, in spite of which studies have already begun at CEPT level, examining the issues of compatibility with fixed systems. Among the frequency bands above 24 GHz, the larger countries within the ITU 2 and 3 Regions (e.g. South Korea, Japan, USA) consider the 28 GHz band as one of the most suitable, although the EU does not support the use of this band by 5G systems considering the protection of the satellite systems.

The EU's 5G mandate identifies the 32 GHz and 42 GHz bands, of all the bands above 6 GHz, as likely to be suitable for 5G purposes, which needs to be investigated, although these are not pioneer bands, that is, their utilisation depends on a WRC-19 decision.

Based on the EU Commission's decision, the CEPT must also specify a new channel arrangement and new conditions for the use of the band (e.g. BEM) in the 26 GHz band, which are expected to be applied in Hungary as well, after a transitional period, following a band conversion. Additionally, a new international frequency co-ordination recommendation will be required and, on this basis, new frequency coordination agreements will need to be concluded with neighboring countries.

According to the investigations currently conducted under EU's 5G mandate it is now possible to conclude, that the 26 GHz frequency band will serve the implementation of the next generation (5G) mobile networks; however, as to the detailed harmonised technical future of this band (channel allocation, BEM definition) no such additional detail is available that could be reflected in the national legislation. Only after the completion of the ongoing international (ITU and CEPT) investigations, as soon as the results and the WRC-19 decisions are known, will it be possible to develop a concrete set of rules at national level, which, however – according to the current plans – will be preceded by an EU decision. It can be stated, however, that the process of harmonisation has begun and regulatory changes are foreseeable based on the EU's 5G mandate and the published CEPT 5G task schedule.

Regarding the main applications, civilian fixed applications are dominant in the 24.25-26.5 GHz band, and non-civilian mobile and fixed applications are dominant in the 26.5-27.5 GHz band. According to the public NJFA¹⁶ (2014) the 25.25-27.5 GHz range is available for aerial, terrestrial and maritime systems, while the 26.5-27.5 GHz range is available for land-based military systems. In addition to this, the 26.5 to 27.5 GHz range is also available for the operation of non-civilian (but non-military) single and dual frequency mobile and digital point-to-point systems. Currently there is no valid radio license within the 26.5-27.5 GHz band.

There have been two sales procedures that offered a possibility to obtain frequency usage rights in the 26 GHz frequency band. A frequency usage right in the 26 GHz frequency band was granted to Magyar Telekom on 15 May 2009 and one to Antenna Hungária on 15 June 2009.

In the case of blocks within the 26 GHz frequency band, the frequency usage rights may be extended without a competitive procedure on one occasion, subject to specific conditions, for a period of 5 years. Accordingly, both Antenna Hungária and Magyar Telekom may request an extension of their usage rights, taking into account the specified deadline (Magyar Telekom until 15 November 2017 and Antenna Hungária until 15 December 2017), and the Authority is obliged to make a decision on the extension by not later than 15 September 2018.

Both sales documentation packages as well as the decisions based on them contain rules pursuant to which the NMHH is entitled to amend the resolution regarding the frequency usage right. Such amendment may affect the band limits of the frequency bands constituting the object of the frequency usage right as well as the size and arrangement of the blocks in the frequency bands. The NMHH has the right to review the terms of the band use and to partially revoke or amend the frequency usage right. In case of amendment, NMHH must take into consideration a number of regulations, including Article 84 (8) of Act C of 2003 on Electronic Communications (hereinafter: Electronic Communications Act), according to which, if a frequency usage right is revoked due to an amendment of a statutory regulation, particularly an international commitment promulgated by law, then the licensee is entitled to compensation. The NMHH is, of course, obliged to inform the parties concerned in due time, in

¹⁶ NATO Joint Civil/Military Frequency Agreement

advance. Such an amendment may not seriously prejudice the licensees' interests, and is only possible in particularly justified cases, in order to ensure efficient use of the band, based on the following reasons:

1. a situation has emerged on the Hungarian electronic telecommunications market that impedes broader access affecting a large consumer segment and fostering the development of information society, the appearance and development of technologies or services allowing greater choice and/or more accessible and higher standard opportunities at a competitive price, that cannot be resolved among rational conditions without applying the above measures;
2. with regard to provisions related to spectrum regulation stemming from international obligations applicable pursuant to Hungarian law; or
3. with regard to primary or secondary sources of European Union law governing the implemented spectrum regulation.

Although, at the time of renewal, the specific content of the new EU obligation will not yet be known, the ongoing harmonisation process must certainly be brought to the attention of the parties concerned.

With regard to the compatibility of future and present usage, it is important to emphasise that, although the 24.5-26.5 GHz band is currently used to operate fixed point-to-point and point-to-multipoint systems (the user blocks have been acquired by the service providers through a sales process) and frequency usage rights are granted until the expiry date, it is still possible that, due to the EU obligation required by the amended rules, the usage rights will need to be changed considerably.

No decision has yet been made on how and when the 5G systems will be possible to be introduced in the band; it is, however, foreseeable that the introduction of the 5G system will not be easy under the current intensive use, so it is likely that a refarming will be required as soon as it is decided that the 26 GHz band must be made available for terrestrial wireless 5G systems. Such a decision will also need to contain provisions on the transition period, the transitional conditions and the rules of appropriate timing. We believe it probable that, prior to decision-making, alternatives need to be developed and, during the negotiations, we must also formulate proposals regarding the protection of the current use, all in a way that is in keeping with the interests related to the introduction of 5G. In view of the Member States' different usage practices, it can also be expected that a transitional period will be required, the duration of which can only be assessed after the channel arrangement and guard band generation rules for the future use of 26 GHz, as well as the method of access have been determined at international level.

In defining the technical rules for the use of the band, demands for wide channels may arise in the case of 5G, which was not a key issue when the existing 28 MHz channel allocation was determined. During the international negotiations, the Hungarian position should be formulated so as to minimise the need for transformation and to ensure that the band is mathematically reorganised, by including any unused sub-bands and guard bands, causing the least possible harm to the interests of the current licensees.

Please explain your opinion regarding the statements below.

- i) *Until the end of December 2019 NMHH does not plan to distribute, in a competitive procedure, any basic blocks that are still available for allocation in the 26 GHz frequency.*
- j) *An important factor during the extension procedures will be the expected change in the technical regulation system.*
- k) *In order to facilitate the earliest possible 5G introduction, the transformation of the current frequency usage rights may be expected, based on the EU harmonisation obligation.*

B. Not-yet-sold bands affected by the harmonisation

4. Utilisation of the 1500 MHz frequency band

The Commission Implementing Decision, adopted in respect of the 1452-1492 MHz band, harmonised the band, taking into account the principle of technology neutrality, for the purpose of serving mobile and fixed communications networks (hereinafter: MFCN) suitable for the provision of wireless broadband services, exclusively for providing supplemental downlink (hereinafter: SDL) connections required due to the increased traffic. SDL exclusively provides downlink use where the spectrum is used only for one-way communication from the base station when providing electronic communications services, by linking it to joint use with a (basic) spectrum available in another frequency band.

Hungary has implemented the EU regulation on the use of the 1452-1492 MHz band for MFCN purposes in the NFFF. The NFFF sets out the technical and band usage requirements necessary for the sale of the band. Coordination arrangements for the use of radio frequencies in national border zones are currently being negotiated. Since one of our neighbouring countries, Ukraine, operates aeronautical telemetry systems as well, negotiations have begun with Ukraine to conclude a co-ordination agreement that also provides for the undisturbed use of MFCN and aeronautical telemetry systems.

At European level, the elaboration of harmonised technical conditions for the use of the 1427-1452 MHz and 1492-1518 MHz bands adjacent to the 1452-1492 MHz band has also begun. The EU harmonisation process has also commenced, and the CEPT must prepare for the Commission a report to be used as the basis for decision-making, by November 2017. The relevant implementing decision is due in the first trimester of 2018. The 1500 MHz frequency band (i.e. the 1427-1518 MHz frequency band) will be sold depending on market demands, after the publication of the EU regulation. The expected EU regulation might provide an option for the simultaneous sale of the full 1500 MHz band.

Please explain your opinion regarding the statements below.

- l) On demand, the NMHH plans to distribute, in a competitive procedure, not more than 16 5-MHz SDL basic blocks within the 1427-1518 MHz band until the end of December 2019.*

5. 2300-2400 MHz frequency band

In Hungary, the 2300-2400 MHz band is allocated to civilian use below 2370 MHz and to non-civilian use above that level. The 70 MHz sub-band available for civilian purposes has a status designed for (fixed and mobile-service) terrestrial electronic communications networks. In this sub-band, the technical parameters of the band use were elaborated for TDD-based¹⁷ usage for MFCN¹⁸ purposes.

The civilian part of the band is designated for radio amateur and short-range radio-determination applications and sometimes used for video-PMSE¹⁹ purposes, as well. Besides the radio amateur usage, both the civilian and non-civilian sub-bands are characterised by occasional use.

In the case of demands for MFCN-purpose use, there are two approaches to the preparatory introduction of the MFCN in the 2300-2400 MHz band:

- establishing the exclusivity of the MFCN (the band may need to be cleared);
- possibility for shared use with other applications in the same band.

Owing to the significant differences in the EU²⁰ Member States' band use practices, the EU-wide harmonisation process has come to a halt. Among the existing applications, the EU prioritises the importance the PMSE application, and defines it as a general goal that the necessary frequencies must be reserved for PMSE. In the case of a determinant ratio of user demand for PMSE in the 2300-2400 MHz band, the use of this bandwidth may need to be shared.

A shared use of the band can be implemented in several ways. The current CEPT²¹ regulation and the relevant ETSI²² standards theoretically provide a possibility for shared use by MFCN and PMSE, and the test results for various pilot projects are already available as well, which equally promise good results and easy introduction.

¹⁷ Time division duplex, a method that implements two-way communication based on the time division principle

¹⁸ Mobile/Fixed Communications Networks (With regards to the convergence of the fixed and mobile wireless communication services, the CEPT regulation introduced the umbrella term 'MFCN' (Mobile/Fixed Communication Networks). This also includes the IMT (International Mobile Telecommunication) systems used in ITU terminology.)

¹⁹ Programme Making and Special Events

²⁰ European Union

²¹ European Conference of Postal and Telecommunications Administrations

²² European Telecommunications Standards Institute

Please explain your opinion regarding the statements below.

- m) On demand, the NMHH will provide a possibility for the introduction of MFCN and PMSE in the 2300-2400 MHz band, by separating the frequency band and designating the sub-bands for different applications, by not later than 2019.*
- n) On demand, the NMHH plans to distribute, in a competitive procedure, not more than 8 5-MHz MFCN TDD basic blocks within the 2300-2400 MHz band until the end of December 2019.*
- o) On demand, the NMHH will make available a sub-band – on a secondary basis – for PMSE purposes, by amending the NFFF.*

C. Already-sold bands affected by the harmonisation

6. 2100 MHz frequency band

Pursuant to the International Radio Regulations, the 1920-1980 MHz and 2110-2170 MHz paired frequency bands (hereinafter: 2100 MHz band) can be used world-wide for the implementation of international mobile telecommunications (IMT).

In the EU countries, this band was harmonised firstly for universal mobile telecommunications systems (UMTS), then, keeping in mind the strategic challenges arising from the increasing spectrum requirements of wireless communications as well as the principle of technological neutrality, for the provision of wireless broadband electronic communications services that can be implemented with mobile and fixed communications networks (MFCNs). Pursuant to Commission Implementing Decision 2012/688/EU, which sets out the rules of harmonised use, only Frequency Division Duplex (FDD) wireless terrestrial communications networks may be installed in this band.

In accordance with the Commission Implementing Decision, Hungary has implemented the EU regulation on the use of the 1920-1980/2110-2170 MHz band for MFCN purposes. The NFFF sets out the technical and band usage requirements that make possible the technology-neutral use of the band in compliance with EU regulations. With respect to UMTS/IMT-2000 systems we currently have coordination agreements regulating the use of frequencies in national border zones, and international coordination agreements are being negotiated regarding technology-neutral use, in compliance with the new regulations.

The so-called "UMTS band" was sold and used for UMTS/IMT-2000 purposes in most European countries in the early 2000s. In Hungary, this band was sold in 2004, and from the available 2x60 MHz spectrum 3 service providers obtained a 2x15 MHz spectrum each, while 2x15 MHz is still unused ("distributable" sub-band).

The sale of the 2100 MHz band, along with other potential bands available for sale, is expected to take place in 2019, although a precondition for this sale is a decision regarding the extension of the existing licenses. In the 2100 MHz frequency band, the acquired frequency usage rights are valid until the end of 2019 and may be extended, on one occasion, by 7.5 years at the request of the licensees. Service

providers must contact the Authority 18 months before expiry of their license to request an extension, and the Authority is obliged take the decision regarding the extension of the license by not later than 9 months prior to the date of expiry of the license period. Consequently, the frequency volume to be sold depends on the outcome of the extension process.

The extension of the band use for another 7 and a half years is, however, only a short-term solution in frequency use. In order to ensure long-term band usage under fluctuating conditions, there is a new type of solution for frequency sale. This new method is called "incentive auction". Such a procedure may take place when the user of the band designated for sale stops using the band for the remaining part of the license period, that is, they return their previously obtained frequency the license of which has not yet expired, making it available for sale, and the authority resells this "returned" sub-band under new conditions and with a new license period. Settlement takes place at market prices. The basis for planning incentive auctions is long-term efficiency, and its basic principle is volunteering. In the United States, this new method has been invented to change the bandwidth usage mode.

Please explain your opinion regarding the statements below.

- p) The NMHH is investigating the applicability of the incentive sales process in order to provide for the sale of as many frequency volumes as possible in the 2100 MHz band by the end of December 2019.*

7. 2600 MHz frequency band

This band is suitable for rolling out broadband access networks in high-density built-in areas, so, in terms of service provision, it can be a complementary band for the 700 and 800 MHz band in which broadband access systems are operated covering large areas. The sale process that also included this band had been closed by NMHH in 2014. During the tender procedure announced on 22 May 2014 in the matter of frequency usage rights related to broadband services, the user block consisting of the 2575-2600 MHz (5x5 MHz, 25 MHz, unpaired) frequency ranges was awarded from the TDD sub-band. Currently, the 2600-2615 MHz (3x5 MHz, ie 15 MHz, unpaired) band is available for sale.

Please explain your opinion regarding the statements below.

- q) Subject to demand, the NMHH plans to sell the remaining block that can still be distributed within the unpaired sub-band of 2600 MHz, by the end of December 2019.*

III. MFCN-related general regulatory solutions affecting multiple bands

A. Regulation of the spectrum maximum

Pursuant to Article 55 (2a) of Act C of 2003 on Electronic Communications (hereinafter: Electronic Communications Act), in view of promoting effective competition and avoiding distortions of the competition, in order to obtain frequency usage rights in a tendering procedure, the tender documentation, as well as the measures that may be implemented during the term of the frequency usage right, may provide for the possibility of imposing quantitative limitations on the radio spectrum (e.g. frequency band, frequency block or frequency blocks) for which a company may acquire rights of use. As technology develops, mobile services are no longer linked to a certain frequency, but rather to the network of a specific service provider that may use even multiple frequencies or frequency bands – depending on the network design strategy of the service provider or the operator – in providing the given service. The applied technology may also determine the band to be used. Furthermore, it may also happen that not all of the frequency usage rights within a band can be obtained in a single procedure, not to mention the secondary trade in frequencies or the legal succession.

Based on the above arguments, the mere fact of a quantitative limitation of a spectrum obtainable through a tendering procedure, considering the total frequency bands available for mobile radiotelephony services, can not, in the long run, achieve the original regulatory objective, which is to promote effective competition and avoid distortions of competition. Besides the quantitative limitations applied in various tender procedures, another solution may be the general (statutory) limitation of spectrum maximums to multiple bands and multiple sales processes, which, however, should be sufficiently flexible taking into account any possible future sales, and may not result in the loss of existing usage rights.

From the aspect of technical usability, we continue to distinguish between the frequency bands below and above 1 GHz, of which the frequency bands below 1 GHz (the availability of which is even more limited) are still primarily used for area coverage, while the bands above 1 GHz are used for network capacity expansion, especially in the case of in respect to the MFCN. In view of this, it would be reasonable to introduce different quantitative limits for the frequency bands below and above 1 GHz.

Even in the case of a spectrum-maximum regulation, the primary aim is to increase spectrum efficiency. Secondary trading also provides an opportunity for this. Under secondary trade agreements, based on a reciprocal lease, where one of the contracting parties allows the other party to collect the yields from a specific volume of the frequency licensed by it, this will cause an increase in the volume of the frequency with respect to which the service provider would be able to collect yields under a frequency usage right acquired through a tender procedure. Applying a technical solution and sharing the active network elements (e.g. by MOCN²³ network sharing) can result in shared frequency use. In this case, there is no change in the person of the licensee, the extent of the license or the payable frequency, however, the right to collect yields can be acquired not only through the use of the frequency volume licensed by the licensee by primary trading, but additional opportunities will be available for the collection of yields through the use of new frequency volumes based on licenses obtained under secondary trading contracts. This legal and technical solution will increase the ratio of the spectrum volume used by one single service provider, whereas the total

²³ Multi Operator Core Network

volume of the spectrum remains unchanged. A major professional challenge is the assessment of the shared spectrum, from the aspect of the regulation of the spectrum maximum. In the case of shared use, each party entitled to shared use will enjoy wider opportunities due to the shared use of the same spectrum. All this may have an impact even on market competition, assuming that the solution does not affect all market players.

Please explain your opinion regarding the statements below.

- r) *NMHH plans to modify the NFFF, by 2018, in order to introduce a general rule for limiting the amount of the frequency that can be acquired in competitive procedures for the acquisition of frequency bands below and above 1 GHz available for MFCN purposes.*

s) *In the case of shared use, the NMHH determines the spectrum maximum taking into account, for each party concerned, the frequency volumes acquired through primary trade as well as those acquired through secondary trade.*

B. LSA concept

Wireless broadband systems (assuming typical parameters such as national coverage, expected interference protection or exclusive channel usage) may interfere with other applications within the same band. Additional technical solutions and regulatory measures are, therefore, required to achieve compatibility. Fortunately, a solution designed specifically for this purpose is already in place.

The LSA (Licensed Shared Access) concept has been developed for the very purpose of creating compatibility between existing and new radio systems, although compatibility studies will still be required in specific cases (frequency band, existing and new applications), subject to user demands. The solutions applicable under the current circumstances in order to increase frequency band utilisation (particularly if the MFCN is introduced), are primarily those that impose only partial – and by no means total – limitations on the existing usage.

Since the 2300-2400 MHz frequency band was identified for a possible LSA introduction (for pilot testing), the EU commissioned CEPT to develop the necessary parameters. According to the completed documents, the shared use of this band by radio service providers is feasible, owing to certain difficulties, however, the EU commitment on an LSA-based introduction of the MFCN has eventually failed. Irrespective of this, the CEPT documents, the relevant ETSI standards, as well as the results of various pilot projects are now also available, all of which encourage us to conclude that wireless broadband systems can be introduced in certain bands without limiting or making impossible the existing use.

According to the results of the Finnish, French and Italian tests, the LSA concept-based system is technologically operational and has fulfilled the expectations. Highlighting the conclusions of the French test:

- The LSA system was operational and compatible with the currently marketed LTE devices.
- Mobile operators have gained insight into the operation of LSA;

- It has proved one of the basic elements of the LSA concept, namely, that the dynamic clearance of one or more frequency bands within a given area at a given time for the purpose ensuring frequency use by the incumbent parties is actually feasible.
- It has proven the beneficial effects of using the LTE carrier aggregation in conjunction with the LSA concept to maintain mobile service continuity.

Please explain your opinion regarding the statements below.

- | |
|--|
| <p>t) <i>The NMHH does not believe that the creation of a general rule for LSA introduction is necessary at this time.</i></p> <p>u) <i>The NMHH has not identified any frequency bands that should be made suitable for an LSA-based MFCN introduction.</i></p> |
|--|

IV. Issues concerning the future use of the VHF III band

The GE06 Agreement and Plan adopted at the Regional Radiocommunication Conference 2006 in Geneva provides a possibility for establishing T-DAB and DVB-T networks in the VHF III band (174-230 MHz). The GE06 Plan provides to Hungary, similarly to the neighbouring countries, frequencies sufficient for a national terrestrial digital television network using TV channels from 5 to 9 and for three additional national T-DAB networks using TV channels from 10 to 12. The frequency set sufficient for the implementation of two national networks designated for T-DAB purposes in the L-band (1452-1492 MHz) is no longer available for the platform, since the allocation of the L-band has in the meantime been changed for another purpose.

Consequently, in addition to the digital television networks in the UHF band, in terms of frequency management, there is also a possibility for the implementation of an additional TV network in the VHF III band. Unlike the SFN areas within the UHF band, the large SFN areas in the VHF band are not ideal for a DVB-T technology-based implementation. A network of better quality could be built up and better coverage could be provided applying DVB-T2.

The introduction of DVB-T in the VHF band requires an additional antenna system/antenna on both transmitter and receiver side, given that the transmitter and receiver antennas designed for the UHF band cannot be used for television purposes in the VHF band. Considering that during the analogue-to-digital transition all the VHF antennas had been removed almost everywhere from roofs and telecommunication towers, the need for additional antennas must also be taken into account if television broadcasting is introduced in the VHF band.

In Hungary, 8 radio programs are currently available, as part of experimental DAB+ multiplex radio broadcasting in the VHF III band, in and around Budapest. The demographic coverage of the DAB+ digital radio service, with three Budapest sites, since December 2008, has been nearly 30 percent.

An important precondition for the successful introduction and spread of terrestrial digital radio broadcasting is that substantially more programs must be available in a larger area and in better quality compared to analogue radio broadcasting. Based on our investigations and on foreign

examples it can be concluded that the currently available frequency set to T-DAB is insufficient for the development of a sufficient quality and quantity of networks.

Considering all these difficulties and criteria, except for two countries – Poland and Finland – the VHF III band is currently not being used for digital television purposes anywhere in Europe and there are no plans to launch television broadcasting in the VHF band in the future either. Several countries have, however, opted for the use of DVB-T frequencies for T-DAB purposes to provide more and better quality networks. As an example, in Austria – among the countries bordering Hungary – as well as in Germany, Switzerland, the Netherlands and the UK the television frequencies in the VHF band will be used for digital radio broadcasting in the future. The related frequency coordination process has already begun. In other countries, this issue is also on the agenda at expert or decision-making level.

Given that the two possible solutions, i.e. the DVB-T or T-DAB use, require different frequency coordination strategies, and will result in the frequency coordination of radio stations with different technical parameters, the decision in this matter can not be postponed from a spectrum management perspective. As long as there is no decision on the purpose of use of the DVB-T frequencies in the VHFband in Hungary, it is impossible to follow a goal-oriented strategy, which may result in adverse consequences as well. The NMHH therefore considers it important that timely decisions be made in this matter.

Please explain your opinion regarding the statement below.

- v) *In Hungary, as well as in other European countries, there is no interest in the frequency set available in the VHF III band for digital television broadcasting, and no changes are expected in this respect in the future either, considering the technological and antenna-related issues. The National Media and Infocommunications Authority plans to designate TV channels from 5 to 9 for T-DAB purposes, which will provide opportunities for the implementation of T-DAB networks in larger numbers, in better quality and with higher coverage areas.*