

**Strategic Aspects
of the Availability of Spectrum for
Broadband Rollout in Germany**

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1 Introduction

The purpose of this paper, "Strategic Aspects of the Availability of Spectrum for Broadband Rollout in Germany", is to set out important key issues related to frequency regulation in the years to come for the public with a professional interest in the subject.

The Bundesnetzagentur describes the various strategic aspects with a view to supporting the German federal government's broadband strategy¹. It seeks to demonstrate, in clear and logical form, the complexity involved, at the planning level, in providing sufficient resources for the provision of mobile broadband services, and also to deal with specific aspects germane to certain frequency bands. The intention is, on the one hand, to provide transparency on the future regulation of spectrum by the Bundesnetzagentur and, on the other, to provide the market with an orientation basis for taking decisions on investment, innovations and the development and further development of business models.

Following the German federal government's primary objectives the Federal Ministry of Economics and Technology (BMWi) prepared the discussion paper entitled "Mobile Media 2020" and launched a national debate on the major issues of mobile broadband with it. On this subject the paper says:

"In order to keep the scarce resources of spectrum available, in an efficient and timely manner and also tailored to suit the market, in line with changed requirements, the BMWi has set a process of debate in motion. The aim is to develop, on a broad basis involving all parties concerned, basic concepts and perspectives both for the keystones of German frequency policy at the WRC-15 - and their subsequent implementation in Germany - and also for the frequency policy measures required by comprehensive strategic considerations such as the broadband strategy and the federal government's information and communications technology (ICT) strategy...."

Consistent with the federal government's broadband strategy and the "Mobile Media 2020" discussion paper, the Bundesnetzagentur's paramount objective is to provide a basis for planning and investment certainty for the future provision of appropriate spectrum resources for broadband rollout in Germany, but also for the user groups affected (including broadcasting, wireless microphones, authorities and organisations concerned with public safety (BOS), and the German Armed Forces (Bundeswehr)) and their spectrum requirements. On this subject "Mobile Media 2020" says:

"The discussion paper is intended to help bring about a fair and reasonable balance of the legitimate interests of all current and potential spectrum users in the frequency bands in very heavy demand, so as to guarantee the best possible use of resources. The guiding principle is to ensure the efficient and interference-free use of the public resource - radio frequencies - which demand has rendered scarce, in order to guarantee adequate and appropriate services nationwide.

An open debate and a transparent process are necessary. The discussion paper from the Ministry of Economics and Technology will set the ball rolling."

The Bundesnetzagentur's "Strategic Aspects" study is aimed at supporting the BMWi's initiative.

The fact that the assignments in the 900 MHz and 1800 MHz bands for public mobile services are due to expire at the end of 2016 triggered off considerations as to how the

1 BMWi's broadband portal (<http://www.zukunft-breitband.de>)

spectrum thus becoming available can best be provided for the broadband rollout in the future. The study is also intended to take account of the comments submitted on the consultations² which have already been conducted on the 900 MHz and 1800 MHz bands. The comments called for and welcomed an all-embracing programme covering the various frequency bands as a means of promoting mobile broadband and other associated demand. Basically the respondents welcomed the blanket approach to the spectrum to be awarded over the next few years for terrestrial systems capable of providing electronic communications services for the provision of telecommunications services, hereafter called Wireless Network Access, and they approved of the Bundesnetzagentur's proposals for a timely, future-orientated frequency award policy and the Bundesnetzagentur's evolved principle of forward-looking frequency regulation which will take future market and technical developments into account. The respondents also thought the discussions on the award of the 900 MHz and 1800 MHz spectrum and the various scenarios proposed in the BMWi's "Mobile Media 2020" paper disclosed the opportunity of a controlled long-term development of frequency use. Several respondents called for the development of general principles for long-term frequency planning which would also take account of current spectrum use in the 700 MHz band. The Bundesnetzagentur had repeatedly, they said, gone for systems based on broad principles in the past, such as the so-called UMTS and GSM systems, which would make regulatory activity predictable for all parties concerned. In this context the growing demand for mobile broadband services meant that the spectrum in the range 450 MHz to 3.800 MHz has extremely strong commercial and social potential.

At the same time the regulatory aim of efficient and interference-free use of frequencies makes it necessary to give due and appropriate weight to the interests of other parties with spectrum needs. This is relevant both to the provision of frequency bands to cover demand submitted for the first time, such as by the Bundeswehr or authorities and organisations concerned with public safety (subsequently refer to as public safety agencies) and to the relocation of incumbent applications currently in operation, removing them from the frequency bands foreseen for Wireless Network AccessBWA.

The Strategic Aspects paper starts with a general explanation and assessment of the importance of frequency regulation for infrastructure, innovation and competition, with the focus on the planning stage. This will help to pinpoint specific aspects of mobile broadband in the overall scheme of frequency regulation and in the related procedures. A survey of this kind was published in the paper "Strategic Aspects of the Spectrum Regulation of the Regulatory Authority for Telecommunications and Post", which appeared in 2004. This survey too served the purpose defined above.

The present paper is not intended as a substitute for the consultations laid down as requisite in the TKG (German Telecommunications Act). The aim is to provide an overview - before any formal consultations take place - in the form of a statement of broad principles. Identified changes will be effected using Frequency Plan amendment procedures which provide for the required non-discriminatory and transparent participation and which the Bundesnetzagentur will initiate in due course for the various frequency bands.

Respondents commenting on the scenarios paper referred also to the need for protecting applications operating in adjacent frequency bands. Such protection is already postulated as a basic regulatory principle based on the regulatory aims defined in the TKG and no further mention is required for specific cases.

Germany, with its broadband strategy, is not the only country whose government has drawn up strategic objectives in this area. In the USA, for example, an additional 600 MHz has been declared necessary for mobile broadband and extensive national investigations have been

2 Consultation on demand identification procedure (analysis paper)
(<http://www.bundesnetzagentur.de/DrahtloserNetzzugang> Project 2016 → Analysis paper)

launched. The EU's first RadioSpectrum Policy Programme³ requires the identification of a total of at least 1.200 MHz for the provision of mobile broadband by 2015, and the ITU's next World Radiocommunication Conference⁴ in the same year will deal in detail with requirements and frequency bands for mobile service.

2 The significance of frequency regulation for infrastructure, innovation and competition

No market in the Federal Republic of Germany has developed as fast as the telecommunications market. One reason is the constantly growing demand by the public at large for mobile telecommunication services. Both growing demand and technological innovations make it essential for frequency spectrum to be made available in sufficient quantity.

The available spectrum, however, is a resource that is limited by the way it is used and by the state of the art technology. The possible use of spectrum can therefore not be left to the free play of market forces. On the contrary, what is needed is a forward-looking, non-discriminatory and proactive regulation of spectrum by the Bundesnetzagentur.

The aim of regulation is the provision of a resource - spectrum - in line with demand and requirements. The focus must be not only on existing uses of spectrum but also on future developments in technology and on the market. This is the only way to ensure that the Bundesnetzagentur will be able to do justice to changes in market demand and other shifts in the operating environment in the shortest possible time. One of the factors to be considered is the interests of users. It is also necessary to facilitate the development of innovative technologies, to guarantee efficient and interference-free use of frequencies and to ensure competition is functional and based on equal opportunities. At the same time any reform must meet the requirements of incumbent radio applications.

A host of different objectives, and they must all be kept in mind both at the planning level and in the context of individual frequency assignments if frequency regulation is to satisfy the largest possible number of interests.

As long ago as May 2010 Germany was the first country in Europe to put the 800 MHz frequencies (also known as digital dividend) up for auction for mobile radio communications. The digital dividend frequencies are the key to the rapid and cost-effective rollout of broadband networks in rural as well as urban regions.

Since the assignment of 800 MHz frequencies in autumn 2010, frequency assignments for the use of base stations for LTE (long term evolution) systems have been granted nationwide for more than 11,000 sites (as of November 2012).

The substantial number of new LTE sites has brought about a significant improvement in the provision of broadband to rural areas in Germany. Areas with insufficient broadband coverage ("white spaces") are distributed evenly across the entire country. Mobile network operators have also succeeded in providing LTE network roll-out at a high pace in the 1.800 MHz frequency bands.

The provision of broadband services to the rural areas continues to be a challenge, regarding both, the geographical coverage and the data rates available. On this the BMWi's "Mobile Media 2020" discussion paper has this to say:

3 (Source: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:081:0007:0017:EN:PDF>)

4 World Radiocommunication Conference 2015
(<http://www.itu.int/en/ITU-R/conferences/wrc/2015/Pages/default.aspx>)

"As required by the updated target for the rollout of high-speed networks, the objective pursued by the German federal government is to make broadband access with transmission rates of at least 50 Mbit/s available to 75 percent of all households by 2014. The goal for 2018 is to make the availability of such bandwidths literally nationwide. There is also demand for broadband access by the Bundeswehr and the public safety agencies.

Another important instrument employed by the federal government for improving, in particular, the mobile use of ICT and ensuring supply to rural communities is the measures of "supportive spectrum policy" which are primarily aimed at expanding the LTE networks and the follow-up technologies."

The coalition's working party under the title "Rural areas, regional diversity" has already considered the question of whether, in the auctioning of Digital Dividend II, the required conditions of coverage should be sharpened so as to give priority to coverage of rural areas, ie so that not just 90% but, as the initial target, 100% of people in the rural areas would have to be covered⁵. In view of the objectives of the broadband strategy, namely fully comprehensive coverage of consumers with high-transmission-rate network access, the provision of extra frequencies below 1 GHz for Wireless Network Access creates a practical possibility for filling the gaps. Demands to this effect were indeed made at the political level in 2012. With a view to creating efficient and long-term secure Internet infrastructures in the country as well as the towns the Bundestag (lower house of the German parliament)⁶ called on the federal government, inter alia,

"[...] to continue the broadband strategy as a basis for high-speed networks and develop it further in accordance with demand and subject to the relevant legal and budgetary limits. In doing so attention should be given to the inadequate coverage which still exists in certain rural areas."

The broadband policy prepared by the SPD's parliamentary party, entitled "Ensuring comprehensive broadband coverage and accelerating dynamic development" and dated 10 September 2012, sets out the following objectives:

"[...] rollout of high-speed networks which allow significantly higher bandwidths of 50 Mbit/s and more and will also meet the demands placed in the future on a modern broadband infrastructure. The great challenge involved in this is to create, or improve, the relevant conditions for the sparsely populated regions, so that they can be linked up with a top-grade broadband infrastructure in spite of the heavy costs involved."

In the Bundestag on 27 November 2012⁷ the coalition's working party, under the title "A future for rural areas - safeguarding and extending regional diversity", motioned for a

1. Modern network of traffic, communications and energy infrastructure

a) Telecommunications

The primary task is to improve the local conditions of the rural areas by ensuring that

5 Ländliche Räume, regionale Vielfalt - wie können wir die Zukunft gestalten? (Rural areas, regional diversity - how can we shape the future?) Berlin, 26 June 2012
http://www.cducsu.de/Titel__koalitionsarbeitsgruppe_laendliche_raeume_regionale_vielfalt/TabID__19/SubTabID__108/AGID__49/arbeitsgruppen.aspx

6 Bundestag Printed Paper 17/9159 of 27 March 2012

7 Bundestag Printed Paper 17/11654 of 27 November 2012, page 2

both urban and rural regions have fully comprehensive access of the same standard to the high-speed Internet, thus preventing a digital divide inside Germany. To achieve the federal government's rollout objectives the focus must be on:

[...]

- the provision of further radio frequencies (eg 700 MHz band) for mobile broadband use [...];"

In its 2011 special report 61⁸ the Monopolies Commission declares itself in favour of a so-called "Digital Dividend II":

"In the long term, what with the expected growth of mobile data transmission volume, it appears to be necessary to provide additional spectrum resources below 1 GHz for mobile communications by 2018/2020 at the latest. The Monopolies Commission is in favour of getting this spectrum from a digital dividend II by making further spectrum below 790 MHz, which has hitherto been assigned to terrestrial broadcasting, available for mobile communications. The Commission is not unaware that currently no adequate prediction can be made on the future demand for spectrum by terrestrial broadcasting. In principle, however, taking into account the growing proportion of broadcasting by satellite, cable and IPTV, the importance of terrestrial broadcasting is likely to be on the wane."

The Bundesrat (German upper house)⁹ referred to this special report in a statement on the divergence of interests:

"The Bundesrat wishes to make it clear that after the digital dividend has been released, the remaining UHF broadcasting spectrum in the 470 MHz to 790 MHz band will continue to be needed for broadcasting. It will also continue to be necessary to fall back on the spectrum in this band for production and outside broadcasting and for events technology - particularly for high-standard microphone equipment in theatres and opera houses - because of the stability required and the low costs."

The provision of spectrum must take account of social and cultural aspects, such as the requirements mentioned by the Bundesrat, first and foremost because of the social importance of broadcasting and Programme Making and Special Events (PMSE) in general. The divergence of interests in relation to the demand for spectrum by broadcasting, mobile communications, wireless microphones and public safety must be brought into balance. In considering how to achieve a consensus of interests the Bundesnetzagentur does not assume a priori that the demand for spectrum is in decline.

The second monitoring report on broadband strategy¹⁰ says on the demand for spectrum for further nationwide broadband rollout:

"The market players are not yet sufficiently aware of the potential for the use of additional frequencies from the digital dividend, as the auction only took place a short time ago and no more than a start has been made on the use of the first frequencies in the digital dividend (790 to 862 MHz). If however the framework is to be established for the provision of additional spectrum from the digital dividend, this aspect must be dealt with in good time, that is, during the next World Radio Conference in 2012, and placed on the agenda for the next conference but one, in 2015."

8 Page 17, section 23

9 Bundesrat Printed Paper 531/12 of 2 November 2012

10 accessible at www.bmwi.de, page 25

2.1 Planning level

At both the national and international level detailed planning is essential to enable the efficient and free of interference use of frequencies in a number of different ways and by various technologies, and also to ensure that competition on the telecommunications markets is in working order and based on equal opportunities. It is furthermore necessary to guarantee that, on the one hand, incumbent users are provided with the required degree of planning and investment certainty and on the other that there is room for new technologies and their applications.

In view of the growing globalisation of the international telecommunications markets, the international harmonisation of spectrum and harmonised frequency use is becoming ever more important. Harmonisation involves not only setting forth radio services as defined by the ITU (International Telecommunication Union) but also laying down highly specific frequency uses together with the pertinent spectrum requirement and provisions regulating the use of spectrum. These international decisions necessarily have a direct effect on national spectrum planning. A case in point: divergences of national planning are not productive in view of the need for industrial economies of scale and of the concomitant restrictions along national borders, nor are they as a rule in the interest of the spectrum users affected. This is particularly true of Germany, with its large number of neighbouring countries. It is however not desirable for international processes to have a negative influence on the development of national markets, which is why international decisions should be limited to setting up the necessary framework. The Bundesnetzagentur therefore, in harness with the federal government, seeks to make an active contribution to the process of international harmonisation. This is the only way to ensure that national policy positions are given the greatest possible consideration within the process of international decision-making.

To secure the necessary transparency, consultations are held in public session on the German positions vis-a-vis international bodies such as the ITU World Radiocommunication Conference (WRC) or the CEPT ECC Working Group Frequency Management (WG FM). The decisions, recommendations and reports of the CEPT ECC also go through the process of a public consultation.

It should be noted that there will always be a time interval between the identification of a frequency resource with the required technical conditions and the actual availability of user devices, as the technical and regulatory parameters first have to be drafted as technical standards and then the corresponding devices need to be developed and manufactured. Hence it is timely decisions on stable framework conditions that are crucial for the expeditious development of the telecommunications markets.

The instruments of national frequency planning are the Frequency Ordinance on the National Table of Allocations (allocation level) and the Frequency Plan (utilisation level), which together form the basis for assignments of frequencies.

The Frequency Ordinance is framed by the Federal Ministry of Economics and Technology and the Frequency Plan by the Bundesnetzagentur. The Ordinance is subject to the consent of the Bundesrat. In cases which affect the interests of public safety and the capacities for broadcasting within the jurisdiction of the federal states, the Bundesnetzagentur has to establish a basis of agreement with the competent state authorities. A public consultation, involving federal and state authorities is an essential part of the procedure governing the preparation of and alterations to the Frequency Plan; the consultation also guarantees the necessary transparency. If the proceedings are to be brisk and unbureaucratic and if innovative services and technologies are to be introduced at the earliest possible date, it will be helpful to conduct procedures in parallel at the allocation and planning levels wherever both levels are affected.

The Bundesnetzagentur draws up the Frequency Plan on the basis of the Frequency Ordinance, giving due weight to the regulatory objectives. In preparing the Plan it must give priority to the interests of users and it must ensure functional competition based on equal opportunities and the efficient and interference-free use of frequencies. Other aspects that must be considered are harmonisation of frequencies at EU-Level, technological developments and the compatibility of the various frequency usages in the transmission media. However, the preparation of Plans must also include the various trends and developments on the market, e.g. the Bundesnetzagentur must take all three major aspects into account: economy, competition, and technical regulations. This applies equally to necessary amendments to a Frequency Plan after it has come into force and to reallocations related to frequency bands that are due to expire or no longer used (refarming). There is no other way to guarantee, for the long term, efficient and interference-free use of frequencies and competition based on equal opportunities for all concerned.

The Frequency Plan's framework conditions are then given specific and more detailed content in the form of the Bundesnetzagentur's internal administrative rules. This guarantees that the Bundesnetzagentur retains the highest possible degree of flexibility and can very rapidly adapt the conditions of frequency use to technological and market trends. All the market players continue nevertheless to enjoy the necessary transparency and planning certainty, since the administrative rules are published by the Bundesnetzagentur and the contents and necessary alterations to them are required to stay within the framework defined by the Frequency Plan.

2.2 Assignment level

According to the Telecommunications Act (TKG) each frequency usage requires prior frequency assignment, unless otherwise provided for by this Act.. Abstract and general planning is converted into specific frequency usage via the process of frequency assignment, the aim being to ensure that frequency usage by all frequency users is efficient, interference-free and non-discriminatory in every specific case. By virtue of the assignment of frequencies the assignee acquires from the Bundesnetzagentur the right to use a particular frequency subject to specified conditions.

As part of the assignment process the Bundesnetzagentur is required to stipulate the framework conditions, defined in abstract and general terms at the planning level, for each individual case. The necessary technical regulations are of great importance in this context as well as competition and economic aspects.

In the case of regional or nationwide assignments which are utilised by a number of base stations, an application must be made, during the process of planning network configurations and rollouts, for the technical location-related parameters to be determined before the individual frequencies may actually be used.

The Bundesnetzagentur can only take the specific local interference situation as between a base station and other radio services into account when the local technical spectrum parameters have been determined for the particular base station. As this interference situation is severely dependent on local or regional conditions, and in some cases on border coordination factors as well, each individual case needs to be examined separately when the location-related parameters are determined.

The TKG lays down that frequencies shall be assigned if they have been identified in the Frequency Plan for the usage intended, if they are available and if they have been established as compatible with other spectrum uses. The Act thus standardises the grounds on which a claim can be made for the assignment of a frequency.

As already mentioned, not enough frequencies are available for every intended usage. In such cases it is incumbent on the Bundesnetzagentur to apply to the individual case the non-discriminatory, objective and transparent procedures provided for in the law for the award of the scarce frequencies, and to develop rules for award procedure.

In order to ensure that scarce spectrum is not taken out of the market for too long a time, the Bundesnetzagentur sets an expiry date for each frequency assignment, the date being determined on the basis of economic, competition and technical regulation factors.

It should be clear from the above that the effect of international and national planning and the procedures used by the Bundesnetzagentur for frequency assignments is to create the conditions under which frequencies can be used by a considerable number of very different users in a non-discriminatory, efficient and interference-free manner.

2.3 Outlook

On all three levels - planning, assignment and monitoring - the Bundesnetzagentur has the same aspects to bear in mind. The aspects of technical regulation have a central role to play, as do the economic and competition factors. All have to be placed in a framework of law and due procedure, with the provisions stipulated in the Frequency Ordinance setting the decisive parameters. This applies both to the preparation of the Frequency Plan and to the level of specific general or individual assignment and to checking and monitoring existing assignments. All this however can only be done inside the limits set by international decisions and agreements (see the diagram below, Figure 1).

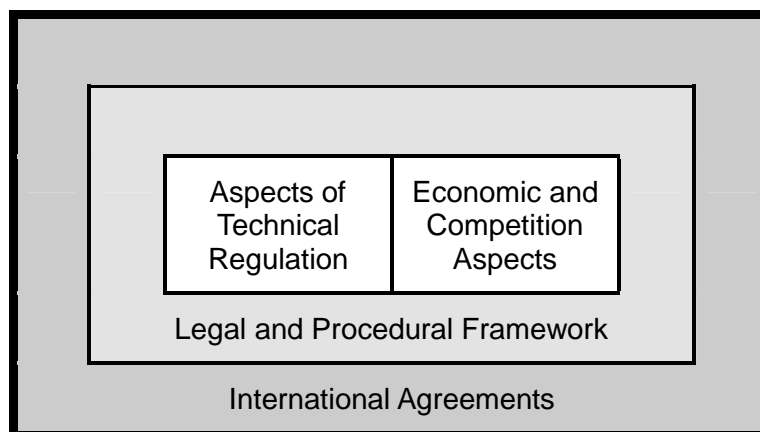


Figure 1: Components of frequency regulation

As a basic principle in taking its decisions the Bundesnetzagentur on the one hand seeks to make its regulatory work technologically neutral in the sense of facilitating new and innovative technologies, but on the other it must, crucially, also take the economic and competition aspects into account. The setting of future framework conditions for uses of spectrum is not a matter purely and simply of the technical and regulatory requirements. For example, the amount of frequencies made available for a specific use decides on the question of spectrum scarcity and thus the type of award procedure selected. The amount of frequencies is also relevant to the costs of acquiring the frequencies. Before new frequency bands can be made available - especially for new usages - the repercussions for other, existing spectrum usages must be carefully analysed and appraised. Frequency regulation therefore acquires considerable strategic significance for the development of the telecommunications markets.

Decisions taken during the planning and assignment phases serve to create stable

framework conditions for the spectrum users and all market players. This is achieved at the level of technical regulation, in particular by laying down specific usage parameters for the efficient and interference-free use of spectrum, and at the economic and competition level by, among other things, providing the necessary planning and investment certainty for market players through determining the designated spectrum or limiting the number of spectrum users in specific areas.

In the future one of the main tasks of the Bundesnetzagentur in connection with frequency regulation will be to continue to provide all market players with stable framework conditions without any impairment of the necessary flexibility regarding the introduction of new technologies and changing market conditions.

The next section will offer an analysis of the already identified and used bands as well as new bands to be provided in the future. Of course, the analysis will take account of the current and future demand of affected users of frequencies. In this context the Bundesnetzagentur will have to find a balance between divergent interests in deciding on the procedures to be used. The question of new frequency bands is also given close attention in the BMWi's "Mobile Media 2020" discussion paper:

"With regard to the future provision of high-performance broadband access, particularly to rural areas, the radio-based technologies which are already available (LTE), using the currently provided spectrum resources, can complement and contribute to the achievement of the federal government's long-term objectives. To achieve these objectives, frequency policy must be directed towards providing additional radio frequencies efficiently and in line with requirements."

3 Available frequency bands for Wireless Network Access

Any sustainable frequency policy must be founded on a status analysis covering all the frequency bands affected. The present strategy paper takes account of current national and international activities related to future frequency usage, including the national status quo for the usage of frequencies in the various frequency bands.

On the basis of national planning and international activities the following details can be given for the frequency bands already identified for Wireless Network Access in the 450 MHz to 3.8 GHz range:

The frequency bands below are currently available for Wireless Network Access:

Frequencies at	Band	Available from:
450 MHz	451.075 – 455.575 MHz / 461.075 – 465.575 MHz	1 Jan 2021
800 MHz	791 – 821 MHz / 832 – 862 MHz	1 Jan 2026
900 MHz	880 – 915 MHz / 925 – 960 MHz	1 Jan 2017
1800 MHz	1710.0 – 1725.0 MHz / 1805.0 – 1820.0 MHz	1 Jan 2026
	1725.0 – 1730.0 MHz / 1820.0 – 1825.0 MHz	1 Jan 2017
	1730.1 – 1735.1 MHz / 1825.1 – 1830.1 MHz	1 Jan 2026
	1735.1 – 1752.5 MHz / 1830.1 – 1847.5 MHz	1 Jan 2017
	1752.7 - 1758.1 MHz / 1847.7 – 1853.1 MHz	1 Jan 2017
	1758.1 – 1763.1 MHz / 1853.1 – 1858.1 MHz	1 Jan 2026

	1763.1 – 1780.5 MHz / 1858.1 – 1875.5 MHz	1 Jan 2017
2 GHz	1900.1 – 1905.1 MHz	1 Jan 2026
	1905.1 – 1920.1 MHz	1 Jan 2021
	2010.5 – 2024.7 MHz	1 Jan 2026
	1920.3 – 1930.2 MHz / 2110.3 – 2120.2 MHz	1 Jan 2021
	1930.2 – 1940.1 MHz / 2120.2 – 2130.1 MHz	1 Jan 2026
	1940.1 – 1950.0 MHz / 2130.1 – 2140.0 MHz	1 Jan 2021
	1950.0 – 1959.9 MHz / 2140.0 – 2149.9 MHz	1 Jan 2026
	1959.9 – 1979.7 MHz / 2149.9 – 2169.7 MHz	1 Jan 2021
2.6 GHz	2500 – 2690 MHz	1 Jan 2026
3.5 GHz	3410 – 3473 MHz and 3510 – 3573 MHz	1 Jan 2022
	3473 – 3494 MHz and 3573 – 3594 MHz, smaller frequency blocks assigned locally or regionally	1 Jan 2023
3.7 GHz	3600 – 3800 MHz; smaller frequency blocks assigned locally or regionally	1 Jan 2023

Table 3.1: Available and assigned frequencies for Wireless Network Access with fixed expiry date

3.1 450 MHz

At both the international and national levels the band 440 – 470 MHz has been allocated to mobile services on a primary basis, and the sub-bands 450 - 455.74 MHz / 460 - 465.74 MHz have been designated for Wireless Network Access for the provision of telecommunications services. Three paired frequencies are available, each with a 2 x 1.5 MHz channel bandwidth. The assignments are due to expire on 31 December 2020.

Consideration is at present being given to the possibility of making these frequencies available for other applications in the medium term, if such a demand will be indicated. For details see chapter 4.1.2.

3.2 800 MHz

At both the international and national levels the band 790 – 862 MHz has been allocated to mobile service (excluding the aeronautical mobile service) on a primary basis, and the sub-bands 791 - 821 MHz and 832 - 862 MHz have been designated for Wireless Network Access for the provision of telecommunications services¹¹. There are 2 x 30 MHz of paired spectrum available. These frequencies were assigned for the first time in 2010 for Wireless Network Access for the provision of telecommunications services and have an expiry date of 31 December 2025.

The centre gap in the band 823 – 832 MHz is used by wireless microphones on the basis of a general assignment¹². At CEPT level the band was identified by the ERC Recommendation

11 ECC/DEC/(09)03 "Harmonised conditions for MFCN in the band 790-862 MHz"

(<http://www.ero-docdb.dk/doks/doccategoryECC.aspx?doccatid=1&alldata=1#2324>)

EC Decision 2010/267/EU

(<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:117:0095:0101:EN:PDF>)

12 General assignment (Order 9/2011, amended by Order 23/2011)

(<http://www.bundesnetzagentur.de/allgemeinzuteilungen> → Microphones → 823 - 832 MHz)

70-03 for PMSE (Programme Making and Special Events)¹³. In addition the European Commission, on the basis of a mandate to CEPT/ECC, is considering a Commission Decision for this band, subjecting this band to a binding harmonisation.

The paired bands at 791 - 821 MHz / 832- 862 MHz are intended to remain available for BWA in the long term. There are no national or international plans to reallocate them.

3.3 900 MHz and 1800 MHz

The frequency bands 880 - 915 MHz, 925 - 960 MHz, 1710 - 1785 MHz and 1805 - 1880 MHz have, according to the national Frequency Plan, been designated for Wireless Network Access for the provision of telecommunications services. Relevant at the international level are the ECC Decision (06)13¹⁴ and the Commission Implementing Decision (2011/251/EU)¹⁵ of the European Commission.

The frequencies are currently assigned to the network operators in spectrum blocks of various sizes. In particular in the 900 MHz band the block sizes are 0.6 MHz to 7.4 MHz. It is planned to adjust the channel arrangement prior to any new provision of spectrum so as to ensure the spectrum can be made available in blocks of 5 MHz whatever technology is employed. This would involve, in consultation with the assignees, putting an end to the 100 kHz shift in the bands 1730 - 1730.1 MHz and 1825 - 1825.1 MHz. Respondents commenting on the scenarios paper also believe that in future 5 MHz blocks will be necessary for the introduction of new technologies (including the defragmentation of the 900 and 1800 MHz bands). However, one of the respondents took the view that defragmentation would always result in a quality problem. It was also argued that the provision of spectrum in 5 MHz blocks was a prerequisite for the flexible and efficient deployment of all available technologies, such as UMTS, LTE and LTE-Advanced. Another respondent felt that the defragmentation of the 900 MHz and the 1800 MHz bands was essential in order to facilitate the introduction of new technologies if GSM networks are to be migrated to more spectrum-efficient technologies.

The rights of frequency usage assigned in the 900/1800 MHz bands which were previously designated for GSM are due to expire on 31 December 2016. The 2010 auction made further spectrum available for Wireless Network Access in the 1800 MHz band to a volume of 2 x 25 MHz of paired spectrum. The expiry date of these assignments is 31 December 2025.

The centre gap at 1800 MHz in the band 1785 - 1805 MHz is used by wireless microphones on the basis of a general assignment with the expiry date 31 December 2021¹⁶. Within CEPT the ERC Recommendation 70-03¹⁷ recommends the band 1785 - 1800 MHz for the same purpose. CEPT currently considers the possibility of extending the frequency band up to 1805 MHz for PMSE, while the band is already available for this purpose in Germany. Furthermore the European Commission, on the basis of a mandate to CEPT/ECC, is contemplating the binding harmonisation of this band by way of a Commission Implementing Decision.

13 ERC/REC 70-03 Short Range Devices (SRD)

(<http://www.erodocdb.dk/doks/doccategoryECC.aspx?doccatid=2&alldata=1#1622>)

14 ECC/DEC/(06)13 "Designation of GSM-900/1800 bands for terrestrial IMT-2000/UMTS"

(<http://www.erodocdb.dk/doks/doccategoryECC.aspx?doccatid=1&alldata=1#2189>)

15 EC Decision 2011/251/EU

(<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:106:0009:0010:EN:PDF>)

16 General assignment (Order 9/2011, amended by Order 23/2011)

(<http://www.bundesnetzagentur.de/allgemeinzuteilungen>) → Mikrofone → 823 - 832 MHz)

17 ERC/REC 70-03 Short Range Devices (SRD)

(<http://www.erodocdb.dk/doks/doccategoryECC.aspx?doccatid=2&alldata=1#1622>)

The bands 880 - 915 MHz / 925 – 960 MHz and the bands 1710 – 1785 MHz / 1805 – 1880 MHz shall remain available for Wireless Network Access in the long term. There are no national or international plans to reallocate them (see the consultation draft in the same Official Gazette for the usage rights due to expire on 31 December 2016).

3.4 2 GHz

According to the national Frequency Plan the bands 1900 – 1980 MHz, 2010 – 2025 MHz and 2110 – 2170 MHz have been designated for Wireless Network Access for the provision of telecommunications services, with the 1900 – 1920 MHz and 2010 – 2025 MHz frequencies identified for TDD applications and the other frequencies for FDD applications. The relevant international legal framework is provided by ECC Decision (06)01¹⁸ and Commission Implementing Decision 2012/688/EU¹⁹ of the European Commission.

Rights for the usage of the paired 2 GHz frequencies, which are due to expire in 2020, will be submitted to assignment proceedings in due course. The 2 GHz frequencies for Wireless Network Access awarded at the 2010 auction at a volume of 2 x 20 MHz have an expiry date of 31 December 2025 (on this see Table 3.1).

Any future designation of the unpaired 2 GHz frequencies for other applications is currently under consideration at national and international level. The CEPT is already investigating the use of these frequencies for new applications, supported by a mandate received from the European Commission. A final report must be submitted by November 2014. Comments on the scenarios paper also referred to the study currently being conducted at European level (CEPT/ECC/FM51) on the possible future use of the TDD frequency bands 1900 - 1920 MHz and 2010 - 2025 MHz. CEPT has placed the focus on BDA2GC (Broadband Direct Air to Ground Communications) and PMSE on the basis of shared use. It must be assumed that the unpaired 2 GHz bands (1900 - 1920 MHz, 2010 – 2025 MHz) will thus no longer be available for Wireless Network Access in the medium to long term.

The paired 2 GHz bands (1920 - 1980 MHz / 2110 -2170 MHz) are to remain available for Wireless Network Access in the long term. There are no national or international plans to reallocate them.

3.5 2.6 GHz

According to the national Frequency Plan the band 2500 - 2690 MHz has been designated for Wireless Network Access for the provision of telecommunications services. There is 2 x 70 MHz of paired spectrum available as well as and 50 MHz of unpaired spectrum in the centre gap. Of international relevance here are ECC Decision (05)50²⁰ and the Commission Decision 2008/477/EC²¹ of the European Commission.

The frequencies were awarded during the 2010 proceedings, and the rights of usage are due to expire on 31 December 2025.

18 ECC/DEC/(06)01 "Harmonised utilisation of 1920-1980 and 2110-2170 MHz for MFCN incl. IMT"
(<http://www.erodocdb.dk/doks/doccategoryECC.aspx?doccatid=1&alldata=1#2149>)

19 EC Decision 2012/688/EU
(<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:307:0084:0088:EN:PDF>)

20 ECC/DEC/(05)05 "IMT-2000/UMTS systems operating within 2500-2690 MHz"
(<http://www.erodocdb.dk/doks/doccategoryECC.aspx?doccatid=1&alldata=1#2056>)

21 EC Decision 2008/477/EC
(<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:163:0037:0041:EN:PDF>)

The band 2500 - 2690 MHz is to remain available for Wireless Network Access in the long term. There are no national or international plans to reallocate it.

3.6 3.4 - 3.8 GHz

According to the national Frequency Plan the band 3400 MHz to 3800 MHz has been designated for Wireless Network Access for the provision of telecommunications services. In the band 3600 – 3800 MHz these systems shall not cause harmful interference to existing and coordinated systems of the fixed-satellite service. Of international relevance here are ECC Decision (11)06²² and the Commission Decision 2008/411/EC²³ of the European Commission.

In Germany, frequencies in the band 3400 - 3800 MHz have been assigned, in a paired manner, to fixed and nomadic broadband wireless access systems (BWA). Both FDD and TDD systems, however, are admissible for use of the spectrum. 7 MHz was set as the basis for channel bandwidth and channel arrangement, while merging or subdividing of channels is possible. A change in the designation for Wireless Network Access enabled the use of the band on a technology and service-neutral basis.

In 2006 the frequencies in this band were awarded in four packages of 2 x 21 MHz in a paired manner and each regionally assigned. The result of the regionalised assignments was that each of the successful bidders achieved nationwide coverage. The fourth package, not auctioned off at the time, was made available in 2008, on application, for regional and/or local uses. It should be noted that both the third and the fourth package includes frequencies which had been assigned for Wireless Local Loop (WLL) in 1999 on a regional basis and without expiry date. New assignments for regional and/or local uses will have the expiry date 31 December 2022.

The band 3600 - 3800 MHz band is not only designated for Wireless Network Access but also allocated to the fixed-satellite service for service links of the fixed-satellite service. Because frequencies have been coordinated for satellite communications in this band, the frequencies for Wireless Network Access are currently available only on a local or regional basis (see Order 1/2009, published in the Bundesnetzagentur's Official Gazette 3/2009).

Discussion about a modification of the frequency parameters throughout the band 3400 – 3800 MHz is currently under way at international level. The ECC has already adopted the harmonisation decision ECC/DEC/(11)06 for MFCN (Mobile/Fixed Communications Networks), which designates the entire band 3400 – 3800 MHz for unpaired applications and also allows paired uses, predominantly based on existing assignment arrangements, in the band 3400 - 3600 MHz. It is planned to modify this ECC decision concerning the same 3400 – 3600 MHz with a view to the harmonisation of a preferred band plan.

The currently effective parameters were developed for point-to-multipoint applications on the basis of ECC Decision (11)06 and ECC Recommendation (04)05, and Commission Decision 2008/411/EC and are not ideal for "fully mobile" use. They are also still based on a 7 MHz channel arrangement, whereas the latest systems usually operate with multiples of 5 MHz. Consequently work is now being done on modified parameters for frequency use (BEMs). This work has the backing of a mandate from the European Commission to CEPT, work on which is to be completed by November 2013. The aim is the subsequent modification of

22 ECC/DEC/(11)06 "Harmonised frequency arrangements for MFCN operating in the bands 3400-3600 MHz/3600-3800 MHz"
(<http://www.erodocdb.dk/doks/doccategoryECC.aspx?doccatid=1&alldata=1#2439>)

23 EC Decision 2008/411/EC
(<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:144:0077:0081:EN:PDF>)

Commission Decision 2008/411/EC.

A comment on the scenarios paper suggests that due to the present revision of ECC Decision (11)06 there is continuing uncertainty about the future use of this band. However, in the view of the Bundesnetzagentur this can apply only to the final components of the technical framework and does not affect the availability in principle of the band for Wireless Network Access. On the other hand a different respondent already sees this band as having an important role to play in the creation of smaller cell structures. With reference to the current allocation to the fixed-satellite service, another respondent recommends dispensing with a new auction for this band in the near future. In the long run, it is argued, it would be advisable to scrutinise the future use of these bands in greater depth, taking the real and actual demand for broadband wireless access into account, and to contemplate removing the restrictions on the use of new ground stations of the fixed-satellite service in the 3.5 GHz and 3.7 GHz bands.

The band 3400 - 3800 MHz is to remain available for BWA in the long term. There are no plans to reallocate it at either national or international level.

4 Potential new frequency bands for Wireless Network Access

4.1 700 MHz

in ITU Region 1 and in Germany, the frequency range 470 - 790 MHz is currently allocated, to broadcasting services on a primary basis and to the land mobile service on a secondary basis for use by professional wireless productions. The Frequency Plan designates this band for television broadcasting, wireless microphones and military applications, the latter on the basis of coordination. In addition there is an allocation to the radiolocation service (wind profiler radar) on a secondary basis in the band 470 - 494 MHz band and an allocation to the radio astronomy service on a secondary basis in the band 608 – 614 MHz.

At WRC-15 the sub-band from approx. 694 – 790 MHz is expected to be allocated to the mobile service on a co-primary basis, co-frequency to the already existing allocation to broadcasting service, and to be identified for IMT applications. Resolution 232 (WRC 12)²⁴ already provides the core principles as follows:

“1 to allocate the frequency band 694-790 MHz in Region 1 to the mobile, except aeronautical mobile, service on a co-primary basis with other services to which this band is allocated on a primary basis and to identify it for IMT;

2 that the allocation in resolves 1 is effective immediately after WRC 15 [...].

4 that the lower edge of the allocation is subject to refinement at WRC 15, taking into account the ITU-R studies referred to in invites ITU-R below and the needs of countries in Region 1, in particular developing countries;”

Although the lower edge (at approx. 694 MHz) has not yet been finally determined, it is nevertheless possible to assume, on the basis of current discussions, that a decision by WRC-15 is likely to be orientated to the television channelling arrangement (8 MHz channel bandwidth). What is known to date about the interests of the parties involved suggests that 694 MHz will be retained as the lower band edge.

Other factors of importance for future provision of spectrum are the channel plan for mobile services and other technical parameters for ensuring compatibility inside the band and in

²⁴“Use of the frequency band 694 - 790 MHz by the mobile, except aeronautical mobile, service in Region 1 and related studies”

relation to adjacent bands. Studies being prepared on these points for WRC-15 are aimed at pushing worldwide harmonisation. At present 14 different options for a possible band plan have been submitted for further discussion. Only two of them contain a proposal for the lower edge of the transmission range for the terminal equipment at below 694 MHz. One option describes the use of the band exclusively as a Supplemental Downlink (SDL) for coupling with other bands used by IMT. Other proposals are based on symmetrically paired bands with conventional duplex (uplink below, downlink above) and capacities between 2 x 30 MHz and 2 x 45 MHz, though a maximum bandwidth of 4 x 40 MHz is likely here. A partial attempt is being made to achieve harmonisation or at least some degree of harmonisation with the APT 700 MHz band plan. As a number of countries outside the Asian Pacific Telecommunity (APT) have announced their intention to implement this band plan and the USA too has made frequencies available in the 700 MHz band with its own band plan, it will be crucially important to weigh up the economic advantages of global harmonisation against the maximum resources which can be exploited for Europe. National alternatives to a coordinated channel arrangement must in this context be regarded as unrealistic. Because of the need to develop international equipment standards, as has already been mentioned elsewhere, it is essential to decide on the channel plan, but also on the provision of the 700 MHz band at the national level at an early stage, so as to enable systems to be implemented by 2018.

This point is also addressed in the BMWi's "Mobile Media 2020" discussion paper in connection with availability in the period 2017-2018:

"The provision of additional resources below 1 GHz could help the federal government to achieve its political target of nationwide broadband coverage. A resolution by WRC-15 could result in the relevant spectrum being made available as early as 2017/2018 as a supplement to frequencies above 1 GHz."

Respondents commenting on the scenarios paper have also become aware of the possibility of a globally harmonised frequency band. Countries in the Asian Pacific region and Latin American countries have, they point out, already committed themselves to the APT band plan. It would be a reasonable assumption that countries in the Middle East and Africa also adopt the APT band plan in its entirety. One of the respondents takes the view that the European 700 MHz band, on account of its propagation properties and potential for becoming an almost globally harmonised band, could play a key role. Germany, it is argued, should seize this opportunity to create a globally harmonised band, as this would enable sector synergies to be generated. Furthermore, the future use of the 694 - 790 MHz frequencies would make it possible to supply rural areas with mobile broadband within a relatively short time and at comparatively low cost. Compared with other EU countries such as France, Germany makes little use of the terrestrial platform for the distribution of TV contents and could be one of the first to introduce the band in question.

France, according to recent information, intends to award spectrum in the 700 MHz band in 2016 in spite of its high level of use of terrestrial broadcasting platforms²⁵.

The European Commission supports the efforts to achieve technical harmonisation at CEPT and ITU level. Given that Finland has announced it wishes to make the band available for mobile communications in 2017, the Commission feels there is a risk of technical fragmentation and the introduction of non-harmonised solutions that may influence the outcome. It has therefore given CEPT/ECC a mandate to work out the technical framework for the so-called 700 MHz band which would, without anticipating a later European implementing decision, include a usage option for radio applications employed by the public safety agencies (PPDR). The CEPT/ECC's statement in response to the EU mandate on the

25 <http://www.lesechos.fr/entreprises-secteurs/medias/actu/0202768886079-tnt-menace-sur-l-avenir-de-la-haute-definition-567167.php>

700 MHz band, requiring the development of a band plan including the necessary technical conditions of use (BEM) for in-band/out-of-band compatibility, is to be made available for public consultation in July 2014 and adopted in November of that year. After WRC-15 a subsequent report to the Commission is requested, so that any necessary adjustments can be made to the WRC results if needed. This report is to be presented no later than May 2016. Preparation for WRC-15 will include the draft of European Common Proposals, which are to be completed in the second quarter of 2015 and set out a coordinated European position.

A national provision of 700 MHz spectrum for mobile applications requires an allocation to the mobile services in the Frequency Ordinance and the designation in the Frequency Plan for Wireless Network Access for the provision of telecommunications services. It must be assumed in this context that the internationally harmonised channel arrangement will be implemented. The Frequency Ordinance is subject to the approval of the Bundesrat. As the 700 MHz band includes capacities for broadcasting within the jurisdiction of the federal states to which the broadcasters are entitled on the basis of the broadcasting regulations, the Bundesnetzagentur must seek the competent federal state authorities' agreement to the Frequency Plan. The same would apply to the needs of the public safety agencies, as the interests of public safety are affected.

The necessary amendment procedures will have to ensure that current and future broadcasting requirements are covered, but also that a solution is found for the requirements of the public safety agencies and for PMSE. Respondents commenting on the scenarios paper, too, would like to have the requirements of all users concerned (mobile communications, broadcasting, secondary users, public safety agencies) given their due weight. Apart from these requirements, which have already been addressed at international level, the German Ministry of Defence has, at the national level, given notice of demand below 1 GHz for military applications already in the context of provision of 800 MHz spectrum for Wireless Network Access. Here too a solution must be found.

To achieve a balance of the various interests, however, it is necessary in order to perform the largest possible number of activities in parallel that all those involved at the political, regulatory and entrepreneurial levels collaborate intensively and briskly, and for all parties to make an active contribution. If they all act purposefully and in concert the relevant proceedings can be speeded up, and this would ensure that the federal government's target for 2018 - the nationwide availability of broadband services - will be met.

The prerequisite is a national consensus of state and federal authorities and the cooperation of all the parties concerned (including mobile communications, broadcasting, wireless microphones, the Bundeswehr and the public safety agencies). On the subject of provision of 700 MHz spectrum the federal government placed the following statement on record during a Bundesrat session in February 2012²⁶:

"In connection with the award of the spectrum hitherto allocated to the broadcasting service - in particular by way of auction - the federal government undertakes to achieve a settlement based on mutual agreement with the federal states covering the distribution of proceeds as between the federal and state governments. This will be done before the Frequency Ordinance is passed to the Bundesrat for its mandatory approval. The federal government is aware that the federal states assume the proceeds will be split fifty-fifty after deduction of the costs resulting from the changes."

The BMWi's "Mobile Media 2020" discussion paper also drew attention to the need for a national consensus as a basis for implementing the broadband strategy:

"What is needed at the national level is a federal government decision which requires

26 See on this: minutes of Bundesrat plenary session 892, pages 4 ff

approval by the Bundesrat. The federal government's statement in the mediation committee on 10 February 2012 should be noted in this context."

The federal states (whose representative organ is the Bundesrat) thus have a decisive role to play in the establishment of the necessary agreement between federal and state authorities, also with regard to the provision of services in rural areas.

4.1.1 Broadcasting

According to the latest digitalisation report of September 2012, DVB-T (Digital Video Broadcasting - Terrestrial) is currently used by about 12% of the approx. 37 million TV households in Germany (including the televisions in non-primary use). The report comments as follows (for the details see *Die Medienanstalten ALM GbR, Digitalisierungsbericht 2012*, page 49; accessible at www.die-medienanstalten.de):

"Terrestrial services have settled at about 11 percent in recent years and will manage a rise to 12.5 percent this year. This means that some 5 million households can see DVB-T transmissions, with terrestrial technology being used primarily in the urban areas [...]"

These numbers should be set against approx. 45% each for the use of satellite and broadband cable transmissions, plus about 5% for IPTV (for the details see *Die Medienanstalten ALM GbR, Digitalisierungsbericht 2012, Daten und Fakten Chartreport*, page 9). The figure officially reported by the BMWi to the ITU for purely terrestrial primary coverage is 5%.

It should also be stated that Germany shows an extremely heterogeneous distribution of terrestrial DVB-T coverage in the various regions: the percentage is markedly higher in areas of heavy and heaviest population density, whereas in some of the sparsely populated rural areas terrestrial services have become almost insignificant. This is certainly due, in part, to the comparatively problematic conditions of reception broadcast-satellite service as an alternative and/or a reluctance to pay the monthly rates for cable TV. However, the fact that wherever private providers are not present terrestrial primary coverage is lower by several orders of magnitude seems to be of far greater consequence.

The contracts governing terrestrial broadcasting by the major private broadcasters are due to expire in 2014. The RTL Group has already announced that it intends to end the terrestrial broadcasting of its programmes at the end of 2014. ProSieben/Sat.1 is currently committing itself to continuing terrestrial broadcasting only until the end of 2017. This will probably leave too little time to offer the undertaking planning certainty for investments such as for the conversion to DVB-T2. Only the public broadcasters have so far taken a positive attitude to continued use of DVB-T and a future switch to DVB-T2, though these providers too are well aware of their dependence on developments in the private sector.

The proportion of terrestrial TV broadcasting in the neighbouring countries varies widely, from about 2 - 5% in Belgium and the Netherlands to approx. 65% in France. In light of this it will be necessary to find solutions for the various cross-border coordination agreements.

At present about 140 DVB-T transmitters operate on the basis of assignments in the 700 MHz band (694 – 790 MHz), most of them are valid until 2025; in the event of refarming of this spectrum these assignments would have to be relocated and coordinated anew at both national and international level. About 40 of these transmitters are used for broadcasting the programmes of private sector operators. Another 15 stations transmit on the immediately adjacent channel 48 (686 - 694 MHz).

Early planning ideas (which still include the RTL bouquet) indicate, however, that relocation or replanning of this kind is indeed possible. Without changing current planning estimates it is

possible for the present scope of DVB-T coverage - on the assumption that the appropriate degree of cooperation from neighbouring countries will be forthcoming - to be realised in principle virtually completely below channel 49 (694 MHz).

For this purpose about 30 more transmitters, in addition to the facilities operating above channel 48, would have to be coordinated differently and correspondingly reconfigured, which might also involve site relocation and/or changes to the antenna systems. The neighbouring countries would have to be willing to support the strategy of treating frequency rights without reference to their subsequent and possibly geographically different use. They would also have to be prepared to agree to exchanges that might become necessary and to the transnational shifting of all the channels contained in the concrete planning, to allow adjustments in the allotments on both sides and to accept the transmitter network adjustments bound up with the changes. Intensive efforts are already being made in this direction in the international groups WEDDIP (Western European Digital Dividend Implementation Platform) and NEDDIF (North Eastern European Digital Dividend Implementation Forum).

Inside Germany some of the current notices of requirements submitted by the federal states would have to be adjusted to actual and possibly future implementation measures.

In general the federal states, in return for their consent to the reallocation of the 700 MHz band in the Frequency Plan, will want broadcasting coverage - providing television and digital and analogue sound broadcasting - to be secured either through the provision of sufficient (DVB-T) frequency resources or through alternative and where applicable joint plans for broadcasting and mobile services, or both. The latter is increasingly being discussed at international level as a **medium to long term option**. Its implementation however will depend both on the availability of new technical systems and on a new and complex regulatory framework. This framework would no longer be restricted to the frequency level but would also cover at least the level of signal streams and their control.

Notwithstanding this, the decisive points, based on the federal states' notification of their demand, are whether the total requirement of transmission capacity for terrestrial television broadcasting can be met even without the 700 MHz band and when this can be done by mutual agreement with the federal states. The decision of the RTL Group to withdraw from terrestrial television broadcasting will presumably, for example, make it easier to clear the 700 MHz frequencies, since the number of transmitters to be relocated would be reduced by about 10%.

The timing of the actual relocation of existing uses away from the 700 MHz band is crucially dependent on the cooperation of the neighbouring countries. Two steps are necessary. First, the technical spectrum preconditions must be established at the level of international agreements. Second, in an ideal scenario the broadcasting uses in the 700 MHz band in neighbouring states would also have to be relocated in support of the aims of the European Digital Agenda. A preliminary proposal has been developed according to which the principle of equitable access to spectrum at international level can be broken down from a single band from 470 - 790 MHz into two sub-bands from 470 - 694 MHz and 694 - 790 MHz. The 4+2 layers principle (appropriate distribution of frequency rights in approx. 4 layers up to channel 48, ie up to 694 MHz, and another 2 up to channel 60, ie up to 790 MHz) has already been presented to nearly all neighbouring countries via WEDDIP and NEDDIF, and they have indicated they support this approach in principle. Finally, concrete agreements on the individual frequency rights have yet to be concluded.

This approach would also make it easier to speed up the release of the 700 MHz band from broadcasting usage in the neighbouring countries, as is shown by the course of events in the 800 MHz band after the 2010 auction. Activities in Germany spurred on the implementation of the digital dividend in those countries, which in turn brought about a decisive improvement in

the conditions of use for mobile communications in the 790 - 862 MHz band, and did so significantly faster than originally expected. An internationally harmonised *modus operandi* for future uses in the 700 MHz band could possibly reduce the time needed for international coordination and the conclusion of the relevant agreements - in spite of the still high level of DVB-T uses in various instances. Mobile communications usage in Germany is also possible in the case of a non-harmonised use of the 700 MHz band in relation to neighbouring states (mobile communications in Germany versus broadcasting in the same frequency band in other countries). The rules and conditions for compatibility studies required for that purpose are currently under development.

It has recently been argued on various occasions that because of the withdrawal of the private broadcasters from terrestrial coverage the public broadcasters could also discontinue this form of operation and that this would have adverse consequences for sound broadcasting. This is based on the theory that antenna supports are used jointly by DVB-T, DAB+ and VHF and that the fixed costs have to date been distributed among a number of services. If TV broadcasting ceased to be one of those services, the costs to be borne by the remaining services (eg VHF, DAB+) would rise sharply, and this could induce them to stop operations on the grounds they were not profitable enough. The counter-argument however is that a total of only about 15% of the transmitter sites are used for both DVB-T and sound broadcasting. Consequently any measure to discontinue terrestrial DVB-T coverage would probably only have limited effects - if any at all - on the cost structures of sound broadcasting.

4.1.2 Frequencies for the broadband applications of public safety agencies and the BMVg (Federal Ministry of Defence)

4.1.2.1 Requirements of public safety agencies (PPDR); time frame

Discussions are currently in progress at European level on future requirements for broadband applications by public safety agencies and possible ways of meeting such demand. Studies commissioned by the Federal Ministries of Economics and the Interior (WIK²⁷ and IABG²⁸) have been carried out with a view to identifying this demand; the results show that total demand for spectrum for Germany comes to 40 MHz, 25 MHz of which should be below 1 GHz. The total demand figure reflects constantly required resources and includes what is needed for day-to-day hazard control. The Bundesnetzagentur plays an active role in CEPT/ECC's frequency management project team (FM49), which was, until the end of 2012, primarily concerned with the verification of European demand, taking the various demand situations of all the administrative bodies into account. FM49 came to the conclusion that operational and implementation reasons made it impossible to split demand into spectrum above and below 1 GHz. The team found that minimum demand in Europe is at the level of 2 x 10 MHz. To satisfy each of the national requirements at least another 2 x 10 MHz would be required - according to the studies quoted above - which would result in total national demand of 2 x 20 MHz.

The next step will be to identify the frequency band(s) for pan-European use.

In addition to the broadband requirements of the public safety agencies, the Federal Ministry of Defence has also given notice of additional demand for broadband applications which could, because the uses are as a rule geographically separate, be served in the same candidate band as that used by the public safety agencies. The efforts of the BMVg directed at efficient - and joint - use of spectrum by the German armed force and these agencies have

27 <http://www.bmwi.de/DE/Mediathek/publikationen,did=444390.html>

28 [http://www.cept.org/Documents/fm-49/1710/FM49\(11\)Info3_IABG-Study-PPDR-capacity-requirements](http://www.cept.org/Documents/fm-49/1710/FM49(11)Info3_IABG-Study-PPDR-capacity-requirements)

been welcomed at the national level. The agencies have also called for 3GPP standardisation in the relevant candidate bands with a view to utilising the concomitant economies of scale.

According to the current timetable the next step is to complete the necessary studies, which will have to be given written form in two ECC reports, to be followed by the framing of an ECC harmonisation decision by March 2014. Preliminary work on the selection of frequency bands started in the first quarter of 2013 and is due to be completed no later than November 2013. It is therefore essential for a decision on a band option to be taken in good time, so as to be able to influence the process.

Mention must also be made of the current mandate from the European Commission to the ECC for the development of a technical framework in the 700 MHz band. The assumption here is that the technical framework for mobile broadband would also be suitable for the applications of the public safety agencies. In July 2014 the statement in response to the EU mandate will be offered for public comment, to be followed by final adoption in November of that year. A follow-up report will have to be delivered to the Commission after WRC-15 as a means of putting adjustments to the WRC results into effect. The follow-up report is to be submitted in May 2016 at the latest. 2020 is taken to be a realistic date for starting the implementation of broadband PPDR applications in Europe. Implementation at this time at national level will also be conditional on prior discussion of the financing of the planned network.

4.1.2.2 Frequency options

Current discussions are centred on the 700 MHz (674 - 790 MHz) and 400 MHz (380 - 740 MHz) bands. The comments submitted on the scenarios paper also touch on this, saying that whether the solutions in the end will be for 400 MHz or 700 MHz, for example, will only be decided by later developments. The respondents expect that international harmonisation / standardisation will show a tendency in the direction of 700 MHz.

The interest in the 700 MHz band derives from, among others, the Scandinavian states, where there is, because of very low population levels in certain regions, a basic willingness to share the use of the publicly accessible mobile networks. The public safety agencies also hope that synergy effects and substantial cost reductions will result from the use of devices that are already available because of the provision of spectrum in the 700 MHz band in the USA. With reference to economies of scale the comments on the scenarios paper also point out that the 700 MHz band has already been allocated for professional mobile communications in the USA. It should be noted here that the USA upper band cannot be provided for PPDR and public safety agencies in Europe, as it is located in the 790 - 862 MHz band, which was awarded in 2010. Simply taking over US devices in Europe is therefore not possible, nor is a globally harmonised channel plan.

Should only the 700 MHz band be identified for meeting the European demand, a core bandwidth of 2 x 10 MHz and an additional up to 2 x 10 MHz would have to be set aside for the demand for PPDR.

A decision in favour of this candidate band for PPDR would also influence the CEPT's reply to the European Commission's mandate on the 700 MHz band. It must be assumed that the Commission too will give consideration to the meeting of PPDR demand in the 700 MHz band.

Provided that no demand will be expressed by mobile operators, there would be no argument against making available large parts of the 700 MHz band for PPDR. But if the public mobile communications do compete in terms of notified demand, such an approach cannot ensure that this spectrum, which is particularly well suited to nationwide network rollout, will be

allocated at the earliest possible date for efficient use in the context of broadband rollout in Germany. Nor would it be sure that the date envisaged by the federal government for the provision of nationwide coverage with 50 Mbit/s - 2018 - will be adhered to. The result could be that the dynamic development of the broadband market in Germany could be slowed down for years on end and that the strong and continually increasing demand by consumers for nationwide mobile broadband services will not be satisfied. Also relevant is that PPDR applications must be assumed to have a long period of use, probably thirty years - or at least up to 2040.

The Bundesnetzagentur has therefore started to investigate the extent to which implementation in the other internationally preferred band, namely 380-470 MHz, would be feasible, bearing in mind that the time frame for implementation would be beyond 2020. This is the model currently favoured by France in particular.

At present the TETRA network for public safety agencies consists of 2 x 5 MHz at 380 - 385 MHz (lower band) and 390-395 MHz (upper band) and serves to make, for the most part, narrowband voice communication possible. In addition, the band 406.1 - 410 MHz is assigned to the Federal Ministry of the Interior for direct mode operations (DMO) between terminal equipment, so as to guarantee a direct connection among individual protection and security officers in the event of an outage or to relieve pressure on the infrastructure.

It is eminently sensible for new bands for broadband public safety uses to be as close as possible to the already implemented public safety systems at 400 MHz. Cost advantages and synergy effects on a large scale could be exploited through the use of already existing sites and technical equipment (eg cable, antennas). On the other hand it should be borne in mind that at 700 MHz - simply because of the propagation conditions - the number of base stations and the concomitant infrastructure (power supply; backbone connection via radio relay link, cable or satellite) would be an estimated one third higher than with an implementation in the 400 MHz band. In the European context it should be noted that large parts of the 400 MHz band have already been dealt with in connection with cross-border coordination for narrowband mobile applications, whereas in the 700 MHz band there would have to be complete, new negotiations.

The restructuring of a sub-band between 380 and 470 MHz would also, in view of the announced implementation time frame, not have to be done in one go but could - as planned in France - be accomplished in a number of successive steps depending on increases in capacity utilisation and the thus proven requirements of the public safety agencies (**rolling approach**).

On the other hand the deployment of such a rolling approach at 700 MHz does not seem to make sense because the resources in question would have to be kept free over the years and not be available for other types of use. Thus it would be in conflict with the principle of efficient use of spectrum.

4.1.2.3 Policy ideas for the band 380 - 470 MHz

The potential candidate band 380 - 470 MHz would create the need for long-term compression and a relocation of some of the existing applications to other bands, eg 146 - 174 MHz (2m band). Current bottlenecks in the implementation of PMR and trunked radio systems could thus be taken into account and a long-term solution found for them. In the run-up to such a restructuring, military assignments in the 70-74 MHz and 78.7-84 MHz bands could, on account of reduced demand by the Bundeswehr, be returned, and the spectrum would then be available for the relocation of specific applications.

Further resources could be created by the public safety agencies returning frequencies from the bands 167.54 - 169.40/ 172.14 – 174 MHz and 74.2 - 77.5/ 84.0 - 87.2 MHz after setting

up TETRA stations and/or networks in the 380 – 400 MHz band and putting them in operation.

The 68 - 87.5 MHz band (4m band) is suitable for certain PMR applications. Propagation conditions, antenna characteristics and dimensions and the setting up and operating costs for the stations and/or networks make the 4m band ideally suited to specific undertakings (for example energy suppliers). As some of the sub-bands have been allocated to the fixed radio service, a check should be made on the extent to which single-channel radio relay operations can be relocated away from the 410/420 MHz band to the 4m band. The spectrum requirements could be met from the sub-bands thus being vacated because of the return of spectrum by the public safety agencies and the Bundeswehr.

A number of studies have been carried out in the past on the potential for relocating specific applications such as single channel radio relay to other bands. Given sufficient lead time many of these applications could be relocated to the 70 – 74 MHz and 78.7 – 84 MHz bands, which would be a for the benefit of PMR and trunked radio systems in the 410 – 470 MHz band.

Apart from the existing applications in the 380 - 470 MHz band, the planning known to exist and directed at future developments on the market should also be borne in mind. There are for example business models of certain users which are currently considering measures which would allow them to use digital technologies inside their present PMR and trunked radio spectrum assignments. Furthermore, the planning of the utilities for smart metering and/or grid projects based on the assumption of long-term use needs to be taken into account. Here it is necessary first to identify actual demand and the spectrum requirements of the utilities and on that basis decide on the frequency bands. Spectrum use by smart grids would in principle be possible in the bands 146 - 174 MHz and 68 - 87.5 MHz, for example. The aim must be to provide the necessary planning and investment certainty to all parties involved by communicating with them at an early stage, and to put the long term programme for the 380 - 470 MHz band on a secure basis by making the necessary changes to the Frequency Plan.

Comments on the scenarios paper for Project 2016 already emphasised that many PMR systems have to have much higher safety standards than public mobile networks. It is requested that spectrum should be dedicated to the broadband mobile data services of the security authorities and for users which are not public authorities, such as utilities, local public transport companies and airports. For technical reasons sub-bands in the 440 - 470 MHz range also continue to be needed for telecontrol applications.

It was also argued that on the one hand these applicants for spectrum compete with the authorities for resources, but on the other there were possibilities for cooperation which made sense for both economic and operational-tactical reasons and which therefore should be taken into consideration. The dedicated spectrum should in any event be below 1 GHz. The lower the frequency, the more favourable the propagation conditions. Hence the frequencies round the already established 400 MHz range would seem to offer a real possibility.

Applications which cannot be relocated have to be taken into account in all circumstances, eg the spectrum used by maritime mobile services in the 450 - 470 MHz band, as the single or duplex frequencies are subject to the Radio Regulations and the corresponding ITU-R Recommendation M.1174-2 and are thus harmonised at international level. As in the past, coordination with these frequencies seems possible because of the restriction to coastal ports. It should however be borne in mind that, by way of preparation for WRC-15, the question is being studied whether additional channels for on-board communication stations are necessary in this band (see Radio Regulations Resolution 358 (WRC-12)).

On the basis of the above the Bundesnetzagentur believes the requirements of the public safety agencies and the Bundeswehr could be met in the 380 - 470 MHz band. Given the foreseeable demand from those two sources and applying the rolling review approach, but also taking developments on the market into account, the Bundesnetzagentur will first look into the possibility of implementation in the 450 - 470 MHz band.

4.1.3 Spectrum for Programme Making and Special Events (PMSE)

4.1.3.1 Requirements for PMSE and the time frame

The term "programme making and special events" refers to radio applications which are needed not only for broadcast productions and other programme material not intended for broadcasting, but also for the provision of audio-visual information in the context of public and private events.

PMSE applications can be operated in various frequency bands, some of them on a secondary basis. Depending on the particular band, the assignment has to be either on an individual or on a general basis, the assignment procedure being orientated to the technical conditions in the various bands, as stipulated in the Telecommunications Act. In Germany at present the secondary uses of the 470 – 790 MHz band form the core band for the operation of professional wireless microphones. This core band is divided into two groups. While the 470 – 710 MHz sub-band is primarily used by the broadcasters for wireless microphones, the 710 - 790 MHz sub-band is primarily used for other professional wireless productions not ancillary to broadcast. Other bands for wireless microphones include the 174 - 230 MHz band and the duplex gaps of Wireless Network Access at 800 MHz (823 - 832 MHz) and at 1800 MHz (1785 - 1805 MHz). Professional wireless audio productions are operated predominantly in the 470 - 790 MHz band.

Spectrum requirements for PMSE applications have two components: basic demand, which is relatively constant in terms of time and place, and peak demand, which arises in highly concentrated form in both the mentioned respects. Whereas the relatively constant demand relates, for example, to microphone equipment in theatres or TV studios, high-level and peak demand occurs in connection with special events such as sporting contests and concerts, or live coverage of news events, where the demand for spectrum and the degree of planning possible can differ widely. A study by the Leibniz Universität Hannover²⁹ identified up to 96 MHz in Berlin as the basic demand level for wireless microphones. Though peak demand at major events varies from occasion to occasion, it has been satisfied in every single case in the past.

4.1.3.2 Frequency options

Inclusion of the 700 MHz band (694 - 790 MHz) in the spectrum provided for Wireless Network Access would affect the above-mentioned wireless microphones and outside broadcasting applications.

The latter would have to vacate at least those parts of the band which are used by the Wireless Network Access uplink and do so before network configuration is started, since use of the spectrum on a primary basis for nationwide Wireless Network Access networks will probably preclude the possibility of PMSE secondary use in the uplink.

A project team has been established at CEPT level for an international examination of PMSE issues, its brief being to analyse spectrum requirements for PMSE applications and to

29 "Report on the frequency resource requirements of Professional Wireless Microphone Systems in urban areas with respect to changing broadcasting allocation concepts"
<http://apwpt.org/downloads/reportonthefrequencyresourcerequirementsofpwms.pdf>

recommend possible solutions. Furthermore the European Commission has mandated CEPT to study possible resources for PMSE. One of the tasks is to identify technical conditions for a European harmonisation of the Wireless Network Access duplex gaps at 800 MHz and 1800 MHz for PMSE (wireless microphones). Another is to identify technical conditions which can contribute to facilitate the use of PMSE, including specific aspects to improve the frequency management and the overall spectrum efficiency of equipment. The ECC's report on wireless microphones was delivered to the Commission in March 2013. The assumption is that the first step will be to harmonise the duplex gaps at 800 MHz and 1800 MHz - already identified by CEPT and assigned on a general basis in Germany - for wireless microphones with binding effect throughout the EU. Other work is required under the mandate, in particular on the subject of wireless cameras, and is to be completed by November 2013.

Respondents commenting on the scenarios paper argued that it was the EU's aim to preserve and promote the diversity of major events. The spectrum for PMSE, currently uniform worldwide, should therefore be maintained as is, one reason being to facilitate the creation of international productions. Reference was made in this connection to the L band, which is internationally available, and to 1800 MHz, 1900 MHz and 2 GHz.

While the 800 MHz band was designated for Wireless Network Access the band 1452 - 1477.5 MHz was provided as an alternative resource for wireless microphones in the Frequency Plan at national level. In the course of international studies on the harmonisation of the 1452 – 1492 MHz band for new uses it was emphasised that, in spite of a preference for Mobile/Fixed Communications Networks Supplemental Downlink (SDL), at national level additional applications could also be accommodated in this band. The conditions under which a shared use of downlink bands for Wireless Network Access and wireless microphones would be possible were therefore investigated.

It is assumed that the interference-free operation of wireless microphones (indoor usage) is possible if the following distances from LTE base stations are maintained:

- 700 MHz and 800 MHz band: ≥ 150 metres
- 1500 MHz band: ≥ 60 metres.

When used outdoor, the separation distances between LTE base stations and wireless microphones increases to at least 300 metres in the 700 MHz/800 MHz band and at least 100 metres in the 1500 MHz band, in order to guarantee that wireless microphones can be operated at a tolerable interference level of -100 dB (mW/MHz).

It is therefore planned to make available the Wireless Network Access downlink spectrum in the 800 MHz band, and additionally in the future the 700 MHz band as well as the band 1452 – 1492 MHz for the use by wireless microphones.

Depending on the final contents of the band plan for Wireless Network Access in the 700 MHz band, it could be possible to continue the operation of some of the existing PMSE equipment by utilising a possible duplex gap and/or a guard band. The proportion of devices which can in fact continue to be used depends on the tuning range of individual devices and the possibility of upgrading them, and on the size of the guard bands, which will be set forth in an internationally coordinated band plan. The possible availability and design of guard bands for PMSE applications will also be decided after the Wireless Network Access band plan has been given final format.

With a view to continuing to offer additional capacities for wireless microphones in a band with similar propagation conditions to those of 1452 - 1477.5 MHz, the band at 1492 – 1518 MHz, which is of similar size, has been set aside at international level, based on a German initiative, for indoor use by wireless microphones. According to manufacturers the corresponding equipment could be placed on the market in a relatively short space of time.

The band was harmonised at European level at the meeting of the ECC Spectrum Management working group, 20 to 24 May 2013; the harmonisation will be implemented nationally through a subsequent amendment to the Frequency Plan. Compatibility studies were also launched on the issue of whether the band can be extended up to 1525 MHz. The Bundesnetzagentur will take an active part in these investigations.

The current subdivision of the 470 - 790 MHz band into "applications ancillary to broadcast" (470 – 710 MHz) and "other professional applications" (710 – 790 MHz) would be one-sided and to the detriment of the latter in the event of the 700 MHz band being provided for Wireless Network Access. This scenario provides another reason for putting a rapid end to the current subdivision into two different groups, thus enabling all professional users to use the remaining core band below 694 MHz on equal terms.

The already existing alternative bands are also gaining in importance for future PMSE use. An alternative for wireless microphones with mandatory individual assignment is the secondary use of the band 174 - 230 MHz. In addition the following bands have been awarded by general assignment: 32.475 – 34.325 MHz, 36.610 – 38.125 MHz, 823 – 832 MHz, 863 – 865 MHz and 1785 – 1805 MHz. The general assignment in the bands 790 – 814 MHz and 838 – 862 MHz is formally still effective until 31 December 2015, but because of the increasing use of the band by Wireless Network Access it is only usable to a limited extent for professional PMSE applications, particularly in the band 838 -862 MHz.

In order to meet the high standards demanded by professional users in the alternative bands below 470 MHz, new devices would have to be developed, and they would have to be able to deliver a comparable quality of audio signal in spite of the difference in physical conditions compared with the band 470 - 790 MHz. In the alternative bands above 790 MHz, especially in the band 1785 - 1805 MHz, such equipment is becoming increasingly available.

To sum up, implementation of all these measures would create the following potential for use or shared use, even if one discounted the band 694 - 790 MHz:

32.475 - 38.125 MHz

174 – 230 MHz

470 – 694 MHz

823 - 832 MHz

863 - 865 MHz

1452 – 1518 MHz

1785 - 1805 MHz

2400 - 2483.50 MHz

This would make a total of more than 440 MHz (excluding the optional capacities in the centre gap in the 700 MHz band) available for PMSE applications. The Bundesnetzagentur will campaign in regard to the existing primary users to achieve additional general assignments.

4.2 1452 - 1492 MHz

The band 1452 - 1492 MHz has been allocated, both in the ITU Region 1 and nationally, to the fixed service, mobile service (excluding aeronautical mobile service), broadcasting service and broadcasting-satellite service. In the current Frequency Plan

- the sub-band 1452 – 1479.5 MHz has been designated for terrestrial broadcasting (sound) and

- the sub-band 1479.5 - 1492 MHz for satellite broadcasting on the basis of decisions at CEPT level.

In addition the band 1452 - 1477.5 MHz has been identified for wireless microphones and furnished with a note that alternative uses of it are being investigated at CEPT level. At present there is, only one frequency assignment for the broadcasting–satellite service until the end of 2018, at national level. A survey conducted by the CEPT showed however that the whole band 1452 - 1492 MHz is for the most part not used. A CEPT project team was therefore set up for the identification of possible alternative uses.

On that basis the Working Group on Frequency Management (WGFM) decided in September 2012 to start developing an ECC harmonisation decision for Mobile/Fixed Communications Networks Supplemental Downlink including the technical parameters in form of a block edge mask (BEM) and to adopt the decision formally by the end of 2013. The band plan will be based on 5 MHz channel arrangement. Apart from the harmonised use other terrestrial applications are to be possible at national level.

The international process for the annulment of ECC Decision (03)02, which designated the 1479.5 - 1492 MHz band for the broadcasting–satellite service, has largely been completed.

Respondents commenting on the scenarios paper called for the L band to be allocated for primary PMSE use, as a lowest level solution, in the event of the 700 MHz band being allocated to the mobile service. According to the respondents the L band was well suited to PMSE because it would deliver synergy effects (use of similar equipment) both inside and outside Europe. It would be easier to exchange productions. However, the manufacturers and users of PMSE equipment needed planning certainty to be able to refinance their investments. Against this backdrop, they argued, use of this spectrum by PMSE on a primary basis made sense. In the Bundesnetzagentur's opinion, however, a unilateral move by one country, with a primary use for PMSE, would not be productive, given the decisions taken at international level. Likewise, many respondents argued in favour of a use as Supplemental Downlink (SDL), which would match the asymmetrical structure of current internet data traffic. They expected a rapid provision of SDL networks once standardisation had been achieved at 3GPP level.

Given that the band has not been used for a long time it is planned to adjust it to international requirements and designate it for Wireless Network Access in the Frequency Plan. No restriction to downlink will then be necessary, the aim being to achieve maximum flexibility for possible uses and dispense with inessential administrative procedures. The band can therefore be placed at the market's disposal in the shortest possible time (see on this the draft document for consultation in the same Official Gazette).

Depending on the implementation targets for Wireless Network Access it would be advisable to look at suitable measures for cancelling the existing frequency assignment to the broadcasting-satellite service for the period until the end of 2018.

4.3 MSS 2 GHz

The bands 1980 - 2010 MHz and 2170 - 2200 MHz have been allocated internationally to the mobile service, fixed service and mobile–satellite service on a primary basis, and identified for IMT. The allocation to the fixed service has not been implemented at national level. In the national Frequency Plan the bands have been designated for satellite communications service connections and for wireless cameras; the latter on a transitional basis until commencement of MSS services.

On 14 February 2007 the European Commission took the decision to harmonise the use of radio spectrum in the 2 GHz bands with a view to setting up mobile satellite services (MSS)

in the bands 1980 – 2010 MHz and 2170 – 2200 MHz (Decision No 2007/98/EC). At the end of the first selection phase of the comparative selection procedure required under Title II of Decision No 626/2008/EC, Immarsat Ventures Limited and Solaris Mobile Limited were found to be legitimate applicants for the provision of mobile satellite services (see Decision No 2009/449/EC of 13 May 2009). On individual applications from the two selected operators, the Bundesnetzagentur granted frequency assignments to these two undertakings for the spectrum specified below, pursuant to section 55 of the Telecommunications Act and Title III of Decision No 626/2008/EC, for the provision of MSS on the territory of the Federal Republic of Germany:

a) Immarsat Ventures Limited:
1980 - 1995 MHz (Earth-to-space), and
2170 - 2185 MHz (space-to-Earth);

b) Solaris Mobile Limited:
1995 - 2010 MHz (Earth-to-space), and
2185 - 2200 MHz (space-to-Earth).

Both frequency assignments are due to expire on 13 May 2027.

Respondents commenting on the scenarios paper pointed out that the 1980 - 2010 MHz and 2170 – 2200 MHz bands (2 GHz MSS) were subject to the conditions imposed by Commission Decisions 2009/448/EC and 626/2008/EC for pan-European mobile satellite services. At the time of publication of the scenarios paper no information had been presented on non-compliance by an EU Member State with the "common conditions" laid down in Decision No 626/2008/EC. Such non-compliance could necessitate its annulment. By contrast another respondent expected action at European level owing to insufficient use of this band.

In the event that future measures by the EU Member States in respect of Decision 2011/667/EU (Modalities for coordinated application of the rules on enforcement) result in the revocation of spectrum usage rights in the relevant bands or sub-bands, the question of reallocating these bands would have to be considered. In a letter of 6 February 2013 Germany called for the enforcement rules to be followed. At the present moment it is not possible to estimate the time that would be needed for completing the relevant procedures.

The Bundesnetzagentur's assessment is that these bands are very well suited to Wireless Network Access because of the possibility of a direct extension of the existing terrestrial 2 GHz band plan (see chapter 3.4) and in the context of international harmonisation they would, where applicable, be available for a future assignment proceeding.

4.4 2300 - 2400 MHz

Since WRC-07 the band 2300 - 2400 MHz has been identified internationally for IMT as part of an allocation to the mobile service on a primary basis, but this has not yet been implemented in the area covered by the CEPT. The band is used by wireless cameras (including those of the public safety agencies), for undertakings, eg in industrial production, and for applications in the field of aeronautical telemetry. In Germany it is the core band for broadcasting and other programme producers, as it enables the basic demand for spectrum for wireless cameras to be met at any place and time, independently of short-term assignments.

It has already been decided that the band will be re-examined by an ECC project team on the basis of retaining and giving due consideration to the existing applications. The team's work is to be completed by the first half of 2014. Comments on the scenarios paper pointed out that the 2.3 GHz band was not taken into account in the current scenarios even though it

offSDLered significant economies of scale, was already harmonised as 3GPP band 40 and met the requirements of LTE-TDD technology. Provision of the band for BWA will only be possible if the present uses are continued and protected or if alternative resources are made available. This is not in prospect at the present moment. An international project team (FM 52) is looking into possible shared use of the band subject to retention of the current applications.

4.5 Further frequency bands

Apart from the bands which have already been identified or subjected to more detailed examination for their harmonisation potential and for which a sufficiently stable regulatory framework can be expected in the foreseeable future, there are also other bands currently under discussion, which at international level, particularly in the course of preparation for WRC-15, have only been submitted for consideration by individual parties. It can be expected that the European and global preparation to WRC-15 will produce a number of modifications and also further proposals. Such proposals will first need further discussion at international level. Complete and transparent preparation at national level will be done via the "National Group" for WRC-15, which is open to all interested parties.

5 Summing up

The aim of "Strategic Aspects of the Availability of Spectrum for Broadband Rollout in Germany" was to set out, in advance of formal public consultations, important key issues related to spectrum regulation in the years to come for the public with a professional interest in the subject, as a way of supporting the federal government's broadband strategy and the BMWi's initiative "Mobile Media 2020".

In keeping with this strategy the priority was to provide planning and investment certainty regarding the future provision of suitable spectrum resources for broadband rollout in Germany and also for the user groups affected (including broadcasters, wireless microphones, authorities and organisations concerned with public safety and the Bundeswehr) and their spectrum needs. As required by the RSPP, spectrum of at least 1200 MHz must be made available in Europe for Wireless Network Access applications for broadband services, so as to achieve maximum broadband speeds and capacities. The 400 MHz to 6 GHz band is already being considered at international level for Wireless Network Access, but also for other radio applications (such as PMSE, PPDR, etc).

The bands already identified and used, together with those becoming available in the future, were analysed in terms of the existing and future spectrum needs of the users concerned. In deciding on the relevant procedures the Bundesnetzagentur had to find a consensus for differing interests along the lines suggested in the BMWi's initiative "Mobile Media 2020". The strategic considerations also took account of current activities at national and international level concerned with future uses in the various frequency bands.

The Bundesnetzagentur's current assessment of the short, medium and long term availability of spectrum for mobile and/or Wireless Network Access is as follows:

As from 2017 the spectrum in the 900/1800 MHz band (previously the GSM spectrum) will again be available for Wireless Network Access. This spectrum can be made available to the market in short term to provide the planning and investment certainty needed for its subsequent use and to ensure that it is used, before any assignment's expiry date, in an economically rational manner and in line with the broadband strategy, employing the tools of new, efficient technologies and innovative broadband applications (see on this the draft document for consultation in the same Official Gazette).

Furthermore, additional spectrum could be made available for Wireless Network Access at

more or less exactly the same time. Specifically, the bands 694 – 790 MHz and 1452 – 1492 MHz are currently under national and international discussion. The message of current assessments and experience with the award of the 800 MHz frequencies is that it is entirely possible to promote the development and rollout of high-performance networks, provided that the 700 MHz spectrum is available in a timely manner due to the deployment of every possible means of acceleration and the effective cooperation of the neighbouring countries. It will then also be possible, as required by the broadband strategy, to help ensure that consumers have access to mobile broadband applications in the rural communities as well. Current timetables regarding these frequencies, including international timetables, suggest that the harmonised technical framework will be of timely and sufficient stability.

In addition to the spectrum mentioned above, other frequencies at 2 GHz and 3.5 GHz will also be available in the medium term. The usage rights awarded for UMTS in the past in the 2 GHz band and the rights awarded for BWA in 2006 at 3.5 GHz will expire in 2020 and 2021 respectively, after which dates they will become available for Wireless Network Access. In the longer term the rights auctioned in 2010 for the 800 MHz, 1800 MHz, 2 GHz and 2.6 GHz bands will be available again for Wireless Network Access as from 2026. This spectrum is also to be made the subject of appropriate assignment proceedings in good time before the relevant expiry date, to ensure that the market players will have the planning and investment certainty needed for its subsequent use.

Possible solutions have been outlined both for the spectrum requirements of mobile communications and for other types of use. Such solutions can ensure the medium to long term availability of sufficient resources for all the applications concerned.

The Bundesnetzagentur is convinced that the constructive cooperation of all the parties involved will enable a political consensus to be reached promptly, in support of both the federal government's broadband strategy and applications of importance to other areas of political activity. In this context the greatest possible store is set by transparent and non-discriminatory proceedings and the participation of all interested groups, so as to establish a stable policy with regard to the necessary legal framework, founded on agreement between the federal and state governments. To obtain a balance between differing interests it is essential for the largest possible number of activities to be pursued at parallel times and for all those involved to play an active part. If all parties are target-orientated and act in concert the proceedings can be speeded up and the federal government's objective achieved: the nationwide availability of broadband services by the end of 2018. This is conditional on a national consensus as between federal and state governments and the cooperation of all the groups and parties concerned.

List of abbreviations

ALM	Association of regulatory authorities for broadcasting
APT	Asian Pacific Telecommunity
BDA2GC	Broadband Direct Air to Ground Communications
BEM	Block Edge Mask
BMI	Federal Ministry of the Interior
BOS	Authorities and Organisations concerned with public safety
BMVg	Federal Ministry of Defence
BMWi	Federal Ministry of Economics and Technology
BWA	Broadband Wireless Access
CEPT	European Conference of Postal and Telecommunications Administrations
DAB+	Digital Audio Broadcasting
DVB-T	Digital Video Broadcasting – Terrestrial
EC	European Commission
ECC	Electronic Communications Committee
ERC	European Radiocommunications Committee
EU	European Union
FDD	Frequency Division Duplexing
GHz	Gigahertz
3GPP	3rd Generation Partnership Project
GSM	Global System for Mobile Communications
ICT	Information and communications technology
IMT	International Mobile Telecommunications
IPTV	Internet Protocol Television
ITU	International Telecommunication Union
LTE	Long Term Evolution
MFCN	Mobile/Fixed Communications Networks
MHz	Megahertz
MSS	Mobile-Satellite Service
NEDDIF	North-Eastern Digital Dividend Implementation Forum
PMSE	Program Making and Special Events
PMR	Private (Professional) Mobile Radio
PPDR	Public Protection and Disaster Relief
RSPP	Radio Spectrum Policy Programme
SDL	Supplemental Downlink
SPD	Sozialdemokratische Partei Deutschland (Social Democratic Party of Germany)

In the event of any conflict between the German and English versions, the German version shall prevail.

TDD	Time Division Duplexing
TKG	Telecommunications Act
UHF	Ultra high frequency
UKW	Very high frequency
UMTS	Universal Mobile Telecommunications Systems
WEDDIP	Western European Digital Dividend Implementation Platform
WIK	Wissenschaftliches Institut für Kommunikations- und Informationsdienste GmbH
WLL	Wireless Local Loop
WRC	World Radio Conference