



Case studies for the award of the 700MHz/800MHz band: Germany

Prepared for GSMA

11 November 2011

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Please note: This document is one of a series of case studies on approaches to awarding the 700MHz/800MHz band¹ for mobile broadband. The countries in this series are Australia, Finland, Germany, Mexico, and UK. Each case study is available as a separate document.²

¹ Across the world, two harmonised UHF bands have been identified for mobile broadband: the 800MHz band (790–862MHz) in ITU region 1 (Europe and Africa) and the 700MHz band (698–806MHz) in the rest of the world.

² The case studies, plus a summary document plus presentation, are available for download from the GSMA website at <http://www.gsmworld.com/our-work/public-policy/spectrum/digital-dividend/>

1 Germany: Summary

The decision to make the 800MHz band available for electronic communications services in Germany was largely a political process driven by the Government's broadband strategy which was announced in February 2009. The strategy envisaged the use of this spectrum for providing wireless broadband services to rural areas which did not have satisfactory access to broadband services such as DSL (or similar). The decision-making process was complicated by the separation of responsibility for the licensing of spectrum for electronic communications services, which lies with the national government, and for the licensing of broadcast spectrum, which lies with each of the 16 Federal States (Bundesländer). As late as 2008, the Bundesländer were indicating that the whole UHF band was needed for the deployment of 6 digital terrestrial television (DTT) multiplexes and 1 mobile TV (DVB-H) multiplex across the whole of Germany, even though cable and satellite take-up amounts to over 95% of households in Germany. It took extensive negotiations between the national government and the Bundesländer, together with the wider European momentum to designate the 790-862MHz band for electronic communications services, before the Bundesrat (representative body of the 16 Bundesländer) adopted the national government's proposals in June 2009.

The licensing conditions and award process for the 800MHz band (and for spectrum in the 1800MHz, 2.1GHz and 2.6GHz bands) were announced in October 2009. One key aspect of the licences for 800MHz spectrum is that they included significant coverage obligations. Specifically, within each Bundesland, the winners of the spectrum were required to build-out their networks in listed communities in four stages in areas with no or very low broadband coverage, before deploying in more populated areas. The so-called "Weiße Flecken-Listen" (white spot lists) had been defined by the administrations of the Bundesländer. The four stages are:

- smaller towns and districts with 5000 or fewer inhabitants (priority stage 1)
- towns and districts with between 5000 and 20000 inhabitants (priority stage 2)
- towns and districts with between 20000 and 50000 inhabitants (priority stage 3)
- towns and districts with more than 50000 inhabitants (priority stage 4).

Deployment in each stage in each Bundesland could only begin once 90% of the population in the towns and districts specified in the previous stage had been provided with access by one or more of the 800MHz licensees. All of the coverage obligations have to be met by 2016 at the latest. Licensees are allowed to co-operate with each other in respect of sharing of infrastructure and leasing frequencies to meet these coverage obligations.

The 800MHz spectrum was awarded in Germany in May 2010 in a combined auction with spectrum in the 1800MHz, 2.1GHz and 2.6GHz bands, resulting in a total of 360MHz of spectrum being auctioned together. The auction utilised an SMRA (simultaneous multi-round auction) format and lasted for 224 rounds running over a period of 6 weeks from 12 April until 20 May, 2010. A total of just under EUR4.4 billion was raised by the German government in the auction, with the 800MHz band accounting for approximately EUR3.6 billion (over 80%) of this total. Six interested players submitted their application for attendance in the auction. Two of them dropped out in the pre-qualification phase. Thus, four players, the four existing operators, competed for the frequencies, with three of these (Telefónica/O₂, Deutsche Telekom/ T-Mobile (Telekom), and Vodafone) each securing 2x10MHz of 800MHz spectrum.

Since the auction, the mobile operators have rapidly deployed LTE networks in the listed villages and cities in rural areas. Vodafone launched its LTE service on 1 December 2010, with Telekom and Telefónica following on 5 April 2011 and 1 July 2011, respectively. In October 2011, the German telecommunications regulator (BNetzA) indicated that the country's mobile operators had already fully met the coverage requirements associated with the 800MHz spectrum in six of the Bundesländer (Bavaria, Baden-Württemberg, Hessen, North-Rhine Westphalia, Rheinland-Pfalz and Saarland). Deployment of LTE in the main cities has also commenced – though primarily using higher frequency bands in view of the above constraints on the use of 800MHz spectrum. Telekom is deploying LTE in the main cities using 1800MHz and 2.6GHz spectrum. It launched its commercial service in Cologne on 1 July (using 1800MHz).

2 Germany: Detailed case study

2.1 Overview of process adopted by the regulator

The main challenge in Germany in relation to the creation of the 800MHz band was the separation of responsibility between the regulation of broadcasting, which is undertaken by the 16 Federal States (Bundesländer)³ and the regulation of electronic communications, which is undertaken at the national level. More specifically, the frequencies used for broadcasting fall under the responsibility of the Bundesländer and could only be used for other purposes if the Bundesländer's demands for capacity for broadcast transmissions were satisfied. Although there is widespread adoption of cable and satellite TV in Germany, the terrestrial television platform is regarded as being important for social inclusion and therefore there was a need for the national government to reach agreement with the Bundesländer for the release of the 800MHz spectrum for non-broadcast services. The German telecommunications regulator (BNetzA) agreed with the Bundesländer that it would mandate the coverage of electronic communications networks in specified rural areas in each Federal State, prior to the deployment of such services in the main cities, in order to ensure that the citizens in these rural regions had access to high-speed Internet services. Figure 2.1, below, provides a timeline of the main events that are of greatest relevance to the creation and award of the 800MHz band in Germany.

Figure 2.1: Summary of major events associated with the 800MHz band in Germany

Year	Event
1997	Government mandates Federal Ministry of Economics and Technology (BMW) to lead the development of the DTT plan
1998	Establishment of "Initiative Digitaler Rundfunk" (IDR – translating to Digital Broadcast Initiative) body led by the BMW in cooperation with the Bundesländer and industry stakeholders to work towards switchover by 2010 [1]
2000	Publication of "Startszenario 2000" by IDR which comprised the implementation plan for DVB-T starting with urban areas and then moving out to rural areas with full coverage in place by 2010 [2].
2002	Implementation of DTT in first Bundesland (Berlin)
2003	Analogue TV switched-off completely in Berlin Implementation plan updated to complete commercial TV switch-over across Germany in 2005 and public sector broadcasts by 2008
2005	Public broadcasters commit to bringing DTT to 90% of the population [3] DVB-H trial in Berlin
2008	Bundesländer authorise DVB-H service – which is subsequently launched in Hamburg, Munich, Frankfurt and Hanover in time for Euro 2008 football competition. Licence handed-back by end of year Digital switchover across Germany completed on 2 December [4]
2009	Government announces plans to use part of digital dividend for deployment of broadband services in rural areas using wireless technologies [5, 6] Adoption of regulation by the Bundesrat (representative body of both the Federal Government and the 16 Bundesländer) allowing 800MHz band to be used by services other than broadcasting [7] Announcement of allocation conditions for award of the spectrum [8]
2010	Holding of auctions and issue of licences for 800MHz spectrum (and spectrum in 1800MHz, 2.1GHz and 2.6GHz bands) Commercial launch of first LTE services by Vodafone (1 Dec)

³ The 16 Bundesländer (plural) represent the highest regional sub-division of the country. Each Bundesland (singular) is responsible for regulating spectrum capacities for broadcasting purposes in its region. The allocation of the broadcasting frequencies and the assignment process on request of capacities by the Bundesländer are a task of the national regulatory authority BNetzA.

2011	Commercial launch of LTE services by Telekom (5 April) and Telefónica (1 July) Completion of rural coverage commitments in first two Bundesländer (specifically North-Rhine Westphalia and Saarland) in September. Completion of these commitments in four additional Bundesländer (Bavaria, Hessen, Baden Wurttemberg, Rheinland-Pfalz) by mid-October
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2.2 Justification for clearance of the 800MHz band

As discussed earlier, the decision to make the 800MHz band available for mobile use in Germany was fundamentally a political decision. The strategy was to use the spectrum as a means of providing universal broadband access across the rural areas of Germany. The decision-making process was however complicated by the separation of responsibility for the licensing of spectrum for electronic communications services, which lies with the national government and its NRA (BNetzA), and for the regulation of spectrum capacities for broadcast purposes, which lies with each of the 16 Bundesländer.

In 2008, it was not clear that there any digital dividend would be available for uses other than broadcasting. The broadcasters in Germany announced plans to deploy six digital terrestrial television (DTT) and one mobile TV (DVB-H) multiplexes (of the six DTT multiplexes, three would be available to the public broadcasters and three for the private broadcasters). The Bundesländer indicated that all of the spectrum was required for broadcasting and none was available for the deployment of mobile services. In December 2008, the German Parliament unveiled proposals to remove the power of the Bundesländer to restrict the use of the UHF band to broadcasting services. This proposal allowed the Federal Ministry of Economics and Technology to publish a plan to allocate broadcasting services to mobile services. The driving force underlying this plan was an acceptance that the UHF spectrum was a key means of delivering high-speed broadband services to the 800 villages without any DSL (or equivalent) broadband access and to another 3000 villages where broadband availability was limited to part of the village.

The key step to creation of the 800MHz band occurred on 18 February 2009 when the German Federal Cabinet announced its broadband strategy which included a focus on making broadband access more widely available in rural areas [5]. The Government's aim was to ensure that each household in Germany would have access to a 1Mbps connection by the end of 2010. This was followed by a Decision of the German Federal States Cabinet (Bundesrat) on 4 March 2009 on the future use of the 470-862MHz band. The Decision provided for the 470-790MHz band to remain available to broadcasters, and for the spectrum between 790-862MHz (the 800MHz band) to be designated for mobile services [6]. This decision was subsequently adopted by the Bundesrat in June 2009 [7].

2.3 Obstacles faced during band clearance

In this section, we discuss a few of the challenges faced by Germany during the process of clearing the 800MHz band.

2.3.1 Adoption of set-top boxes

In the Berlin-Brandenburg region, set-top box subsidies were offered to households who were financially less well-off and who were entitled to the use of a TV set under the German social benefits system. This was in view of the cost of set-top boxes, which in the earliest stages of launch of DTT could cost as much as EUR200 each. In total approximately EUR732 000 was spent on the acquisition and distribution of set-top boxes to around 6000 households [9].

With the rapid fall in set-top box costs, such subsidies were not provided in any other region of Germany. Instead the federal regulatory authorities focused their consumer-related efforts to support the take-up of DVB-T on two measures:

- pro-active marketing ahead of the transition from analogue to DTT to minimise the impact on consumers
- financial incentives for broadcasters to use the new platform.

The marketing efforts were carried out through regional offices focusing on areas which were soon to be affected by analogue switch-off. The marketing was carried out in close cooperation with regional retailers and press in order to benefit from the effects of viral marketing. In addition, a common brand for these marketing efforts was established in

2005 (“DVB-T: DasÜberallFernsehen”⁴) which provided access to a database estimating the type of antenna required at a specific address. [10] The establishment of a common brand was expected to lead to better recognition amongst consumers, and to facilitate the marketing efforts. The concluding report of the DVB-T task force [11] stated that the marketing efforts mentioned above were so successful that there was no requirement for a transitional period of simultaneous broadcasting of analogue and digital signals in most regions from the end of 2005.

In addition to the marketing efforts, the regional authorities provided financial subsidies to private broadcasters in exchange for a commitment to use the DVB-T network. These subsidies triggered complaints from the competing cable and satellite operators who argued that they were a form of state aid. The European Commission examined this issue on three occasions in relation to Berlin-Brandenburg [12], Bavaria [13] and North Rhine-Westphalia [14]. In all three cases, the financial subsidies to broadcasters were revoked.

2.3.2 Migrating PMSE (including wireless microphones) users

The use of programme-making and special events (PMSE) is accepted as a secondary use in Germany for Channels 61-63 and 67-69 [15]. PMSE comprises a number of uses including wireless links used by television and radio programme makers, radio links used in theatre productions and music concerts and wireless microphones used as part of such performances but also for non-professional use such as local events (e.g. religious ceremonies, school events etc). These users typically make use of the spectrum on a licence-exempt basis.

As PMSE is a secondary use of channels 61-63 and 67-69, this means that PMSE users are not protected from any interference with other authorised (primary) uses in the band. This allocation expires on 31 December 2015. It has been estimated that there were around 700,000 licence exempt PMSE devices operating in Channels 61 and above.

The allocation of the 800MHz band for electronic communications services by the German government on 14 July 2009 [7] raised concerns that the levels of interference that PMSE users in this band are subject to may increase significantly. Channels 51 to 60 were identified as alternative frequencies that could be used by PMSE users, again on a secondary basis (to DTT). This triggered a political discussion as these users were concerned that the creation of the 800MHz band would make their equipment unusable. Many users indicated that they were not aware of this risk at the time of purchase of their equipment and sought compensation for the additional costs they would incur (for example to purchase new equipment to operate in lower frequencies). A study by the Association of Professional Wireless Production Technology (APWPT) has identified that wireless devices with a total value of around EUR1.4 billion would be affected by the creation of the 800MHz band.

On 29 September 2011, the budget committee of the Bundestag accepted a resolution that put in place a compensation mechanism for PMSE users in Germany. The details of the compensation mechanisms are as follows [16]:

- a total budget of up to EUR129 million will be made available for compensation
- compensation will only be paid to users who are affected by interference with nearby LTE base stations
- compensation will amount to the net book value of any affected equipment
- to calculate the net book value, a linear depreciation over 5 years will be applied to all commercial users while a depreciation period of 8 years will be applied to all non-commercial users
- the rules only apply to equipment bought prior to 21 October 2009.

2.3.3 Military use

Prior to the allocation of the 800MHz band for the provision of electronic communications services, we understand that the band had been assigned for use by German military services in particular Channels 61-63 and 67-69 [17]. We are not aware of any compensation being paid to the military for relinquishing this spectrum.

⁴ <http://www.ueberallfernsehen.de/>

2.4 Protection of other/neighbouring spectrum uses

2.4.1 Protection of digital terrestrial television reception

The licence conditions for the 800MHz spectrum band [8] specified emission characteristics in accordance with CEPT Reports 30 and 31 [18, 19] and further specified that licensees are responsible for ensuring there is no interference with neighbouring uses (such as DTT) but that since the emission constraints are set in line with the latest technological advances, it is expected that an ‘interference free’ deployment of LTE should be possible. The broadcasting industry has expressed concerns about the potential for significant levels of interference to DTT reception from mobile services. However, although coverage obligations in 6 of the 16 Bundesländer are fulfilled and more than 2000 LTE800 base stations have been installed by the 3 licensees, we understand that no significant cases of interference have been reported to date. The situation is likely to be reviewed in the event that any major interference issues were to arise.

2.4.2 Concerns regarding interference to cable TV installations

There were concerns that the use of LTE in the 800MHz band could trigger interference with cable television. In anticipation of such a negative impact on its operations, regional cable operator Kabel BW submitted an expedited application at the administrative court in Cologne to halt the award of the 800MHz band. This application was rejected in March 2010 [20]. The court reasoned that there were no strong indications at this point to justify a delay of the award and that potential interference could be considered at a later stage if it were to emerge.

A similar approach was chosen by the telecommunications regulator (BNetzA) in its auction rules. It first established that cable operations would not fall under the ITU definition of a “radio service”. As such, these operations would be of secondary nature to wireless broadband services in the allocated frequency bands. At the same time, the BNetzA determined that mobile operators would have to put in place reasonable provisions to minimise interference with cable operations [16]. In a similar note to the administrative court in Cologne, it stated that the potential for interference is minimal for the foreseeable future, given the expected penetration rate of LTE service, and that further means to minimise interference might be available at the time that interference might potentially emerge in the future.

2.5 Award mechanism for the 800MHz band

The 800MHz spectrum was awarded in Germany in May 2010 in a combined auction with spectrum in the 1800MHz, 2.1GHz and 2.6GHz bands, resulting in a total of 360MHz of spectrum being auctioned together. The auction utilised an SMRA (simultaneous multi-round auction) format and lasted for 224 rounds running over a period of 6 weeks. A total of just under EUR4.4 billion was raised by the auction, with the 800MHz band accounting for approximately EUR3.6 billion (over 80%) of this total. The four existing operators competed for frequencies in the 800MHz band, with three of these (Telefónica/O₂, Deutsche Telekom/ T-Mobile (Telekom) and Vodafone) each securing 2x10MHz of spectrum.

One key aspect of the licences for 800MHz spectrum is that they included significant coverage obligations. Specifically, within each Bundesland, the winners of the spectrum were required to build-out their networks in listed communalities in four stages in areas with no or very low broadband coverage, before deploying in more populated areas. The four stages are:

- smaller towns and districts with 5000 or fewer inhabitants (priority stage 1)
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- towns and districts with between 20000 and 50000 inhabitants (priority stage 3)
- towns and districts with more than 50000 inhabitants (priority stage 4).

Deployment in each stage in each Bundesland could only begin once deployment to 90% of the population in the listed towns and districts specified by for the previous stage had been provided with access. All of the coverage obligations had to be met by 2016 at the latest. However, if the towns and districts had been served with internet access through other technologies (e.g. DSL) in this time, that coverage would count towards the 90% obligation. Licensees are also allowed to co-operate with each other in respect of sharing of infrastructure and leasing frequencies to meet these coverage obligations.

Since the auction, the mobile operators have rapidly deployed LTE networks in these rural areas, with Vodafone launching its LTE service on 1 December 2010, with Telekom and Telefónica following on 5 April 2011 and 1 July 2011, respectively. In October 2011, the German regulator indicated that the country's mobile operators had already fully met the coverage requirements associated with the 800MHz spectrum in six of the Bundesländer (Bavaria, Baden-Württemberg, Hessen, North-Rhine Westphalia, Rheinland-Pfalz and Saarland).

Deployment of LTE in the main cities has also commenced – though primarily using higher frequency bands in view of the above constraints on the use of 800MHz spectrum. Telekom is deploying LTE in the main cities using 1800MHz and 2.6GHz spectrum, and launched its commercial service in Cologne on 1 July (using 1800MHz).

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