Bundesministerium
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RheinlandPfalz

Action Plan for the Transformation of Radio Broadcasting in the Digital Age

Roadmap / Draft

Progress Report for the Digital Radio Board

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Foreword

The switch to digital is affecting all areas of life and business. Digital technologies are changing the way in which media content is produced, disseminated and consumed. In television, the digital transformation was started years ago, and today it is virtually complete. The situation in radio is different: although most broadcasters have now adopted hybrid strategies for the dissemination of their programmes, broadcasting via FM (or in German UKW, ultra-short wave) is still the mainstay of the radio scene in Germany. However, its popularity also led to analogue FM broadcasting coming up against its limits some years ago. The frequency spectrum is crowded. It does not offer any capacity for more programmes and additional contemporary offerings.

DAB+ (Digital Audio Broadcasting) offers a new terrestrial digital transmission option in the FM spectrum. DAB+ started in August 2011 with the broadcasting of 13 radio stations, which have since been disseminated via a nationwide multiplex. Now not only public broadcasters but also many commercial radio stations are broadcasting their programmes via DAB+. In addition, the Internet also offers radio stations a good option for reaching listeners. Both for conventional linear radio programmes and for non-linear audio offerings, the dissemination of programmes over the Internet has been growing continually in recent years. This is evidence of steady growth in online audio offerings and curated playlists[1] in Germany.

BMVI (the German Federal Ministry for Transport and Digital Infrastructure) is working together with the *Länder* to open up new development prospects for radio in tomorrow's digital world. This concerns both the provision of high-performance mobile and stationary Internet connections, as well as digitisation of terrestrial radio broadcasting. The radio of the future should be based on listeners' interests. This is true of stationary use and for radio usage on the move.

The Federal government and the *Länder* intend this roadmap to provide a framework for building a long-lasting digital radio broadcasting infrastructure in Germany, which enables innovations in radio, broadens the range of programming, and opens up the world of digital radio sound all over Germany. In addition, the development of additional and traffic information services will be rendered possible. For that purpose, legislative and organisational changes are required.

[1] "curated playlists“ are lists of pieces of music or songs chosen by the station's editorial team

Management Summary

FM radio is still the most intensively-used means of transmission, but the Internet and DAB+ can point to rising usage statistics. The recognised DRM30 and DRM+ standards are also available for digital terrestrial transmission.

The radio of the future will be based on listeners' interests. Exactly how the switch to digital radio happens will depend on which digital transmission modes listeners put their trust in for the long term.

The roadmap contains eight measures which create the necessary framework for the transformation of radio broadcasting in the digital age:

1. "Smart-Radio“ Regulation: mandatory equipment of radio receivers with at least one digital interface;

2. creation of a regulation that ensures that analogue transmission capacity freed up by public broadcasters is not allocated to new or different analogue radio offerings;

3. support of the building of digital high-speed broadband networks;

4. provision of the necessary transmission capacity for setting up a second nationwide DAB+ multiplex by the Federal Network Agency;

5. creation of the conditions for use of TPEG;

6. agreement on a method to determine levels of DAB+ equipment;

7. further development of the measuring methods for radio usage in liaison with AGMA, which also includes the usage of digital terrestrial broadcasting;

8. Policy support of the transformation process from analogue to digital radio broadcasting via evaluation and updating of the roadmap.

1. Radio usage

Radio usage in Germany has been consistently high for years. Three out of four Germans (78.7%) listen to radio on weekdays. That makes 57 million listeners a day. The average time spent listening is 190 minutes, the longest time listening to one station 242 minutes.[2] In the 10-29 year-old age group, the average listening time on weekdays is usually lower, at 127 minutes and longest time listening to one station of 181 minutes.

By far the main radio transmission mode in Germany is still analogue modulated FM, despite the possibility of listening to radio in a fixed location or on the move via the Internet. 98% of daily audio usage is offline use of radio and recordings. Online use of audio (podcasts, music files, radio streaming and other online audio) on the other hand only accounts for a 2.5% share of total duration of usage. The highest online usage of audio content is among 14-19 year-olds, with an 11.6% share, and among 20-29 year-olds at 3.8%.[3] The ARD/ZDF long-term study on mass communication comes to the conclusion that radio, as the oldest electronic medium, would not be superseded by new audio offerings.[4]

Nevertheless, the Internet is an increasingly relevant platform for radio broadcasters. They are using it to broaden their offering to listeners. Besides the simultaneous broadcasting of their FM programmes, they offer music streams, podcasts, news and information about schedules, presenters and events over the Internet. In 2015, online audio advertising generated 17 million euro (net) in sales. This figure is growing at 37% per year, and will reach 39 million euro in 2018.[5]

In countries which are considered as pioneers of digital terrestrial radio (DAB+), the share of radio usage via digital transmission is rising continuously. 60% of Norwegians, 53% of Swiss and 45.5% of British people listen to digital radio.[6]

The Digitisation Report 2016 by the media regulatory authorities states: "In comparison with television, digitisation of radio has so far had a shadowy existence. Now that seems to be gradually changing. According to the survey results for the Digitisation Report 2016, digital radio and even Internet radio have recorded positive growth for the third year in a row. On the other hand, radio reception via cable and satellite are in down."[7]

2. Transmission modes

In the early days of radio in the 1920s, programmes were broadcast on Medium Wave. After the Second World War, transmission using FM started in Germany. On 28 February 1949, Bavarian Radio began operating the first FM transmitter in Europe. In the VHF band, FM (Frequency Modulation) established itself as a modulation process and made VHF a successful radio transmission mode.

Whereas in the USA, medium wave in particular is still a standard transmission mode for radio, in Germany programmes are no longer broadcast via Long or Medium Wave. The last Medium Wave transmitter operated by a publicly-owned broadcaster in Germany was switched off on 31/12/2015. Commercial stations gave up using this transmission mode much longer ago.

The digital transformation is posing major challenges for traditional radio broadcasting, as well as opening up new opportunities. Media usage is becoming increasingly convergent and the popularity of non-linear audio offerings is growing continuously, which is why individual voices in support of purely linear programme offerings foresee a gloomy future. Against this backdrop, the BMVI (the German Federal Ministry for Transport and Digital Infrastructure) presented in April 2015 a study commissioned from the Institute für Rundfunktechnik (Research centre of the German broadcasters (ARD / ZDF / DLR), Austria's broadcaster (ORF) and the Swiss public broadcaster (SRG / SSR).[8]. The discussion since publication about the individual transmission modes is summarised below.

2.1. FM

The discussion about the FM transmission mode concentrates primarily on its economic significance.

The popularity and importance of analogue broadcasting via FM continue unabated.

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[2] https://www.agma-mmc.de/fileadmin/user_upload/Pressemitteilungen/2016/PM_ma_2016_Radio_II.pdf

[3] Gattringer/Mai; Radio bleibt der Soundtrack des Tages (Radio remains the soundtrack of the day); Media Perspektive 4/2016; p. 209

[4] Gattringer/Mai (FN 2); p. 214

[5] http://webradiomonitor.de/studie/webradiomonitor-2016/

[6] Concerning DAB+ usage in individual countries, see http://www. worlddab.org/country-information

[7] Arbeitsgemeinschaft der Landesmedienanstalten GbR: Digitalisierungsbericht 2016

[8] Institut für Rundfunktechnik: Terrestrischer Hörfunk: Zukünftige Entwicklung im Hinblick konkurrierender Übertragungswege (Terrestrial radio: future developments concerning competing transmission modes)

The Verband privater Rundfunk und Telemedien e.V. (Association of Private Broadcasters and Telemedia - VPRT). Therefore, switching off this transmission mode is not up for discussion. Politicians are expected to create the conditions for the market to decide freely between transmission modes and standards.

The Arbeitsgemeinschaft privater Rundfunk (a consortium of representatives of the commercial broadcasting industry - APR) is also in favour of a market-driven solution, with decisions being taken by competing radio broadcasters. The job of the politicians is considered to be to broaden the options of market players rather than restrict them.

The Arbeitsgemeinschaft der öffentlich-rechtlichen Rundfunkanstalten der Bundesrepublik Deutschland (Association of Public Broadcasting Corporations in the Federal Republic of Germany - ARD) and Deutschlandradio are pursuing the aim of introducing digital radio using DAB+ as part of a hybrid strategy. The ending of a simulcast phase, during which FM and DAB+ were operated in parallel, and the ending of FM transmissions could only occur with the cooperation of all market players, and only at the same time as the commercial broadcasters.

In its 20th report, the Commission for Identifying the Financial Requirements of Broadcasters (KEF), which audits the funding of public broadcasters and makes a recommendation about the level of the licence fee, evaluates the "Digital Radio (DAB+)" development project. It came to the conclusion that it was not economic to operate two transmission modes for radio for the period of time planned by ARD and Deutschlandradio. The switchover to DAB+, which was cheaper in comparison to VHF, could not succeed unless there were clear commitments by the Federal Government, the Parliament and the *Länder* about DAB+, and a realistic switch-off date set for VHF.[9]

2.2. DAB+

Since 1999, the first programmes in DAB mode were broadcast, predominantly on VHF channel 12 and on the L-Band at 1.5 GHz with a limited transmission power. Due to the proximity of military usage, channel 12 was subject to a transmission power limit, and in the L-Band did not enable sufficient transmission power anyway. Transmission using DAB could therefore not continue via multiplex, as well as due to the low number of programmes.

Only after the RRC-06 conference[10], which released the whole VHF band for DAB and due to the introduction of DAB+ with improved audio coding and provided with MPEG 4, could more programmes be broadcast in a multiplex and several multiplexes in the same place with a significantly higher transmission power to ensure indoor reception. Only then could market-oriented attractiveness be achieved.

Advocates of DAB+ emphasise the possibilities of greater programme diversity, better sound quality, user-friendliness of the receivers and cheaper broadcasting, at the same time as cutting energy consumption. According to Bayern Digital Radio GmbH, for Bavaria-wide broadcasting of a programme via 40 VHF transmitters requires 116 KW of electricity, whereas for broadcasting a programme via 60 transmitters using DAB+, only 22.4 kW are required.[11]

Moreover, digital transmission via DAB+ offers cost advantages compared with analogue broadcasting. According to data from ARD, the costs of broadcasting via DAB+ after switching-off VHF will be between 75% and 80% of the current VHF broadcasting costs.[12] The media institutions examined the suitability of digital radio systems for local/regional radio broadcasting in a report, and issued recommendations for action.[13]

Critics have found fault with the currently still relatively low market penetration and, in comparison with VHF receivers, low level of equipment of vehicles and households with DAB+ receivers. In addition, there are doubts that lower-cost broadcasting using DAB+ will be possible for broadcasters of local or regional programmes. So the cost advantages depend on having a well-utilised multiplex. The merger of several, adjacent FM broadcasting territories into one DAB+ broadcasting territory - as proposed by the media institutions - entails the risk of cannibalisation due to the geographical proximity of stations on the advertising market.

[9] 20th report by the KEF, introductory remark in Chapter 6, Section 1, p. 187

[10] ITU Regional Radiocommunication Conference, 2006

[11] Bayern Digital Radio GmbH: GREEN BROADCAST – the economic and ecological benefits or DAB+; Published at http://www.worlddab.org/technology-rollout/business-case

[12] 19. Report by KEF, p. 133, Note 251

[13] Conference of Directors of the Regional Media Institutions, Technical Committee 2, here: Technical Conference of Regional Media Authorities (TKLM): Digitale terrestrische Verbreitung des lokalen/regi- onalen Hörfunks – Bewertung und Empfehlung von digitalen Hörfunksystemen für die lokale/regionale Hörfunkversorgung, Bericht vom 20.10.2015 (Digital Terrestrial Broadcasting of Local and Regional Radio - Assessment and Recommendation of Digital Radio Systems for Local and Regional Radio Broadcasting, Report of 20/10/2015.

The VPRT therefore calls for a technically and journalistically meaningful and at the same time financially viable solution for the further development of local radio in DAB+.
This would have to be found beforehand for the various different structures in the *Länder* concerned (e.g. Baden-Württemberg, Bavaria, Lower Saxony, North Rhine-Westphalia, Saxony).

The APR points out that the advantages claimed for DAB+ with regard to programming sales would have to be decisive for every company under their specific constraints, to give them a reason to commit to DAB+ and, even more so, to drop their existing distribution channel. The opposite would be the case if regulatory pressure were brought to bear to make each company commit to DAB+ or give up VHF although the benefits for the company were not apparent.

In this regard, the BMVI supports a pilot project proposal by the Niedersächsischen Landesmedienanstalt (Media Authority of Lower Saxony - NLM), in which the expansion of the DAB/DAB+ system and the possibility of local switching-off of single-frequency networks will be investigated. The project was launched at the end of 2015 and is due to be completed within two years.

2.3. DRM30 and DRM+

Digital Radio Mondiale (DRM) is a narrow-band digital transmission system developed initially for the digitisation of radio on long, medium and short-wave frequencies. For use up to 30 MHz, Modes A to D were standardised in 2001. These variants are also referred to collectively as "DRM30".

In 2009, Mode E was added to the DRM standard, which is suitable for use in the VHF frequency range (frequency range from 30 MHz to 300 MHz). This variant is also known as "DRM+".

The German DRM Forum refers to the particular suitability of the standard for local radio. Local radio structures does not appear feasible with DAB or DAB+. It is pointed out that DRM+ with its narrow-band transmission signal (96 kHz) can be used both in the VHF band II (87.5 MHz – 108 MHz) and in VHF-Band III (174 MHz – 230 MHz). In this regard, particularly for VHF Band II, the compatibility with existing radio services above 108 MHz and below 87.5 MHz still needs to be clarified.

It is not out of the question that DRM+ could play a more significant role in radio broadcasting in the future. However - apart from software-based solutions - at present there are no receivers on the market suitable for reception of DRM+.

2.4. Internet and IP-Radio

According to the Digitisation Report 2016 by the Media Authorities, Internet radio is the second most frequently used type of reception after VHF (34.1% compared with 94.1% for FM use). However, only 2.9% are received on special radio sets connected via a WLAN. It is mostly smartphones, PCs, laptops and tablet computers that are used for reception. Only 0.7% of usage is via permanently installed IP radio receivers in cars.[14]

The diversity of audio offerings on the Internet is unsurpassed. According to the Webradiomonitor 2016, a total of 10139 different online audio offerings and curated playlists were in existence in Germany, including 2453 different webradio streams. Of the Webradio streams, 1781 were online-only offerings, 415 streams were online simulcast offerings[15] and 257 streams were online-sub-brands of the simulcast offerings.[16] In this way, the traditional programme makers link the transmission modes within their hybrid strategies and use both transmission modes.

For transmission via the Internet, programme-makers are reliant on highly-developed telecommunications networks. This relates not only to the terrestrial Internet but also mobile phone networks. Radio broadcasters point out in this regard that the business models of the mobile phone networks with their profit-oriented pricing models, user-dependent network extension, limited volume tariffs, etc. are not in a position to provide continuous, free and unrestricted access to radio offerings with a stable nationwide service compatible with the aims of public service radio.

2.5. Digital radio in Europe

In Europe too, analogue radio transmission via FM continues to be at high levels, although in relation to DRM+

[14] Arbeitsgemeinschaft der Landesmedienanstalten GbR: Digitalisierungsbericht (Digitisation Report) 2016

[15] Simulcast offerings include one-to-one transmission of conventional FM/DAB+ radio programmes over the Internet.

[16] http://webradiomonitor.de/studie/webradiomonitor-2016/

it only mentions considerations concerning its introduction. No univocal statement can be made about the use of the Internet as a transmission mode for radio broadcasting either. DAB+ is now an established radio transmission mode in the United Kingdom, Norway, Switzerland, Denmark, the Netherlands and Italy.[17]

During the course of 2017, Norway will switch over to DAB+ and gradually switch off its FM transmitters. Switzerland is planning the digital switch-over between 2020 and 2024. The United Kingdom is extending its national and local DAB transmitter networks and has defined the criteria for switching-off FM. In Denmark, a consistent roadmap for digital radio has been proposed, which provides for a complete switch-over. In the Netherlands - after the start of national programming in 2013-2015 - new coverage with regional services has come into service. In Italy, the digital radio network has been extended to Southern Italy, Sardinia and Sicily. 43% of the population already has coverage. The number of digital stations is growing continuously. RAS (the South Tyrol broadcaster) has announced that at the end of 2017, it will start switching off the first, smaller FM transmitting stations.

In the meantime, France, Belgium, Poland, Austria and Slovakia have also begun broadcasting programmes via DAB+.

In France, DAB+ services have been in operation since 2014 in Paris, Nice and Marseilles. A further development of digital radio all over France is planned. In Belgium, broadcasters have been transmitting via DAB+ since 2015. The extension to Flanders is planned for 2016. In Poland, Polish radio has extended its digital radio coverage and is now reaching 55% of the population. In Austria, a pilot operation with 15 DAB+ stations was started in the Greater Vienna area in May 2015. Since December 2015, Slovakia has also been running a DAB+ trial in Bratislava. And in Slovenia, a licence was issued to the public broadcaster in 2016 for the first national DAB+ multiplex.

3. The role of the *Länder*, the federal government and the EU

The federal government, the *Länder* and the EU already successfully created the framework conditions for the switch-over from analogue to digital radio transmission during the digitisation of television broadcasting. The existing roadmap should pave the way for supporting the digital transformation of radio, and create the relevant framework conditions.

Under the federal system of the Federal Republic of Germany, broadcasting is a matter for the *Länder*. Under the Constitution, the federal government is not responsible for technical matters relating to telecommunications and terminals. The transformation of radio broadcasting in the digital era therefore requires cooperation between the federal government and the *Länder*.

The usual practice for this cooperation takes the following form: The *Länder* specify the basic structure for the broadcasting scene, and decide whether programmes are to be broadcast nationwide, regionally and/or locally and formulate the requirements to meet the needs for coverage. Based on these definitions, the Federal Network Agency makes available the frequencies required for terrestrial broadcasting to meet those needs. The *Länder* or the bodies designated by them decide which transmission capacities or requirements will be allocated to the public and the commercial broadcasters. The capacity allocated to commercial radio is then put out to tender by the media authorities of the *Länder* as a platform or as individual programme channels. At present, the requirements for coverage of analogue and digital terrestrial radio have been formulated in all the *Länder*.

3.1. Media law provisions in regional law

In the individual *Länder*, the media laws currently contain concrete provisions for a planned switch-off of FM. In Saxony, radio programmes can still be broadcast via FM until the end of 2025. From 2026 onward, terrestrial radio transmission will only use digital.[18]. In Saxony-Anhalt, the deadline for the switch, which has already been postponed once, is also set as 31/12/2025. A shutdown of FM is possible before than that date, if the criteria laid down by law are already fulfilled at an earlier date. [19]

In Bavaria, open-ended digital and analogue radio broadcasting licences were granted on 01/09/2016. There is a clause enabling the FM licence to be revoked if the station is not also broadcast digitally. In Saxony-Anhalt, the extension of FM licences was tied to the condition that the broadcaster concerned also needed to broadcast its programming via DAB+.

[17] Concerning individual European countries, see EBU; Market Report – Digital Radio 2016; http://www.ebu.ch/files/live/sites/ebu/files/Publications/EBU-MIS%20-%20Digital%20Radio%20 Report%202016.pdf

[18] § 4 para. 6 Saxony's Commercial Radio Act (SächsPRG)

[19] § 35 Media Act of Saxony-Anhalt (MedienG LSA)

Overall, the broadcast licensing practices of the *Länder* are different.

At federal and EU level, on the other hand, at present there are no legal guidelines about the future of analogue terrestrial radio or compulsory introduction of digital terrestrial radio.

For television, the European Commission set a deadline for switching-off analogue TV transmission in 2012, in an action plan and two communications 20 .[21] To support this process, in 2002, the EU adopted the Universal Service directive[22], which provided that only TV sets equipped with a digital interface compliant with the EU standard could be brought onto the market.

3.2. Digital Radio Board

Together with the *Länder*, BMVI set up the Digital Radio Board in 2015, to discuss the changes in radio caused by digitisation with representatives of the commercial and public radio broadcasters, the media authorities of the *Länder*, the car and radio manufacturers as well as network operators, and jointly shape the subsequent developments. In this roadmap, the Digital Radio Board defines the tasks, actions, responsibilities and timetable for a coordinated process. At the same time, the Digital Radio Board oversees the implementation of the roadmap.

In doing so, it considers the positions of the ALM (Association of States Media Authorities in the Federal Republic of Germany), the ARD, Deutschlandradio, the Association of Private Broadcasters and Telemedia e.V. (VPRT), the Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (ZVEI - Central Association of the Electrical Engineering and Electronic Industries) and the Verband der Automobilindustrie e.V. (VDA - German Automotive Industry Association).

The roadmap defines actions to pave the way forward from analogue to digital radio broadcasting.

4. Digitisation of radio broadcasting

4.1. Framework conditions for broadcasters

The public broadcasters could fulfil their statutory mandate to make and broadcast programming operating as a medium and a factor of the process of free individual and public opinion formation, by using suitable transmission modes. In choosing the transmission mode, they have to observe the principles of viability and economy. In assessing viability, the Commission for Identifying the Financial Requirements of Broadcasters (KEF) considers matters including the availability of receivers in households and the mass fitting of cars with receivers.

Commercial radio funds itself with advertising revenue based on usage and coverage. For this purpose, appropriate receivers must be available for the target groups concerned, and the programming must be receivable. The VPRT is therefore calling for the entry into migration phases to be considered only once proven technical usage - and not a merely technical range - of a digital standard reaches 40% in a geographically extensive network structure on a par with that of the ARD broadcasters, based on economic considerations. At the time of the launch of the nationwide DAB+ multiplex in 2011, the VPRT talked about plans according to which for DAB+ programming to be a success, 16 million receivers would have to be reached among users within four years.

According to the digitisation report by the media authorities dating from 2016, at present, there are around 139.4 million FM radios, compared with 8.2 million DAB+ receivers and 4.6 million IP radio receivers. 12.6% of households have at least one DAB+ receivers.

According to the DAT report 2017, 21% of new car buyers and 10% of all used car buyers ordered or bought a car with a DAB+ car radio. 22% of car owners have a suitable receiver. That compares with 76% of new car buyers, 85% of used car buyers and 75%

[20] COM(2002) 263 fin.; Europe 2005: A European Information Society for growth and employment; COM(2203) 541 fin.; Communication from the Commission on the transition from analogue to digital broadcasting (from digital 'switchover' to analogue 'switch-off') and COM (2005) 204 fin.; Communication from the Commission on accelerating the transition from analogue to digital broadcasting

[21] COM(2005) 229 fin.; 1 June 2005

[22] Annex VI to Art. 24; Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009 amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services.

of car owners who own a car fitted with a car radio.[23]

The statements and figures quoted show: The revenue that commercial broadcasters generate from advertising is just as dependent on the availability of receivers in homes and vehicles as the cost-effectiveness of the DAB+ transmission mode for the public broadcasters. So the success of digitisation of radio is fundamentally dependent on the availability of digital receives in homes and vehicles.

4.2. Smart Radio Regulation

The introduction of DVB-T for digital terrestrial TV transmission within a decade is a successful example of a successful analogue to digital migration. A prerequisite for the creation of digital reception possibilities was the obligation imposed on manufacturers and retailers since 1997 to only bring onto the market television sets with an interface for digital reception.[24] In the Universal Services Directive, the EU required this throughout Europe.

In order to strengthen digital radio broadcasting, a comparable regulation is needed for audio receivers. This should be technology-neutral, and guarantee the interoperability of receivers.

Such a measure promotes the technical basis for reception of digitally transmitted programming, and at the same time creates planning certainty for manufacturers and retailers. It will also be necessary to plan for appropriate transitional periods. The ZVEI has called for a lead-time of 1.5 to 2 years for the receiver manufacturers. This period is required both for the development and production of new receivers as well as for retailers to sell-off existing equipment.[25]

An obligation to incorporate digital interfaces into new audio receivers into new radio receivers should, however, not be interpreted as anticipating a switch-off of FM or constituting a precedent for a particular transmission standard. Nevertheless, it will support the digitisation of radio broadcasting.

Measure 1:

In order to support the digitisation of radio, the Federal Ministry for Transport and Digital Infrastructure is proposing to incorporate a provision in the Telecommunications Act that the vast majority of radio receivers would have to be equipped in future with at least one digital interface, enabling reception and playback of digitally encoded content, provided that this is allowable under European law. To achieve advantages of scale in production, Germany will push for this rule to be included in the regulatory framework of other EU Member States.

The BMVI and the *Länder* first called on the European Commission in Spring 2016 to include digital radio in the Digital Agenda for Europe, and to incorporate an obligation to ensure interoperability of radio receivers in the revision of the regulatory framework for electronic communication. In their position papers on the European Commission's planned amendment of the regulatory framework for electronic communication, the United Kingdom[26] and the Netherlands[27] both made similar calls. The European Commission has not responded to the request for such a provision in the regulatory framework for electronic communication[28]. An EU-wide Smart Radio regulation is not achievable at present. The European Commission has revealed itself to be open to national initiatives.

5. Digital future of the radio landscape

5.1. Strategies of the parties concerned

ARD and Deutschlandradio are pursuing the strategic objective of a stand-alone terrestrial transmission mode for radio broadcasting and to introduce digital radio via DAB+ consistently as part of a hybrid strategy. In the long term, they are counting exclusively on digital transmission and the switch-off of all analogue radio transmission modes.

[23] Deutsche Automobil-Treuhand GmbH, DAT-Report 2017; http://www.dat.de/report

[24] Law on the Application of Standards for the Transmission of Television Signals (Fernsehsignalübertragungs-Gesetz - Television Transmission Act - FÜG) of 14 November 1997; now 48 of the Telecommunications Act (TKG)

[25] ZVEI; Position Paper on Complete Digitisation in Radio Broadcasting; July 2015; p. 4

[26] UK Government response to the European Commission consultation on the review of the Audiovisual Media Services Directive (AVMSD); p. 2

[27] Position Paper of The Netherlands on the Review of The Regulatory Framework for Electronic Communications Networks and Services; p. 6

[28] Proposal for a directive establishing the European Electronic Communications Code: https://ec.europa.eu/digital-single-market/en/news/proposed-directive-establishing-european-electronic-communications-code

The operation in parallel of analogue and digital transmission (simulcast operation) will occur for the shortest possible period, and only for as long as necessary. They have signalled the funding necessary for parallel operation to the Commission on the Commission for Identifying the Financial Requirements of Broadcasters (KEF) for the funding period 2017 to 2020. The KEF has allocated the corresponding funding, but pointed out at the same time that it is uneconomic to operate two transmission modes for radio for the period planned by ARD and Deutschlandradio.[29]

ARD plans to achieve virtually nationwide DAB+ coverage of 95% of the population in the period between 2018 and 2020. For network extension and the associated marketing measures, it needs funding of 122.7 million EUR and has proposed a switch-off of FM transmissions after 2025 or after 2028.

Deutschlandradio plans a further extension of its transmitter network and has signed a funding requirement of 73.7 million EUR including 4 million EUR for marketing. It has stated its wish to switch off its FM transmitters in 2025 at the latest.

For DAB+, the KEF allocated ARD funding of 89.4 million EUR and Deutschlandradio 63.6 million EUR. This is tied to a clear call for the politicians to set "clear framework conditions for the introduction of DAB+ and the subsequent ending of a simulcast"[30]

The KEF is therefore expecting that in applications for its 22nd Report in 2019, the following milestones will have been reached:

"1. The decision by the federal government and the *Länder* on the concept for the FM switch-off has been reached;
2. a methodology for determining DAB+ usage has been agreed between the market participants, and usage statistics have been published;
3. the large car manufacturers have been induced via appropriate, possibly regulatory measures, to offer DAB+ radios as standard equipment;
4. at least 27% of households own DAB+ receivers (10% in 2015 and 3.5 annual rates of increase of 33% each).“[31]

ARD and Deutschlandradio are prepared to take FM transmitters out of service incrementally even before the final switch-over to DAB+. They would wish to receive assurances that the FM frequencies released would not be allocated to commercial competitors. Likewise if commercial broadcasters decide to cease FM transmission and transmit exclusively via DAB+, either for all their operations or only in some regions. With a view to transmission on the nationwide DAB+ multiplex, for example Klassik-Radio already switched off its less powerful FM transmitters in 2015.

The media acts of the *Länder* provide that in this case, users must reach agreement about the allocation of the analogue transmission capacity released. In the event of a dispute, the government of the *Land* concerned or its media authority decide on allocation. With the planned switch to DAB+ in mind, basically they could waive a new allocation of any FM frequencies released. Since they are currently obliged by law to allocate available frequencies, usually an amendment is required to media regulation, to rule out further allocation or assignment. On this point, individual *Länder* have quite different positions, so that at present, there appears no prospect of a uniform procedure for the *Länder* to take account of the legitimate interests of the public and commercial broadcasters.

5.2. Measures

There are various and partly contradictory opinions about what to do with the frequencies used for analogue transmission in the FM band. Representatives of commercial radio stations are pressing for the market to be allowed to decide freely between transmission modes and standards. ARD and Deutschlandradio point out that the cessation of the simulcast phase in a transition of terrestrial radio broadcasting from VHF-FM to DAB+ can only happen in collaboration with all market participants, and only at the same time as the commercial broadcasters. Others take the view that a sensible transition to digital terrestrial radio broadcasting in combination with the intended promotion of media pluralism cannot succeed unless analogue transmission capacity which is no longer needed is re-allocated to activating new FM offerings. In order to achieve a balance of interests, the Digital Radio Board proposes the following measure:

[29] 20. KEF Report; Note 299 onward

[30] 20. KEF Report; Note 310

[31] 20. KEF Report; Note 317

Measure 2:

Alternative 1:

A provision will be incorporated into the Frequency Regulation, which provides for the following:

Alternative 2:

The Länder will examine to what extent a provision should be created in the law of the Länder:

If a public broadcaster decides to cease completely or partially the transmission of its programming via FM, the transmission capacity released by this decision shall not be available for meeting additional or different needs for analogue radio transmission.[32]

For Frequency Modulation radio transmission, initially the frequency range from 87.5 MHz to 100 MHz will be used, on the basis of the Stockholm Frequency Plan 1961for Europe and Africa[33]. The allocation for the radio service was extended by the ITU at the WARC 1979 to the range up to 108 MHz[34] and implemented in the Geneva Plan 1984[35] which came into effect in 1987. Only with that extension, and the expansion of broadband cable networks and direct satellite reception did sufficient resources become available to make the current breadth of commercial radio programming in Germany possible.[36]

Nowadays, commercial radio is a second mainstay of the dual broadcasting system. Therefore, media regulation could provide that in parallel to terrestrial FM broadcasting, there must also be an additional digital terrestrial transmission mode. These provisions would contribute to compensating what has been, to an extent for historical reasons, an unequal distribution of the frequency resource between public and commercial broadcasters.

6. Infrastructure for digital radio

An extensive infrastructure is required to make digitisation of radio a success. This concerns both the extension of the Internet for broadcasting via Internet Protocol (IP), as well as the actual radio transmitter network. Accordingly, further measures address both the extension of broadbanks networks in general, and in addition, there are special measures for digital terrestrial radio using the DAB+ standard.

6.1. Internet-based transmission

Germany aspires to play a pioneering role in the penetration and use of digital services. Demand for high-speed Internet connections is rising extremely fast: due to increased video communication and transmission, at the same time as use of digital devices in the home, applications such as digital learning, increased networking within the home, telework or audio services and Internet-based radio. Everyone needs to be able to exploit the advantages of digitisation. Therefore, Germany needs nationwide high-speed networks. The federal government's target is, by the end of 2018, in a first stage based on an efficient technology mix to achieve a nationwide broadband infrastructure with a download speed of at least 50 Mbit/s. In a second stage, the broadband networks should be sustainably focused on the needs of the Gigabit Society and developed further.

Since construction and extension of these nationwide high-speed networks cannot be achieved only through the private sector, state incentives are needed. In the context of its responsibility for the digital infrastructure, the federal government has taken numerous measures to create optimal framework conditions for the private sector to build and extend networks. For example, this was done by making available more former radio frequency bands suitable for broadcasting in wide areas which laid the foundations for enabling access in very rural areas to mobile broadband services, as well as nationwide penetration of smart mobility services. In addition, the federal government and the *Länder* have supported the extension of broadband where a programme extension based purely on economic grounds would not have enabled extension.

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[32] Adaptation of transmission capacities to meet the coverage targets of unchanged existing coverage requirements of the *Länder* are possible to the extent necessary.

[33] Regional Agreement for the European Broadcasting Area, Stockholm, 1961 (ST61)

[34] Final Acts of WARC-79 (Geneva, 1979); http://handle.itu.int/11.1004/020.1000/4.101

[35] Plan for use of the band 87.5-108 MHz for FM sound broadcasting in Region 1 and part of Region 3, Geneva, 1984 (GE84)

[36] See also the 3rd Broadcasting Judgement of the Federal Constitutional Court; BVerfGE 57, 295 FRAG (1981)

Measure 3:
The federal government is currently promoting the extension of high-speed broadband networks with 4 billion euro. It is planned to continue these support measures. In addition, the Länder are providing incentives.

6.2. DAB+ transmitter network

Since the end of 2016, 82% of the population of Germany have been able to receive the programmes of the nationwide DAB+ multiplex in their homes. German motorways enjoy 98% coverage. Other transmitters are planned to achieve virtually nationwide coverage. Progress on extending the transmitter network has reached different stages in the individual German *Länder*.

The ARD broadcasters already have a good DAB+ infrastructure in their *Länder*, and are increasing coverage incrementally.

For local, regional and *Land*-wide commercial stations, basically a North-South divide has emerged. The best coverage is in Bavaria and Baden-Württemberg, and in the city states of Hamburg and Berlin. In other German *Länder*, for example in Mecklenburg-Western Pomerania and Lower Saxony, there are no corresponding commercial broadcasters' networks.

Since the regional broadcasting conference RRC 06 (2006), the requirements in VHF Band III (frequency range from 174 MHz to 230 MHz) in Germany have changed. The originally-planned partial use for DVB-T is no longer being implemented. So the resources in VHF Band III will instead be used entirely for transmission of DAB+. In order to achieve the required coverage, the frequencies have to be negotiated and coordinated with Germany's neighbours. This is based on the *Länder* having shared their ideas on the requirements structure with the Federal Network Agency in September 2016.

6.2.1. Second nationwide multiplex

The first nationwide DAB+ multiplex has made an important contribution to the success of DAB+. Thanks to the multiplex, retailers have included a wider range of DAB+ radio sets in their product range, giving listeners the possibility, regardless of the network extension in the individual *Länder*, to receive digital programming, and due to increased reporting in the media, public attention to DAB+ has grown.

It can be anticipated that a second nationwide multiplex will give the development of DAB+ further impetus. This is also shown by the experience in the United Kingdom and in the Netherlands. In these countries, network operators and broadcasters have joined forces to operate a national DAB+ platform.

The Commission on the Authorisation and Supervision of Media Organisations published a tender on 15/11/2016 for a second, nationwide DAB+ multiplex. The corresponding requirements were reported to the Federal Network Agency and the feasibility confirmed by the agency. The media law approval was granted at the Prime Ministers' Conference on 8 December 2016.

According to the requirements analysis, the requirements must be implemented as far as possible with large-area single frequency networks. If this is not possible at present due to the short implementation deadline and technical constraints, other frequencies will initially have to be used on a transitional basis.

Measure 4:
The Federal Network Agency will make the required transmission capacity available for the implementation of a second nationwide DAB+ multiplex. That includes the option of using Channel 5A, where this is possible without interfering with the adjacent BOS utilisation.

6.2.2. Regional and local DAB+ transmitters

Local radio or regional radio in Germany takes different geographical and organisational forms. In some *Länder*, the broadcasting territory has a diameter of up to 150 km (regional), while in other territories, it is only 10 km (local). Besides commercial local radio stations, there are civic radio and educational radio as well as campus radio stations.

According to a study by the Technical Conference of the Regulatory Authorities (TKLM), it appears possible to cover the broadcasting territories for local radio content with DAB+ too. This would mean that any local radio station would be able to cover at least its current FM territory.

However, for economic reasons, it is not appropriate to install a multiplex capable of transmitting about 15 stations for every broadcasting territory of an individual station. On grounds of making optimal use of frequencies as well as on cost grounds, several local broadcasting territories should be combined into one larger DAB+ area, and broadcast via a shared multiplex. That cuts

the broadcasting costs for every station, and the local radios have the possibility to include more programming in their portfolio. [37] In Bavaria and Baden-Württemberg, it has already been implemented in this way. The broadcasting costs can also be further reduced if local radios can share the use of regional multiplexes.

In order to save more broadcasting costs, a "Small-Scale DAB" concept was developed in Switzerland especially for community radios. Open Source software (ODR-mmbTools) was used to generate the DAB multiplex Eight larger Swiss cities are already covered by small-scale DAB transmitters, and 12 more towns will follow by the end of 2017.

In Germany, a first DAB transmitter using small-scale DAB was built in Rhineland-Palatinate in 2014 (collaboration between the regulatory authority, the technical university of Kaiserslautern) as a pilot project, and it was demonstrated that it could be used in the longer term. Reports on the design and laboratory measurements were published, and based on them, the Institut für Rundfunktechnik built a small-scale DAB transmitter and undertook further research.

The British regulator OFCOM undertook a trial of small-scale DAB in 2015, and published the final report in September 2016.[38]

6.2.3. Funding

The State Broadcasting Treaty provides in its § 40 for media regulators funding the technical infrastructure, which can also used for the switch from analogue to digital terrestrial radio. The *Länder* are making use of this possibility in different ways.

6.2.4. Broadcasting of traffic information and warnings

Use of the radio in the car amounts to 28 minutes per person per day.[39] Most drivers switch on their radio out of habit.

For traffic news, they trust not only the spoken traffic reports, but also their their satellite navigation system, which receives traffic data together with the FM radio signal. The RDS-TMC system currently[40] used no longer meets the requirements for "smart traffic systems".

The European Commission specified its requirements for a modern traffic information system in the ITS Directive[41] and made implementation mandatory for the Member States. On that basis, the Intelligent Traffic System Act (IVSG) was adopted in Germany in 2013.

In its "Road Action Plan"[42], the BMVI assumes that digital radio is indispensable as a transmission mode for traffic information, because it does not generate any additional cost for users and all content is received and evaluated by all navigation devices at the same time. In the context of the national ITS-Road Action Plan (Action area 1.5), the participants collaborated with the objective of conveying all safety-relevant traffic information to road-users with the required quality without additional payment and regardless of the data source[43]. However, radio broadcasters are not compelled to broadcast traffic information. If they nevertheless decide to do so, the information service must fulfil certain conditions.[44]

For traffic information, the National IT Summit[45] is pursuing a hybrid approach consisting of radio and mobile telephony, with a basic offering of safety-relevant traffic information via DAB+ and an individual premium offering via mobile telephony.

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[37] Conference of Directors of the Regional Media Institutions, Technical Committee 2, here: Technische Konferenz der Landesmedienanstalten (TKLM): Digitale terrestrische Verbreitung des lokalen/regi- onalen Hörfunks – Bewertung und Empfehlung von digitalen Hörfunksystemen für die lokale/regionale Hörfunkversorgung, Bericht vom 20.10.2015 (Digital Terrestrial Broadcasting of Local/Regional Radio - Assessment and Recommendation of Digital Radio Systems for Local/Regional Radio, Report of 20/10/2015

[38] https://www.ofcom.org.uk/research-and-data/tv-radio-and-on- demand/radio-research/small-scale-dab-final-report

[39] Gattringer/Mai (FN 2); p. 211

[40] RDS-TMC, Radio Data System – Traffic Message Channel. RDS is a system whereby additional information can be transmitted with the FM radio signal. RMC is a service within RDS for transmission of encoded traffic messages.

[41] Directive 2010/40/EU of the European Parliament and the Council of 7 July 2010 on the framework for the deployment of intelligent traffic systems in road transport, and for interfaces with other modes of transport

[42] http://www.bmvi.de/cae/servlet/contentblob/102800/publicationFile/70307/ivs-aktionsplan-street-broschuere.pdf; p. 16

[43] https://www.bmvi.de/SharedDocs/DE/Anlage/VerkehrUndMobilitaet/Strasse/ivs-massnahmen.pdf?_blob=publicationFile; p. 22

[44] See Article 8 of the delegated Commission Regulation (EU) No. 886/2013 of 15 May 2013 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users

[45] National IT Summit 2015; Kompass Digitale Netze and intelligente Mobilität http://www.bmvi.de/SharedDocs/DE/System/ Digitales/it-gipfel-kompass.pdf?blob=publicationFile; p. 13

The data transmission occurs in TPEG format.[46] In comparison with RDS-TMC
, among other things it offers improved capabilities for location referencing and faster and more frequent data transmission. This is particularly important for safety-relevant information.

At present, the potential of TPEG cannot be fully exploited. On the one hand, not all DAB+ radios in vehicles are TPEG-ready, and on the other hand, the content and quality of the traffic information sent by the mobile phone operators barely differs from that of TMC information.

Measure 5:
The transmission network operators, the automotive industry, and the commercial and public radio broadcasters will sign a joint agreement to create the conditions for TPEG to be fully usable in the field of broadcasting.

Furthermore, EWF (Emergency Warning Functionality) is a development with considerable potential, and is in the trial phase. Using EWF, digital radios fitted with the relevant equipment can receive bad weather and disaster warnings independently of the Internet or mobile phone services.

6.2.5. Determining the number of radios

The KEF has the made the granting of additional funding for DAB+ network extension as from 2020 conditional on at least 27% of households owning a DAB+ radio.

So far, the number of DAB+ radios has been determined by a survey in connection with the Digitisation Report by the media regulation authorities. On the other hand, market research institute GfK produces monthly sales figures for radio receivers. However, that does not include, for example, DAB+ car radios in new cars.

For the decision about a migration from analogue to digital terrestrial broadcasting, it is necessary to have a significant database about the actual market penetration of digital radio receivers. This is becoming urgent, because for its next KEF funding application in 2019, the number of radios sold will be taken into account.

[46] TPEG: Transport Protocol Experts Group – international standard for transmission of speech-independent and multimodal traffic and travel information

Measure 6:
Market participants will agree a method to determine the level of DAB+ equipment by mid-2017.

6.2.6. Determining radio usage

Commercial radio programmes are financed by advertising. ARD organisations also broadcast advertising. Advertisers choose radio stations based on their reach and target groups.

In Germany, reach is measured for all media genres by the umbrella organisation Arbeitsgemeinschaft Media-Analyse e.V. (AGMA). The necessary data is gathered for radio by a computer-assisted telephone interview (CATI) (ma Radio). The interview does not ask which transmission mode the listener uses for the programme. For audio offerings on the Internet, the retrieval of the programmes is technically ascertained (ma IP Audio). This interview is supplemented by surveys to get a comprehensive picture in terms of the personal reach. A convergent reach (ma Audio) is determined from the data for ma Radio and ma IP Audio.

Now there is radio equipment that can measure radio usage electronically, which is comparable with the measurement of TV ratings.

Radio usage via DAB+ is currently not measured separately. In the computer-assisted interview for ma Radio, agma restricts its scope to the FM stations that can usually be received locally. Stations that are only transmitted via DAB+ in the region concerned are not surveyed. Reliable figures concerning radio usage via DAB+ are a prerequisite for assessing the cost-effectiveness of this transmission mode. The KEF will also demand this evidence in support of funding applications for the public broadcasters for the funding period from 2020 onward.

Measure 7:
The market participants will discuss a further development of the measuring methods in liaison with AGMA, which also covers the usage of digital terrestrial transmission. The aim should be to ascertain the reach in an increasingly diverse radio landscape without discrimination, objectively, appropriately and comparably for all transmission modes. From 2018 onward, radio usage via FM and DAB+ is to be published based on the refined measurement methods. It should be ensured that the proof of performance of commercial radio stations which is needed

With regard to the DAB+ usage, representatives of ARD, Deutschlandradio, the media organisations and commercial radio stations agreed with AGMA in May 2016 to carry out a "DAB+ special study" in a first stage.

6.2.7. Digital Radio Office

The introduction of DAB+ will only be a success if all companies and organisations with an interest in success coordinate their diverse activities and speak with a single voice. For this purpose, a project office backed by all parties can play a supporting role, which coordinates the tasks of communication with listeners, retailers, the car industry, etc.

In Switzerland, this task is performed by the MCDT, an SRG company, in which private broadcasters also now have a stake. In the UK, "Digital Radio UK" was founded for this purpose. Comparable organisations exist in the Netherlands and Norway.

Following the example of the UK, the members of the association Verein Digitalradio Deutschland e.V. founded the "Digitalradio Büro Deutschland" in June 2016. It has a manager and other staff recruited from Deutschlandradio. The task of the Bureau is to inform the public about digital radio/DAB+ and coordinate the cooperation by the various stakeholders. The Bureau also manages the promotors who were previously employed by Deutschlandradio. Membership of the association - and the collaboration within the Digital Radio Bureau Germany - is open to any interested market participant without discrimination. The aim is to promote competition among programme makers, within retailing, among equipment manufacturers, platform providers, transmitter operators and providers of transmitter sites.

ARD has set up its own organisation to promote DAB+, which has at its disposal the marketing budget made available by the KEF.

7. Future activities: Timetable

It is not possible to predict with certainty how the switch to digital radio will progress. What will be decisive is which digital transmission mode listeners will trust in the long term. Here, clear development trends are still not definitively identifiable. So the *Länder* will keep a very close watch on the subsequent development of radio, together with the federal government. This roadmap thus creates a media and telecommunications regulatory framework which will continue to promote the further development of the digital transformation of radio.

The measures proposed can mostly only be effective in the long term, but in the view of the *Länder* and the federal government they are necessary to speed up the digitisation of radio.

Final decisions on the digital future of radio can according to the current assessment only be made reliably in a few years' time, based on findings which have yet to be reached about the development of the digital radio market. The media regulators provide an important overview of the digitisation of radio with their annual Digitisation Report. The Webradiomonitor, produced by the Bavarian Regulatory Authority for Commercial Broadcasting, the German Association for Digital Economy (BVDW) e.V. and the Association of Private Broadcasting and Telemedia (VPRT) e.V., also documents the development of Internet radio and online audio offerings each year. These reports have already influenced the decision-making in this roadmap.

Measure 8:

Federal government and Länder support the development process from analogue to digital radio broadcasting. They agree

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