

Radio Spectrum Policy Group

Questionnaire on the long term spectrum requirements for television broadcasting in the European Union including the number of TV services, HDTV, interactive services, mobility requirements and the possible introduction of Ultra High Definition Television

The questionnaire in **Annex 1** has been prepared to facilitate the work of the sub-working group of Radio Spectrum Policy Group (RSPG) preparing the draft opinion on the future spectrum requirements for Wireless Broadband, specifically issues relative to the future of the 700 MHz frequency band (694 -790 MHz). This frequency band is currently used in Europe for terrestrial television and in many countries also for PMSE on secondary basis and represents approximately 30% of the total remaining UHF spectrum used by the television broadcasting. The impact of an exclusive reallocation of this spectrum to wireless broadband will therefore be significantly more important for the broadcasting service than in the case of the 800 MHz band.

The responses to the questionnaire¹ will contribute to the analysis of the RSPG on the future use of the 700 MHz as well as on the evolution of the digital terrestrial platform (DTT) over the next decade (2012 – 2022)

For more information on the background to the various elements of the questionnaire see **Annex 2**.

For an example of how to respond to Question 1 please see **Annex 3**.

Please submit completed questionnaire contained in Annex 1 and return to [zeeshan.nazneen@comreg.ie] by [Friday 28th September 2012].

¹ The RSPG is aware of the ITU-R WP 6A questionnaire which addresses similar issues and we will if possible try to use responses to that questionnaire to complement the information/views in the draft opinion.

Annex 1: Questionnaire

Member State Response details (please complete):

<i>Member State</i>	<i>Name</i>	<i>Organisation</i>	<i>Date</i>
Germany	Dr. Ronald Lorenz	MEDIA BROADCAST GmbH	27.09.2012

Question 1 (consider section 1 of Annex 1 to help you with your answer):

(See Annex 2 for example answers for your assistance)

i) Please describe the DTT platform in your country, currently on-air, in following terms (please use the following format for your answers):

Member State	No. of Multiplexes	Reception availability	Reception mode²	Number of TV program services and content format	DTT System and modulation	Intended coverage reach³	Coverage obligation (Y/N)⁴	Coverage (as a percentage of population)	Spectrum band used (UHF IV/V or VHF Band III)
D	1	Free-to-air	Fixed / Portable outdoor / Portable Indoor/ Mobile	4 SD per MUX	DVB-T 16QAM-2/3	National; 95%-100% population	Y	90%-100%	UHF IV/V
D	2	Free-to-air	Fixed / Portable outdoor / Portable Indoor/ Mobile	4 SD per MUX, 5 or 6 if higher modulation scheme is used (see next column)	DVB-T 16QAM-2/3, some local provider use DVB-T 64-QAM-1/2 or DVB-T 64-QAM-2/3	Regional; 95%-100% population	Y	90%-100%	UHF IV/V

² E.g., fixed (roof-top), portable indoor, portable outdoor, mobile.

³ E.g., national, regional, local.

⁴ Is there a legislative coverage obligation, e.g., a Public Service Broadcaster.

D	3	Free-to-air	Fixed / Portable outdoor / Portable Indoor/ Mobile	4 SD per MUX	DVB-T 16QAM-2/3	Regional; 75%-80% population	Y	55%-66%	UHF IV/V
D	2	Free-to-air	Fixed / Portable outdoor / Portable Indoor/ Mobile	4 SD per MUX	DVB-T 16QAM-2/3	Local; 15%-20% population	Y	15%	UHF IV/V
D	1	Free-to-air	Fixed / Portable outdoor / Portable indoor Mobile	4 SD per MUX	DVB-T 16QAM-2/3	Local; 10%-15% population	Y	6%	UHF IV/V

ii) Are there plans to deploy (a) additional DTT multiplexes and/or (b) foresee the launch of new services **in the short term (1 – 5 years)**?

(a) additional DTT multiplexes (please use the following format for your answers)

There is no intention to deploy additional multiplexes for Public Service Broadcasters (PSB).

In some densely populated areas where DVB-T acceptance is high, a few transmitters may be added by Commercial Broadcasters. The Coverage area of existing multiplexes may be increased. This could be done either by increasing the area of Single-Frequency Networks (SFNs) or by moving frequencies from rural areas to urban and metropolitan areas.

To increase capacity in Commercial multiplexes, 64QAM will be used in some areas.

Member State	additional Multiplexes (Y/N)	No. of additional Multiplexes	Reception availability	Reception mode ⁵	Expected content format (SD and or HD)	Expected DTT system and modulation (if known)	Intended coverage reach ⁶	Intended Coverage (as a percentage of population)	Spectrum band used (UHF IV/V or VHF Band III)
D	Y	1	Free-to-air	Fixed / Portable outdoor	4 SD	DVB-T 16QAM-2/3	local	5% population	UHF IV/V
D	Y	1	Free-to-air	Fixed/ Portable outdoor	6 SD	DVB-T 64QAM	regional	15%-20% population	UHF IV/V

(b) foresee the launch of new services (please use the following format for your answers)

[It is understood that the new services mentioned below should relate to the terrestrial broadcast platform, since all of the mentioned services (apart from UHDTV) already exist to some extent on other platforms (cable, satellite, ADSL)]

Member State	Additional Services (Y/N)	Expected content format (SD and or HD)	Reception availability	Expected content format (SD and or HD)	Interactive services (Y/N)	VoD (Y/N)	Ultra High Definition on TV (Y/N)	Other (Y/N)	If answer Yes to Other, please specify
D	Y	HD	Free-to-air	HD	Y	Y	N	N	

⁵ E.g., fixed (roof-top), portable indoor, portable outdoor, mobile.

⁶ E.g., national, regional, local.

iii) When do the existing DTT licenses in your country expire?

Answer: Almost all by 31st of December 2025

Question 2

How do you foresee different means of reception (DTT, ADSL, Cable, satellite etc.) complementing each other?

Answer:

DTT, Cable, Satellite, IPTV (ADSL) and Internet based services are considered complementary with regard to the provision of future linear and non-linear broadcast content.

DTT, Cable, Satellite and IPTV provide linear broadcast content to the home; additionally, ADSL provides non-linear broadcast content to the home. DTT provides coverage for mobile and portable linear broadcast content. Wireless broadband complements the former by providing linear and non-linear content to mobile and portable devices.

Beyond the purely technical aspect of content provision, political, cultural and social aspects especially of Public Service Broadcasting are to be taken into account. This includes e.g. free-to-air reception, discrimination-free access to platforms and full population coverage.

Question 3:

i) Do you think that the DTT platform in your country will evolve to being capable of delivering audio-visual services also to mobile terminals?

Answer:

The DTT platform in Germany already provides portable and mobile reception for more than 90% of the population. There are hundreds of portable and mobile devices on the market, and more than 1 million cars are equipped with DVB-T receivers. It is the intention to enhance the coverage to about 95%.

On the other hand, there are no DTT receivers built-in in smartphones and tablets (with very few exceptions), and the DTT platform (in Germany) is available on such devices only by using additional devices.

There is no principal technical problem to integrate DTT receivers, it is just due to business policy. This has been clearly demonstrated by some DVB-T-mobile phones which have been available on the German market for a longer time, and in South Korea where a major part of the Smartphones is suited to receive TV via the DMB standard.

- ii) If yes, what is the required evolution of the DTT network platform architecture? Please give details in relation to: -
- a. the DTT network topology (whether there will be a need to migrate from high- power/ high- tower to low- power/ low- tower type of networks);
 - b. to the use of MFN versus SFN networks to achieve the evolution, and
 - c. a possible migration to a new DTT system(e.g. to facilitate interactive services) and transmitting technologies (e.g., DVB-T2, DVB-T2 Lite, etc.).

Answers:

- a) As explained under i), the DTT platform in Germany already delivers linear broadcast content to portable and mobile receivers. The transmission is based on an economically viable high-power/high-tower network concept, with almost all transmitters operating in SFN's. Most probably, non-linear broadcast content to portable and mobile terminals will be provided to a greater extent by wireless broadband networks based on low-power/low-tower networks.
- b) Almost all DTT networks in Germany are based on the SFN approach, in order to best fit to service area requirements and to achieve a high spectral efficiency. Some of these SFN's are very large and already reach technical limits (self-interferences).
- c) Migration to DVB-T2 is currently under investigation, and detailed roll-out plans are to be developed and agreed by all partners. DVB-T2 will provide a higher picture quality and/or an increased number of programs within the same amount of spectrum, while maintaining the possibility to be received in a portable as well as a mobile environment. The migration will require additional spectrum in the UHF band for the transition period. Severe improvements/enhancements in services to be provided – e.g. picture quality, number of services and new formats (see above) – are needed in order to attract customers to migrate from DVB-T to DVB-T2 in a relatively short time frame, e.g. in order to minimize the above mentioned simulcast period.

- iii) Do you believe that a DTT platform evolving towards delivering audio-visual services also to mobile terminals may also be used by mobile operators to cope with:

- a. the data traffic required to deliver linear video content (i.e., with mobile terminals including broadcasting tuners), and
- b. certain non-linear content that could be pushed (and stored)?

Answers:

- a) Mobile operators would need to use a DTT platform for the delivery of linear broadcast content at least for short and medium term, e.g. because of the required data capacity on one hand and concerned costs on the other hand.
- b) Cooperation of the DTT platform and the mobile platforms with respect to push and store of non-linear content is currently under investigation.

- iv) What evolutions do you expect would be required for mobile networks to be capable of delivering linear video content ubiquitously to both fixed and mobile terminals?

Answer:

In order to be capable of delivering linear public broadcast content, mobile networks would have to be available virtually everywhere in the country. In addition, mobile networks would have to provide a data capacity of 100 MBit/s or more in broadcast mode which allows for the supply of at least the same programme offer as provided currently by DTT networks. In densely populated areas an even higher data rate of more than 200 Mbit/s might be needed (PSB plus Commercial multiplexes).

At the same time, costs of such mobile networks should be comparable to or at least in the same order of magnitude than costs for DTT networks.

Current mobile networks are far from being able to facilitate this.

- v) Of a possible convergence between terrestrial mobile and (evolved) DTT platforms, what do you consider will be the consequences of mobile networks being capable of delivering linear video content to mobile terminals?

Answer:

A proposal which is currently on some tables is to provide linear video content via mobile networks using LTE radio technology. However, studies which have been carried out so far come to the conclusion that costs for such mobile networks will be dramatically higher than those for typical broadcasting networks. One reason is that the network itself will consist of thousands of transmitters (for Germany), another that a certain “backhaul”-infrastructure is needed in order to supply data and control all transmitters (it is explicitly noted that transmitters have to transmit synchronized).

On the other hand, spectrum efficiency and overall content delivery costs are not (only) a question of radio technology, rather than of network topology. A few things are summarized below:

- It can be easily shown that DVB-T2 as a radio technology is more spectrum efficient than LTE. This is especially true if the same network topology is considered and the impact of inter-transmitter distances is taken into account for LTE networks as well as guard bands and duplex gaps (“entire spectrum consumption”).
- In addition, the overall spectrum need of mobile networks need to be taken into account, including e.g. guard bands and duplex gaps. Other services or applications like PMSE or Wind Profile Radars can not be operated in close spectrum proximity to mobile networks, e.g. due to relatively high out-of-band emissions and transient effects of mobile terminals.
- Huge or even nationwide SFN’s could be implemented by using either DVB-T2 or LTE. Especially for LTE, this has to be based on a lattice with very low inter-transmitter distances (according to current standards and technology). Networks⁷ based on smaller cells and/or much shorter distances between two transmitters are (much) more expensive.
- On the other hand, not all TV programs are distributed uniformly on the national German level, e.g. because of different federal Media Laws. Consequently, a uniform distribution of programs which are not to be provided for the entire of Germany using only a single (nationwide) frequency channel without delimited supply areas is not feasible. Further restrictions are due to national borders.
- Furthermore, it might be useful to consider receive antennae of mobile terminals in detail. An improvement in antenna gain of the order of 4 to 6 dB could be achieved, which would result in severe link budget improvements and potentially lower costs. On the other hand, the lower the frequency is the larger is the wavelength, resulting in larger physical dimensions as well as lower antenna gain.

Hence, the potential advantage of mobile radio networks with respect to spectrum efficiency is restricted. It is still unclear whether the terrestrial television supply of Germany by mobile networks would be feasible with less frequency spectrum than is required today for broadcasting or not.

⁷ This includes e.g. „backhaul“ and synchronization.

Question 4:

- i) How many DTT multiplexes do you expect will be needed in your country in the long-term (beyond 2020),

Answer:

We expect and plan for 6 multiplexes, intended mainly for portable and mobile reception, interleaved in 320 MHz in the UHF band (470 - 790 MHz). These networks are needed to fulfil the requirements of PSB and of Commercial Broadcasters, taking into account the above mentioned reception requirements (resulting e.g. in relatively robust DTT mode(s)) as well as quality requirements (e.g. HD).

3 multiplexes out of these 6 multiplexes are envisaged to cover the demand of public service broadcasters for full area coverage (95% - 100% population coverage).

The other 3 multiplexes will be used by Commercial Broadcasters either for nationwide (full) area coverage, or alternatively, to provide metropolitan and local area coverage with more than 3 multiplexes.

Country	No. of Multiplexes	System & Modulation	Reception Mode	Capacity per multiplex (Mb/s)	Intended Percentage Population Coverage	Content per Multiplex	Total Capacity (Mb/s)	Total Spectrum Bandwidth needed (MHz)
D	3	DVB-T2, 64-QAM	Fixed, portable, mobile	20 - 25	95% - 100%	4 - 8 HD/SD	60 - 75	168 ⁽¹⁾
	3 ⁽²⁾	DVB-T2, 64-QAM	Fixed, portable, mobile	20 - 25	95% - 100% ⁽²⁾	4 - 8 HD/SD	60 - 75	168 ⁽¹⁾

- ⁽¹⁾: From experience with the GE06 planning process and experience with coping with the impact of Digital Dividend I, it is assumed that on average 7 channels are required to provide one layer with full (nationwide) area coverage. Overall, it is expected that the intended coverage target can be almost achieved with the presently available spectrum of $2 \times 160 = 320$ MHz (470 – 790 MHz). This takes into account also secondary services such as Radio Astronomy and Wind Profile Radars which cannot be “migrated”.
- ⁽²⁾: 3 multiplexes with full area coverage (95% - 100% population coverage) or more than three multiplexes on a local/regional basis with overall population coverage much lower than 95%.

ii) What services do you expect the DTT multiplexes to carry (assuming use of DVB-T2/HEVC)?

Answer:

It is expected that almost all of the current programmes will be in HD quality in the future.

iii) What transition and migration paths do you anticipate will be required to achieve this long-term DTT goal for your country?

Answer:

A transition period with a certain simulcast will be required, especially in all congested / densely populated areas where DTT acceptance is relatively high. Therefore, extra spectrum is required in order to migrate from traditional linear-only DTT in SD quality to a future converged linear/non-linear programme offer in HD quality.