

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 –JOINT RESPONSE FROM UK PUBLIC SERVICE BROADCASTERS AND MULTIPLEX LICENCE OPERATORS

Member State Response details (please complete):

<i>Member State</i>	<i>Name</i>	<i>Organisation</i>	<i>Date</i>
<u>United Kingdom</u>	<u>Peter Couch / David Hemingway</u>	<u>Joint response on behalf of Arqiva, BBC, ITV & Channel 4</u>	<u>28 / 09/ 2012</u>

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)
UK	2	99.995%	fixed	9 SD MPEG2	DVB-T, 64-QAM FEC 2/3	National but including regional services	Y	99.2%	UHF Channels 21 – 60
UK	1	99.995%	fixed	5 HD MPEG4	DVB-T2, 256-QAM FEC 2/3	National	Y	99.2%	UHF Channels 21 – 60
UK	3	99.995%	fixed	11 SD MPEG2	DVB-T, 64-QAM FEC 3/4	National	N	92.0%	UHF Channels 21 - 60

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)**?

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.

(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 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)
UK	Y	1	99.995%	fixed	SD	DVB-T, QPSK FEC $\frac{3}{4}$	Local	Approx 50%	Geographic Interleaved Spectrum UHF Channels 21 – 60
UK	Y	1	99.995%	fixed	SD	DVB-T2, QPSK FEC $\frac{2}{3}$	Nation (Northern Ireland)	2% of UK, 78 % of Northern Ireland	UHF Channels 21 – 60.

(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 on TV (Y/N)	Other (Y/N)	If answer Yes to Other, please specify

The UK broadcasters believe that in time viewers will demand that the majority of content will be delivered in High Definition on the DTT platform. There are three additional national layers (Multiplexes 7, 8 & 9) co-ordinated within the GE06 Plan that will be available for use once DSO completes. These additional national layers would be ideal for the provision of additional capacity to offer the DTT platform the additional capacity necessary to facilitate a future transition of the platform to DVB-T2 and ultimately enable additional services (those known being HD, 3D, UHD and 60fps) as well as new technologies (such as HEVC) required to cope with additional demand for data-rate caused by the additional services. To this end and in light of Ofcom's recent UHF Strategy Consultation we have encouraged Ofcom to allow the deployment of upto 2 additional DVB-T2 multiplexes in the 600 MHz band to enable additional High Definition services to be introduced to further drive the take-up of T2 enabled equipment by the consumer. In so doing this is likely to ease a future transition of the DTT platform to DVB-T2.

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:

In the order provided above;

- Two Public service multiplexes one licensed until 2022, one licensed indefinitely
- One Public service multiplex licensed until 2026
- One commercial multiplex licensed until 2022; two commercial multiplexes licensed until 2026
- The Local multiplexes are to be licensed late 2012 / early 2013 and the intended licence term is 12 years.
- The NI Multiplex will begin service in October 2012 and be licensed for 12 years.

Question 2

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

Answer:

When considering television platforms it is important to note the continuing importance of the DTT platform in content delivery:

- Television viewing remains one of the UK's foremost leisure activities, with viewers watching an average of 4 hours of television per day – with this figure being on an upward trend.
- Within the UK, DTT is the most popular television platform, providing the primary means of accessing television in 47% homes and in use by over three quarters of UK homes (supporting secondary televisions and recorders).
- DTT provides universal, free at the point of use access to the PSB and Commercial Content services
- DTT has brought with it a huge expansion of consumer choice through new services and content available for free to virtually all of the UK through open standards and a horizontal market – in so doing, it has driven platform competition and innovation.
- DTT has evolved to meet consumer needs and to deliver spectrum efficiency. Hundreds of millions of pounds have been invested in a new universally available free to air platform, enabling the release of 112 MHz of UHF spectrum through the digital switchover (DSO) process, delivering HD within existing spectrum, and adopting the most efficient broadcast technologies, i.e. DVB-T2.

- Ofcom and independent analysts predict that DTT will remain highly important to UK viewers for the foreseeable future – for instance, 3 Reasons forecasts that DTT will be the primary source of TV reception in 44% of UK homes in 2020⁷, and will remain the most popular TV platform.
- Current technical limitations of the UK's broadband infrastructure make IPTV better suited to limited on-demand services as opposed to unlimited one-to-many broadcast services. Even if these technical limitations are addressed in the future Ofcom believes “it is unlikely that there will be sufficient consumer take-up of super fast broadband and IPTV receivers for IPTV to provide a complete substitute for the DTT platform at least over the next decade”⁸. Free to air satellite does not provide a full substitute for DTT.

The DTT platform in the UK has also evolved to offer access to on demand and ‘over the top’ services available via the fixed telecoms network. Recent focus to deliver this type of functionality has been through the youview consortium where Broadcasters, Fixed Network Operators and Broadcast Network Operators have co-operated to launch a consumer proposition that combines the best of terrestrial broadcast services and on demand services. As BT continue to extend their fibre roll-out programme to reach in-excess of 80% of UK households by the end of 2014 then this extends the proportion of the UK that will be able to benefit from this enhancement. In addition to this industry led initiative there are complementary services being launched that leverage the technical capability in the latest DVB-T2 enabled devices to offer over the top services via MHEG-IC when the T2 receiver is connected to a fixed IP network.

The Cable operator service footprint has largely remained unchanged over the last 10 years, further expansion of this footprint is unlikely due to the heavy investment required and hence expansion of this service offering to more households will likely be dependent on gaining access to the fixed operators fibre network.

As noted for the DTT platform above the fixed fibre network is undergoing roll out with immediate service provision being aligned to a hybrid model combining the benefits of the DTT platform in delivering the linear broadcast service with on demand delivered via the fixed network.

The Satellite platform has been aggressively targeting broadband roll-out over recent years with the extension of its Pay TV offering to include on demand services. Furthermore, the satellite operator is now moving into the wireless space through the provision of content to mobile devices that are WiFi enabled.

Question 3:

- 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:

⁷ Source: 3 Reasons LLP Spring 2012 market model.

⁸ Ofcom consultation document – Securing long term benefits of scarce spectrum resources – 29 March 2012

Whilst the current DTT network in the UK is designed to deliver services to fixed reception (rooftop aerials) there are also examples of widespread use of portable receivers (often using set-top-aerials) and also mobile terminal reception, in particular some cars have the capability to receive DTT services and computer dongles are also available to enable DTT reception for laptop computers. However, although the existing DTT network already has some capability to deliver to portable and mobile terminals there has been little integration of DTT tuners in smartphone and tablet devices limiting the extent to which consumers may utilise this means of content delivery. If there was greater access to broadcast content on mobile terminals, facilitated by embedded DTT tuners, then there would be potentially two approaches that could be adopted to enhance existing DTT services to make them more suitable for mobile reception;

- (i) Utilise dedicated T2 Lite⁹ streams within a DVB-T2 multiplex augmented by WiFi offload for in-building coverage; and /or
- (ii) Targeted deployment of additional DTT sites to ensure enhanced in-building reception and more robust reception on the move.

In some countries, e.g. Austria and Germany, where the DTT network has been designed to deliver portable reception then the delivery of services to a mobile terminal will be that much easier. Hence, the current DTT network design could be augmented to provide for reception to mobile terminals but without the appropriate commercial and regulatory circumstances for the integration of DTT tuners in a wide range of portable devices this outcome is unlikely and the potential complementary benefits of the coexistence of broadcast and mobile networks lost.

In view of the significant commercial and regulatory barriers which could limit both the availability of broadcast spectrum to facilitate the expansion of coverage to mobile devices and technical and commercial barriers which may prevent the integration of DVB-T2 or T2 Lite receivers into mobile devices, it is recommended that regulatory bodies should also work with the mobile sector to encourage the introduction of state-of-the-art 3GPP mobile broadcast standards – such as MBSFN/eMBMS – in those spectrum bands which are allocated to mobile communications. These technologies have the potential to be able to dynamically switch spectrum use on a cell-by-cell basis from traditional unicast mobile data applications to broadcast data services when a large number of users wish to simultaneously access the same AV content. Such an approach has the potential to deliver significant spectrum efficiency benefits in circumstances where live television and radio viewing is an important part of the services delivered to mobile devices, whilst offering complementary benefits relative to both higher quality fixed DTT broadcasts services and traditional (and potentially on-demand) unicast data streaming.

- 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:

⁹ The inclusion of a DVB-T2 Lite stream in an existing multiplex will result in a reduction in the capacity available for fixed reception services.

- (a) If the DTT platform were to evolve towards delivering audio-visual services to mobile terminals then there are two practical approaches to network design as noted in response to 3(i) above and the actual solution will be dictated by the Quality of Service (QoS), reach and coverage of the service provision and hence the propensity to utilise High Tower / Low Tower network configurations will be a function of these criteria. For urban areas there is likely to be the need for an increase in localised field strength and hence targeted local in-fill which may be deployed as localised SFNs.
- (b) If the solution were to be an enhancement to existing DTT networks then the network design would have to be accommodated within the existing networks making use of MFNs and SFNs as appropriate to maximise reach and minimise interference, as noted in response to 3(ii)b localised SFNs may be needed in urban areas. However, the introduction of white space services could limit the potential opportunity for additional DTT site deployment for service optimisation.
- (c) As noted in response to 3(i) the development of a DTT service to deliver services to mobile terminals will be dependent on the introduction of DVB-T2 based services.

- 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)?

Answer:

Yes. The utilisation of the DTT platform to deliver audio-visual services to mobile terminals would enable the mobile operators to;

- a. utilise their spectrum assets to deliver bi-directional mobile services for which the spectrum and the technical standards have been optimised avoiding any efficiency losses through the partitioning of spectrum for linear and non-linear content delivery. Efficiency losses will result where linear data streams utilise FDD banded spectrum allocations. Furthermore, broadcast delivery of content offers a guaranteed QoS that will exceed anything typically available via mobile networks which is particularly important for content of high impact, e.g. live sporting events. DTT networks are ideally suited to the delivery of high bandwidth content to consumers independent of the number of consumers active unfortunately mobile networks are less well suited to this type of content delivery as the spectrum is a finite resource shared amongst and consumed by the users.
- b. the availability of local storage aligned to an embedded DTT tuner would offer additional functionality to the mobile terminal that would further minimise the need for the mobile operator networks to be drowned by the increasing demand for audio-visual content and more efficiently deliver content when and where it is needed..

This would all be subject to the mobile terminals being DVB-T/T2 enabled.

- 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:

No comment

- 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 propensity for mobile networks to deliver audio visual content to the handset is heavily dependent on the aggregate traffic consumed per a cell and as a consequence there are inherent challenges associated with the reliable delivery of video content to mobiles. Hence, whilst mobile networks can deliver audio visual content to the mobile device in isolation if the volume of concurrent feeds grows beyond a level which is practical for the network design and available frequencies then there is no more efficient approach to the delivery of high volume content than linear broadcast networks.

Question 4:

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

Answer:

The UK DTT platform currently operates six national multiplexes as described in response to Question 1(i). As capacity comes available on the platform through technical enhancements there continues to be sustained demand for access from channel providers. In our recent joint submission to Ofcom's consultation on the future use of UHF spectrum we noted the potential migration of the majority of broadcast content consumption to the High Definition format in the future. To make this possible, whilst continuing to deliver the range and diversity of content that is currently available and enjoyed by the consumer, there will need to be as a minimum the same number and configuration of national multiplexes that exist today but utilizing the DVB-T2 standard.

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

Answer:

The UK has already adopted DVB-T2/MPEG4 for one national coverage multiplex to deliver High Definition services and has announced the addition of one further DVB-T2 regional coverage multiplex in Northern Ireland (to come into service in October 2012). The rate of adoption by the consumer of DVB-T2 equipment since the launch of services in 2010 has been strong with DVB-T2 enabled DTT equipment providing the primary source of TV reception in 1.6m homes at the end of 2011, with further take-up on primary sets forecast to increase to 3.4m by the end of 2012. Additionally, DVB-T2 DTT equipment was also used on 1.7m further non-primary sets at the end of 2011, with this forecast to increase to 4.5m non-primary sets by the end of 2012. As noted in response to 4(i) we anticipate the need for a full transition of the DTT platform to DVB-T2/MPEG4 at some point in the future to support the natural evolution of content consumption to the High Definition format. Furthermore, we also believe it is important that the DTT platform needs the scope to evolve and develop in the future through further technical innovations to offer the potential for service enhancements e.g. 3D, UHD and 60fps services. However, whilst a move from DVB-T to DVB-T2 service delivery will provide for spectrum efficiency gains in the long term, in the short to medium terms there will be a need for transitional access to spectrum to facilitate that migration. Future enhancements to the technical standards on which the terrestrial services operate will also require additional spectrum to replicate this transition process and enable future efficiency gains to be realized. It is also clear that although more efficient compression technologies such as HEVC have the potential to deliver significant benefits to broadcasters and regulators – from more efficient use of limited radio spectrum - broadcasters and regulators will need to offer consumers significant additional value from further service enhancements to encourage a widespread transition of television receivers to HEVC compatibility. Given access to appropriate transitional spectrum and the creation by broadcasters of a wide choice of HD content it is possible to foresee that almost all UK DTT reception equipment will be DVB-T2/MPEG4 capable by 2020. However, a transition to HEVC is likely to take considerably longer and would be dependent on the development and free-to-air access of further enhanced services such as substantially enhanced HD channel choice, UHD or 60 fps services.

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

Answer:

As noted in response to question 1b above we are currently in dialogue with Ofcom to encourage the deployment of interim DVB-T2 DTT multiplexes in the 600 MHz band to allow for a simulcast arrangement of the key PSB content in High Definition. The interim multiplexes as proposed would stimulate the replacement of DVB-T consumer equipment by T2 and ultimately enable the transition of the whole DTT platform to DVB-T2 in the future. The migration of DTT multiplexes from DVB-T operation to DVB-T2 operation can be readily achieved within the confines of the existing international frequency plan (GE06) provided that the consumer has adopted the equipment. If however, there needed to be a displacement of DTT services out of the 700 MHz band, which is one potential future scenario, being considered by Ofcom in its recent consultation, we believe there will need to be some form of International Co-ordination process to optimise the sub 700 MHz spectrum across Europe ensuring that sufficient spectrum is available on a territory by territory basis to accommodate as a minimum the scale of existing services. In order to make the consumer transition possible

we also anticipate the need for a simulcast period of existing content in the High Definition format without this the rate of adoption of consumer equipment may be slow delaying the switch off of DVB-T multiplexes and hence the transition to more efficient DVB-T2 multiplexes.

However, until a formal decision is made regarding 700 MHz spectrum use in Europe and then subsequent planning studies are undertaken to develop the new International Frequency Plan the actual process is still to be defined. Furthermore, the mechanism by which a simulcast period is paid for is still to be defined.