EBU
OPERATING EUROVISION

RSPG / Wireless Broadband Sub-Group

Only by e-mail to:
zeeshan.nazneen@comreg.ie

28 September 2012

DT/83

Dear Sir or Madam,

**Please find attached the response of the European Broadcasting Union (EBU) to the "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"**

EBU is an industry association representing 85 broadcasting organisations from 56 countries. Please note that this response concerns only questions 2 and 3 of the questionnaire, as responses to questions 1 and 4 are country specific. In addition to this reply, you will find in the attachments a selection of related EBU publications. We have also attached a copy of the EBU reply to the ITU-R questionnaire on broadcasting spectrum requirements dated 31 July 2012.

Yours Sincerely,

For the European Broadcasting Union,

**Peter MacAvock**
Technology & Innovation



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28.09.12

**EBU response to the**

**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

EBU
OPERATING EUROVISION

## Questionnaire

## Member State Response details (please complete):

| *Member State* | *Name* | *Organisation* | *Date* |
|---|---|---|---|
| | | **European Broadcasting Union** | **.. September 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 mode[1]** | **Number of TV program services and content format** | **DTT System and modulation** | **Intended coverage reach[2]** | **Coverage obligation (Y/N)[3]** | **Coverage (as a percentage of population)** | **Spectrum band used (UHF IV/V or VHF Band III)** |
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[1] E.g., fixed (roof-top), portable indoor, portable outdoor, mobile.
[2] E.g., national, regional, local.
[3] Is there a legislative coverage obligation, e.g., a Public Service Broadcaster.

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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)

| **Member State** | **additional Multiplexes (Y/N)** | **No. of additional Multiplexes** | **Reception availability** | **Reception mode[4]** | **Expected content format (SD and or HD)** | **Expected DTT system and modulation (if known)** | **Intended coverage reach[5]** | **Intended Coverage (as a percentage of population)** | **Spectrum band used (UHF IV/V or VHF Band III)** |
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(b) foresee the launch of new services (please use the following format for your answers)

| **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 TV (Y/N)** | **Other (Y/N)** | **If answer Yes to Other, please specify** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

[4] E.g., fixed (roof-top), portable indoor, portable outdoor, mobile.
[5] E.g., national, regional, local.

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

Answer:

**Question 2**

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

Answer:

TV is today distributed by several platforms such as DTT, cable, satellite and ADSL. These platforms complement each other in order to provide broadcasters´ services to basically everybody. The various platforms have different characteristics and the uptake varies a lot across Europe.

The platforms complement each other in terms of

- coverage and reach
- programme offer
- interactivity
- free-to-air versus subscription based services
- ability to distribute services for portable/mobile consumption

DTT in general provides universal coverage and easy access for most viewers. In many countries the terrestrial broadcast platform is the primary means of delivering broadcast services. For EBU members it has an important role in fulfilling their universal service obligations and general interest objectives. The uptake of DTT is steadily growing and the terrestrial platform remains very important for television distribution in the vast majority of European countries. According to the latest data available, 53% of EU households rely on terrestrial networks for their TV reception (Special Eurobarometer 362, July 2011). Some

European countries have over 80% DTT viewer uptake and in countries like Spain, Italy and France, DTT is the principal means of TV reception for the majority of the population.

Cable TV is predominantly available in areas of high population and can not generally be expected to expand further. Satellite transmissions can be received in large areas but require line of sight between the satellite and installation of a receiving satellite dish, which may not always be possible. ADSL based TV distribution is still very limited in most European countries and the capacity required for IPTV distribution can not be provided everywhere since it depends on the distance from the user's premises to the nearest telephone exchange.

In many cases a household´s second and third TV sets are served by DTT, even though the first set may be served by some other platform. This includes TV reception in summer houses etc.

While DTT networks in many countries primarily are designed for fixed reception, DTT also provides the possibility for mobile and portable reception, at least in areas where the DTT signals are strong enough. In some countries the DTT networks primarily are designed for portable reception.

DTT generally provides a wide offer of the most popular programme services, including regional and local services. Satellite often offers a larger number of channels, in particular international ones, but very few or no regional and local services. Depending on the size and scope of a cable network the programme offer could be very large or quite limited. Any regional and local programmes in cable networks in many cases originate from DTT transmissions.

DTT and satellite broadcasting do not inherently offer a return path. In order to provide interactive or hybrid services these platforms need to be combined with some sort of broadband access, which could be wired (such as ADSL) or wireless. Many large cable networks today include broadband access while ADSL of course provides interactive possibilities. It should be noted that the capacity requirements for the broadband access is much lower if the bulk of the TV traffic is carried by a broadcasting network and not by the broadband network.

One very important feature, in particular for public broadcasters, is the ability to deliver the TV signals free to air. Viewers should be able to receive such services without the need for extra payment. In all countries DTT provides a certain programme offer free to air, in many cases complemented by subscription based DTT services. Cable is normally provided through a subscription, even though some "free to air" channels could be mandated by must carry regulation. Satellite is in general subscription based, sometimes complemented by free to air channels. ADSL is always subscription based.

It is evident that business models and costs for viewers and broadcasters differ for the platforms and that different households may prefer different TV distribution solutions. The various platforms complement each other and provide alternatives for TV reception on the market, thus promoting competition and choice for the public. Broadband technologies are increasingly important as a complement to broadcasting, in particular for the delivery of non-linear services.

**No alternative technology will be able to replace terrestrial broadcasting in all aspects in the foreseeable future**. All relevant issues, both technical and non-technical, such as costs, coverage, access to the networks, QoS, control over the signal integrity, and contact with the audiences need to be taken into account in assessing various options.

To remain viable any platform needs to have suitable conditions for development and evolution. In the case of DTT, such evolution includes generalizing High Definition Television and offering 3D and Ultra High Definition television. This requires access to suitable and sufficient frequency resources to allow transition to these enhanced services.

**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:

Yes in some countries, but not in others.

Mobile terminals, including smartphones, tablet computers and TV receivers built in cars and other vehicles are increasingly being used by the viewers and listeners for access to audio-visual content and services. It is in the interest of the EBU Members and other European broadcasters to ensure that technically and cost efficient platform is available to deliver the full range of broadcasting services.

The role of DTT is specific to the circumstances in each national market. In many countries it is the principal means of receiving TV services for large parts of the population. The main target is large TV sets intended for stationary viewing. Usually, the emphasis is on maximising the DTT capacity and providing near-universal coverage (e.g. more than 98% of the population) for the reception via roof top aerials. Portable reception, including for large screen TV sets, is possible in those areas where signal strengths is sufficiently high. However, in some countries, the evolution of the DTT platform towards delivering audio-visual services also to mobile terminals may be constrained by the possible loss of capacity for fixed reception.

DTT networks can be, and in some countries are, designed for mobile reception. However, the target receivers for DTT services are portable and mobile TV sets. Mobile terminals such as smartphones and tablets currently available in Europe are in general not equipped with DTT tuners and thus cannot connect to

DTT networks. Consequently, the market demand for audio-visual content on smartphones and tablets is currently addressed only via wireless broadband (i.e. mobile communications networks and in particular WiFi networks). As only the unicast mode is possible on wireless networks this fuels the growth of data traffic on broadband networks while the potential of DTT remains unused.

It is the EBU view that innovative broadcast services to both fixed and mobile terminals can be facilitated through a cooperative use of DTT and mobile broadband networks. The two platforms are complementary in terms of their capabilities, i.e. mobile broadband networks are optimised for delivering one-to-one services while DTT is optimised for delivering services requiring a high sustained data rate (such as TV) to large audiences simultaneously. Concerning delivering audiovisual services to mobile terminals the two platforms are addressing the same users, but (at least partly) for different types of services. It is of course necessary that mobile terminals also include a tuner for DTT reception in addition to their tuner for reception of broadband services.

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.).

Answer:

a) Architecture of DTT networks is determined by the service requirements and coverage targets, taking into account regulatory and legal requirements and cost considerations. Reception on handheld devices, in particular indoors and in mobile conditions, requires higher level and more homogeneous distribution of radio signal compared to the fixed, roof top reception. In order to cover large areas for mobile reception, DTT networks would probably need to become denser than is currently the case, in combination with a suitable choice of transmission modes and power. However, we see no need for DTT topology to change as to resemble that of the cellular dense networks. The mobile networks need to be dense in order to cope with increasing traffic demand while the capacity of a DTT network is independent of its level of densification.

b) The DTT platform has already evolved towards SFNs, which are a well-established and mature technique. Indeed, broadcasters have already implemented SFNs in many European countries, in particular to provide regional coverage.

Delivery to mobile terminals can be achieved by either MFN, or SFN networks, or a mixture of both. SFNs may in some cases increase spectrum efficiency and improve quality of mobile coverage compared to MFN. However, SFNs architecture also bears a number of inherent constraints, in particular those

related to self-interference[6], which require trade-offs to be made between the size of the coverage area, capacity, ruggedness and costs. Therefore, implementing SFN does not automatically lead to better performance for mobile delivery.

c) The current DTT networks are optimised for delivery of linear broadcasting services and have on their own a limited ability to carry advanced broadcast services which require both forward and return path including on-demand, interactive, hybrid, data and multi-screen services. DTT can in any case provide a forward path and carry a linear component of hybrid services (HbbTV). Advanced interactive broadcast services are dependent on the availability of broadband connection and consequently their reach is constrained by the penetration and the capabilities of the broadband platforms. However, broadband networks on their own, in particular mobile broadband, seldom have sufficient capacity for a universal delivery of broadcast services to large audiences with a sustained quality of service. If broadcast networks are used in conjunction with broadband networks the delivery of the whole range of broadcast services could be facilitated.

DVB-T2 is an improved, second generation of the DVB-T standard. It provides significant improvements over earlier specifications and it is expected that DVB-T2 will eventually prevail on DTT platform. However, this evolution will have to take account of economic realities, in particular the investments in DVB-T based equipment made by DTT network operators and the public in the course of the recent analogue to digital switch-over. It is likely that DVB-T and DVB-T2 will co-exist for a prolonged period of time.

DVB-T2 facilitates efficient delivery of broadcast services to mobile terminals. By configuring the system parameters accordingly, services can be optimized for fixed reception as well as for mobile and/or portable reception. DVB-T2 even supports the coexistence of services with different protection requirements within one multiplex. In addition, a specific profile, *T2-Lite*, has been defined in the DVB-T2 specification to allow simpler receiver implementations for mobile broadcasting. *T2-Lite* can be mixed with conventional T2 signals in a single multiplex while allowing separate optimisation for the delivery to handheld devices. Mobile T2 receivers are not yet available on the market. Ideally, they would be integrated in the mass market mobile terminals.

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)?

[6] Self-interference is an effect of mutual interference between transmitters in the same network. As all transmitters operate on the same channel, under some conditions signals from remote transmitters can disrupt the reception of signals from near-by transmitters. Mitigating self-interference may lead to the reduction of the available transmission capacity in particular for large SFNs.

Answer:

Yes.

a) Audio-visual services generate a large and growing portion of data traffic on mobile networks. At the same time most of these services have stringent requirements in terms of quality of services (QoS). Both present a challenge to mobile network, in particular if the same content is requested by a large number of users at the same time (e.g. for live events). As mobile networks at present only provide unicast connections delivery costs are correlated with the size of the audience. Furthermore, the costs of providing the required capacity in the cellular networks are prohibitive, except in some limited, notably urban areas.

   At the same time DTT networks provide a near universal coverage and are optimised for precisely this type of services. Delivery costs on DTT are independent of the number of concurrent users.

   There seems to be a clear case for cooperation between terrestrial broadcasting and wireless broadband. While both platforms would continue to operate independently when required for specific services, their combination could facilitate significant technical and cost efficiencies to be achieved. A number of benefits for all stake holders are to be expected from such cooperation. Broadcasters would be able to offer a full range of services to mobile users. For the mobile operators it may be of a particular interest that a significant part of data traffic would be offloaded from the mobile networks while at the same time extending coverage and quality of service. In that way the value of DTT platform as well as mobile networks would increase. The immediate pressure to find additional spectrum for mobile services would be reduced. The users would benefit from an increased choice of services and seamless integration of both broadcast and broadband delivery.

   Integrating broadcasting receivers in mobile terminals is an attractive and relatively simple solution. While such devices are not yet available in Europe, they are common in other regions of the world such as US, Japan, Korea and China (see annex 1 to this response).

   The required regulatory intervention would be minimal, if any. **However, it would be very important for the European regulators to give a clear signal to the market concerning long term certainty for the DTT platform.**

   Furthermore, a common core specification for mobile terminals should be included in both future DTT and mobile broadband standards in order to facilitate access to rich media services irrespective of the delivery method.

b) DTT networks have been rolled out for a specific purpose of delivering broadcast services. However, the underlying technology, in particular DVB-T2 is capable of carrying other types of content and services. Furthermore, combining broadcasting and broadband delivery with the storage capabilities in the user devices would open new possibilities for the delivery of content and services. Live content requires to be delivered in real time. Pre-produced programmes could for example be placed in the storage and 'released' within linear sequence without affecting the user's TV experience. Furthermore, the stored content could remain available for later viewing or listening (e.g. catch-up) without the need for a repeated delivery over a network.

Similar mechanisms could be applied for other type of content, e.g. 'push' on-demand audio-visual and other services, software upgrades, etc. More possibilities would emerge as the technology, services and network operation practices develop.

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:

Mobile technology is already capable of delivering linear video content to mobile terminals. However, mobile networks currently have a limited capability of delivering linear services to large audiences, in particular because of the following:

- Insufficient capacity;
- Limited coverage where sufficient QoS can be sustained (e.g. the fact that a signal from a mobile network is available on a given location does not necessarily mean that high bitrate service such as linear TV is available);
- High costs of delivery;
- Fixed terminals (e.g. TV sets) are currently not capable of connecting to a mobile network.

Mobile networks would need to address the above mentioned issues if they are to become a viable platform for the delivery of linear video content to large audiences. Some of the possibilities are outlined below:

- Migration to LTE and wider frequency channels in order to maximize spectrum efficiency.
- Implementation of a broadcast mode in mobile networks (e.g. LTE eMBMS) in addition to unicast. Without broadcast capabilities it is not realistic to assume that mobile networks will become a viable delivery platform (For comparison: if the TV services currently available on DTT were to be delivered over mobile broadband networks on a unicast basis the consequential data load would be a few orders of magnitude higher that the total data traffic

currently carried on mobile networks). Furthermore, currently only up to 60% of the channel capacity can be used for eMBMS while the available guard intervals do not allow large distances between base stations. Therefore, LTE specification may need to be further developed in order to enable eMBMS to use the full channel capacity and large inter-site distances.

- Ensuring a sufficient Backhaul capacity, i.e. capacity from the base stations to the core network (For example: 30-50 TV programmes are currently available on DTT in many countries. This number may further increase in the future. Furthermore, all TV services intended for viewing on large screens will in the future be delivered in HD quality. Even with the expected advances in coding techniques this would require a Backhaul capacity in excess of 150-200 Mb/s for linear TV alone.)
- Capability to cooperate with DTT (see the reply to question 3 iii) above). This may include appropriate spectrum sharing scenarios.
- Innovative solutions for indoor coverage where a vast majority (>80%) of media consumption takes place. It is not optimal to serve this demand exclusively from outdoor networks. WiFi offload, and femtocells are some of the possible solutions.

Furthermore, mobile networks should be considered in a wider context of the development of electronic communications infrastructure, including fixed broadband and broadcasting platforms. Areas of possible improvements include:

- Avoiding duplicating mobile network infrastructure as it leads to fragmentation of the spectrum resource and is not optimal in the situation of spectrum scarcity.
- Building up the capacity of mobile networks in order to enable services that can efficiently be delivered by the existing other means (For example: linear TV services are already being provided over DTT. Mobile networks are not a viable alternative to DTT. The two platforms should be used in a complementary way which would facilitate their evolution and possible future convergence).

The governing principles should be the service quality, availability, costs and benefits for the users.

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:

The consequences will largely depend on the scope and timeframe of such convergence. There are many aspects that will determine the significance of the fact that mobile networks would be capable of delivering linear video content to mobile terminals, such as:

- Similar capability of other delivery options (e.g. DTT or WiFi);
- Associated business models and their market acceptance (e.g. free-to-air, pay model, broadcast or unicast);
- Costs;
- Importance of mobile terminals for linear viewing (e.g. as opposed to large screens).

A number of benefits could be expected from a cooperative utilisation of DTT and mobile networks (see the response to question 3 iii) above). However, this assumes a scenario where (evolved) DTT and mobile networks continue to coexist.

Further convergence may take place in the future and it may take various forms. From the broadcasters point of view there are several criteria that are equally applicable to any delivery option, including mobile networks. These criteria are:

- Technical quality and reliability - capability of continuously supporting the required QoS;
- Service availability and reach - including the extent of coverage, the categories of devices that can be addressed and the market acceptance;
- Costs for both broadcasters and users.

One additional criteria that is important for EBU Members is that a delivery platform helps to fulfil their public service remit.

Furthermore, mobile networks would possibly need to be subject to coverage and service obligations. Terrestrial broadcasting has been the only delivery platform that offers universal coverage and free-to-air reception. It would be important to facilitate free-to-air model also on mobile networks.

Innovative regulatory and business models may be required.

**Question 4:**

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

Answer:

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

Answer:

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

Answer:

Attachments (in separate files):

1. TR013 EBU technical Report on “The Future of Terrestrial Broadcasting”
2. TR014 EBU technical Report on “What follows HDTV? A status report on 1080p/50 and ‘4k’”
3. TR015 EBU technical Report on “Defining Spectrum Requirements of Broadcasting in the UHF Band”
4. R131 EBU Recommendation on “Terrestrial Broadcasting in Europe”
5. EBU reply to ITU-R questionnaire on broadcasting spectrum requirements, 31 July 2012

Annex 1

# Examples of broadcast receivers integrated in mobile devices

There are numerous examples around the world where mobile phones equipped with broadcast receivers are already available on the market. FM receivers are certainly the most widely spread type of integrated receivers but there are also digital receivers of different types. The following is a non-exhaustive list of links where more information on these kinds of mobile phones can be found.

***USA***

http://www.usatoday.com/tech/news/story/2012-01-04/metropcs-tv-tuner/52377470/1

http://www.fiercemobilecontent.com/story/dyle-outs-samsung-lightray-4g-first-local-broadcast-tv-phone/2012-08-02

***Japan***

http://en.wikipedia.org/wiki/1seg

http://wirelesswatch.jp/2012/04/05/mmbi-launches-nottv-mobile-broadcasts/

Deployment of Mobile Multimedia Broadcasting based on ISDB-Tmm technology in Japan

***South Korea***

http://en.wikipedia.org/wiki/Digital_Multimedia_Broadcasting

http://www.nytimes.com/2010/05/31/technology/31mobiletv.html?pagewanted=all, note the following paragraph:

*In South Korea, 25 million people watch free digital terrestrial broadcasts on mobile handsets and two million pay to subscribe to satellite programming, according to Korean broadcasters. The typical screen made by Samsung is a three-inch, or 7.6-centimeter, diagonal. Batteries support three to six hours of viewing. In Korea, free mobile TV broadcasts are interspersed with ads.*

- see also the Korean Outlook (end of section 2.2.1)

***China***

http://en.wikipedia.org/wiki/China_Multimedia_Mobile_Broadcasting

http://sanchezi.edublogs.org/2011/04/23/mobile-phone-tv-solution-of-cmmb-td-scdma/