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EBU COMMENTS TO THE RSPG OPINION ON EU spectrum policy implications on the digital dividend

The EBU welcomes the opportunity to present its comments on the Radio Spectrum Policy Group (RSPG) opinion about the EU spectrum policy implications on the digital dividend.

Public service broadcasters have a public mission that includes encouraging national culture and social cohesion, providing reliable, unbiased information and varied and balanced programming for all segments of the population. Public service broadcasters in Europe are also naturally called upon to provide nearly “universal” coverage, which means that public service programmes should be available to virtually every citizen throughout the national territory. It is important to recognise that this requirement for near-universal coverage requires significant allocations of spectrum.

Public service broadcasters are, as major producers and providers of European content and as driving-forces for digital switchover, a key asset for fostering and promoting the information and knowledge-based society and for bridging the digital divide. They have contributed enormously to the development of European Standards for DVB, DAB, including their mobile derivatives and HDTV as well as to the development of the GEO6 Agreement and to the deployment of digital broadcasting services which allows for more efficient use of the spectrum.

1. The digital dividend and its uses

According to the RSPG Opinion, the digital dividend is defined as 'the spectrum made available over and above that required to accommodate the existing analogue television services in a digital form in VHF¹ (Band III) and UHF (Bands IV/V)'.

Digital broadcasting transmissions make more efficient use of spectrum in comparison with analogue transmissions. Analogue TV was planned in the European Broadcasting Area by the 1961 Stockholm Agreement (ST61) in Band I (47-68 MHz), Band III (174-230 MHz) and Bands IV/V (470-862 MHz)². While most of the countries planned for 2 to 4 analogue TV services for fixed roof top reception, some countries have been able to increase the number of analogue TV services to 5 or 6. When switching to digital broadcasting, four analogue TV services can, in general, be accommodated within one DVB-T multiplex. Countries with five or more

¹ Although not considered in the RSPG Opinion, many European countries have switched-off analogue TV in Band I and some of them have already released the band for other services, for example, UK, Germany, ...

² Strictly speaking, Band I assignments ranged from 41 to 68 MHz, and Band III assignments ranged from 162 to 230 MHz. There were also some analogue television assignments in Band II for some East European countries.

analogue TV services, and using DVB-T with a robust modulation scheme, may need two DVB-T multiplexes for broadcasting their existing analogue TV services in digital format.

Three different types of uses as potential candidates for the digital dividend are the following:

1. Broadcasting and/or Broadcasting-like applications such as:

- increasing the number of digital TV services (e.g. for reception on roof-top antennas or portable set-top antennas);
- improving and increasing the coverage of digital TV transmissions and improving the audio and video quality;
- digital audio services (T-DAB);
- digital TV services designed for reception on hand-held receivers (e.g. T-DMB, DVB-H);
- additional regional and local programmes;
- high-definition TV (as already introduced in the USA, Japan, Korea, Australia).

2. Non-broadcasting services, such as 3G mobile phones, WiMAX, etc.

3. Broadcasting and/or non-broadcasting services yet to be defined.

With respect to the first type of usage, the increase in the number of programmes and the improvements of audio and video quality are necessary in order to motivate users to buy a digital receiver, and to be able to better compete with satellite and cable platforms. Terrestrial broadcasting is a key delivery platform that must be considered alongside the satellite and cable platforms as these multiple platforms will compete to offer more choice to the general public, and will promote growth in a fair and competitive horizontal market. Since the start of terrestrial digital broadcasting in many European countries the digital offer has already appeared with an increased number of standard quality digital TV programmes compared to analogue TV. However, those digital transmissions have a reduced coverage due to the limitations required for the protection of existing analogue services.

Many European countries have also started T-DAB transmissions in Band III. Some countries are also planning to use Band III for multimedia applications using a T-DAB based system (e.g. DAB IP, T-DMB).

Therefore, after a complete switch off of analogue TV, not all of the digital dividend spectrum will be fully available because part will have been occupied by the additional digital TV services and by T-DAB in Band III. Part of the free spectrum is expected to be used to increase the population coverage and/or to provide higher field strengths so as to deliver more reliable services to mobile receivers or portable set-top antennas. Because of the high demand for broadcasting services in Europe many national Governments have already allocated 5 to 6 licenses to operate a digital broadcasting multiplex (as, for example, in the UK, Spain, France, Sweden, Germany). The results of the RSPG questionnaire have also shown this high demand for broadcasting services.

HDTV is likely to be a requirement in the near future. In some countries (e.g. the UK, Sweden) terrestrial HDTV tests have already been carried out and have been received very well by the public. However, it is not possible to introduce HDTV on a significant scale before the analogue switch-off because HDTV requires considerably more spectrum than standard definition digital television.

In addition, flat panel displays with an 'HD Ready' label are already available in the market. Such displays require twice the bit rate compared to traditional CRT screens, even for standard definition television. That increase in required bit rate reduces the number of standard quality television programmes that broadcasters can allocate in a multiplex, although the problem could be ameliorated by the use of MPEG4.

Broadcasters are willing to introduce advanced coding methods, such as MPEG4, which could reduce the requirements of data capacity. However, almost all European countries that have launched digital terrestrial television services use MPEG2. It may be difficult for viewers to accept another technology change and buy new receivers without an increase in the service offer to include adequate reception on flat screens and/or HDTV services.

In relation to the third category of uses, as these types of service are still to be defined, the allocation of the entire digital dividend to the first two categories would reduce the flexibility for future innovative technologies and the opportunities for new service providers to make use of the spectrum.

Radio spectrum management also needs to take into account social, cultural and political considerations. Radio spectrum policy cannot be based solely on technical parameters but it also needs to take into account cultural considerations and the interests of all sectors, including broadcasting, and must balance their respective needs (Recital 8 of the Decision No 676/2002/EC of the European Parliament and of the Council on radio spectrum policy). Moreover, the European Parliament's "Resolution on the transition from analogue to digital broadcasting - An opportunity for European audiovisual policy and cultural diversity?" of 27 April 2005 stresses that the redistribution of spectrum resources must not be left to the free play of competition. It also states, *inter alia*, that the technical and legislative options for the switch-over must be not only economic but also of a social, cultural and political nature in order to safeguard the European public audiovisual sector.

EBU is of the opinion that:

- The high demand for broadcast and broadcasting-like applications cannot be ignored. European national Administrations have acknowledged the high demand for broadcasting services in their requirements submitted to the RRC-06 and in their national discussions about the use of the digital dividend as stated in their reply to the RSPG questionnaire. In addition, any further technology changes made to the broadcast environment will require an enhancement in the service offering in order to induce viewers to purchase the necessary equipment.
- Based on subjective tests, flat screens require twice the bit rate compared to CRTs, even for standard definition quality. MPEG4 compression will help in providing these services in a spectrum efficient way.
- In addition to the broadcasting services that have been licensed or will be licensed soon, additional multiplexes will be needed to introduce more services, with improved quality for flat screens and with HDTV using MPEG4 compression.
- Transmission capacity will be needed to improve the coverage of the existing digital services, which are restricted by the protection of analogue during the transition period.

2. The RRC-06 and the GE06 Agreement

The ITU Regional Radiocommunications Conference held in Geneva (RRC-06) had the objective of producing a Plan for digital terrestrial broadcasting in Band III (for T-DAB and DVB-T) and in Band IV/V (for DVB-T). The resulting GE06 Agreement is an all-digital frequency Plan optimised for implementation at the end of the transition period when analogue will be switched off and/or will not require further protection.

Analysis of the GE06 Agreement for the CEPT area indicates that:

- The majority of European countries obtained 7 to 8 nationwide coverages (also called multiplexes or layers) for DVB-T in Bands IV/V and 1 in Band III. In Band III, they also

obtained 3 nationwide coverages for T-DAB. Some obtained additional coverages in parts of their territories.

- The number of coverages which can be provided by GE06 is very large and significantly increases the spectrum usage as compared to ST61; in fact, this usage exceeds the theoretical capacity of the frequency bands (for the sets of service conditions defined at RRC-04). These 'extra' coverages have been achieved at the expense of accepting higher interference levels which may result in lower quality services and/or reduced coverage area. To overcome these difficulties when implementing the plan and in order to provide reliable services, it may be necessary to deploy, in small areas, low power transmitters using additional frequencies, wherever single frequency networks are not feasible.
- In the CEPT area as a whole, around 50% of the DVB-T requirements planned in the UHF band were for fixed roof top antenna reception and around 50 % for portable outdoor/mobile reception. On a country by country basis some countries planned mainly for fixed reception, some opted mainly for portable outdoor/mobile reception, while still others planned for a combination of both reception types. Portable indoor reception represents an almost negligible proportion of the requirements. However, the digital Plan entries specified for portable outdoor/mobile reception allow for a certain level of coverage for portable indoor reception as well. In the VHF band, the proportion of requirements planned for portable outdoor/mobile reception is higher (around 60 %).
- The analysis also shows that the channel usage is as high in the upper part of the UHF band as in the lower part with the exception of few channels, like channel 38 (used for Radio Astronomy) and channel 69 (used by military mobile services in certain European countries). In general, most countries have Plan entries for any given 'layer' of coverage with frequencies spread across the whole frequency band.

The use of the broadcast spectrum is critically dependent on national circumstances (such as topography, penetration of satellite/cable services and requirements for regional and local services). The RRC-06 has also emphasised the different spectrum needs across European countries as well as the different frequency planning approaches adopted.

A key conclusion for European countries is that different amounts of the digital dividend are achievable in different parts of the bands and for different potential uses. It will be up to each individual Member State to decide on how the digital dividend will be used in their country. As stated in Article 9 of the EU's common regulatory framework for electronic communications networks and services (Directive 2002/21/EC) which concerns management of radio spectrum, '*Member States... shall ensure that the allocation of such radio frequencies by national regulatory authorities are based on objective, transparent, non-discriminatory criteria*'.

EBU is of the opinion that:

- Because of the high interference levels accepted at the RRC-06, coverage is likely to be unsatisfactory in some areas in practice. Additional frequency resources will be required to improve coverage in such cases.
- Due to national circumstances, the digital dividend will have different sizes in different parts of the spectrum, from one country to another.
- Because of differences between European countries in the digital dividend available and the requirements of local markets, each country needs to decide on how to use its available digital dividend. Therefore no mandatory rules should be established on how to use (or not use) the digital dividend.

2.1 Broadcasting services under GE06

The GE06 Agreement offers significant flexibility for the future development of the digital plan by virtue of allotment planning and the spectrum mask concept. Such flexibility allows the use of the digital dividend by broadcasting services without any need for additional regulatory actions to be undertaken by Member States.

The GE06 Agreement has been optimised for digital terrestrial broadcasting by creating a de facto harmonisation of planning criteria and parameters. The use of the digital dividend by broadcasting-like applications would maximise the efficient use of the spectrum.

The RSPG notes the case of high field strength downlink services as broadcasting-like candidates for the digital dividend. In that respect, the following should be noted:

- The GE06 Agreement has foreseen various planning configurations allowing each country to choose the parameters (i.e. reception mode, system variant and data capacity) that best suited their national needs.
- The GE06 Agreement includes entries for fixed rooftop reception, portable outdoor/mobile reception and portable indoor reception for T-DAB and/or DVB-T services. It does not include entries for digital TV services designed for reception on hand-held receivers (e.g. T-DMB, DVB-H). Nevertheless, the Agreement is flexible enough to allow for implementing such services although not necessarily in all areas.
- Handheld reception requires much higher field strengths values than required for the other reception modes. Since the power levels for different planning configurations are very different, the choice made at RRC-06 may have some consequences for future implementation of new configurations, such as additional costs at transmitter sites or a reduction of the number of available layers.
- The use of very dense networks could facilitate the implementation of handheld reception, but in the case of use of a frequency channel adjacent to the one used by another transmitter in any given area, adjacent channel interference may occur. Co-sitting both transmitters could be a solution; broadcasters are studying different solutions which could facilitate the implementation of broadcasting networks for handheld reception. However, further investigation is needed to evaluate the potential impact of any re-planning which may be needed to accommodate higher radiated powers.

As stated in its reply to the RSPG Opinion on the introduction of multimedia services in particular in the frequency bands allocated to the broadcasting services, the EBU agrees that, at the pan-European level, harmonisation of frequencies (that is, the choice of a common sub-band) for broadcasting multimedia services would provide benefits in antenna design and in reducing costs for manufacturers. However if the sub-band is too small there will be a frequency planning difficulty in implementing a nationwide coverage using the available allotments or assignments for one or more networks for handheld reception. In addition, in Bands IV/V, compatibility with the GSM services at 900 MHz (that is with a sufficiently large frequency separation) can facilitate the use of combined broadcasting and mobile terminals. Although GE06 provides harmonisation for digital broadcasting, the following points should be taken into account for the specific case of handheld reception in Bands IV/V:

- The identification of nationwide coverages would result in the use of frequencies spread across the whole frequency band and the choice of individual frequencies would not, in general, be the same from country to country.
- The identification of a common sub-band would require a certain re-allocation of frequencies at national level and additional international coordination.
- In order to minimise constraints to be imposed to other broadcasting services and to avoid a significant replanning, such a sub-band should not be too narrow. It should be wide

enough to allow for the composition of one or two layers from the GE06 Agreement for these purposes and to restrict re-planning of remaining broadcasting layers to a minimum.

- It is also important that the sub-band identified is not dedicated to handheld reception only; it should be up to each Member State to decide the use of their digital dividend by digital services designed for reception on hand-held receivers, depending on the requirements of their market.
- To obtain a frequency separation in relation to GSM at 900 MHz, channel 55 is the upper channel to be used for handheld reception in Band IV/V. This seems to be a reasonable practical limit for a frequency separation.
- Some manufacturers have stated that it is not necessary to restrict handheld receivers to a separate sub-band and that the whole of the channel range 21 to 55 could be used. However, this is only from the point of view of equipment restrictions and does not include any re-planning considerations.

EBU is of the opinion that:

- The GE06 Agreement has been optimised for digital terrestrial broadcasting by creating a de facto harmonisation of planning parameters and criteria. The use of the digital dividend by broadcasting and/or broadcasting-like applications would maximise the efficient use of the frequencies in GE06 Agreement.
- A sub-band for equipment offering multimedia handheld applications should be wide enough to allow to implement one or two layers from the GE06 Agreement for these purposes and to restrict re-planning of the remaining broadcasting layers to a minimum. The range of channels 21 to 55 seems to be appropriate, subject to the results of any further re-planning investigation.
- The sub-band identified is not to be for exclusive use of handheld reception. It should be up to each Member State to decide about the use of their digital dividend by digital services designed for reception on hand-held receivers or for other types or reception.

2.2 Non-broadcasting services under GE06

The flexibility of the GE06 Agreement under the envelope concept together with Article 5 of the Agreement allows the use of digital entries in the Plan by other non-broadcasting services. The RSPG indicates the specific case of fixed/mobile applications (including uplinks) as non-broadcasting candidates for the digital dividend in the UHF band.

From a regulatory point of view, such applications will require an allocation in the ITU Radio Regulations in the entire UHF band. This could be achieved at the next ITU World Radiocommunications Conferences (WRC-07 and/or WRC-11).

From a technical point of view, the propagation characteristics of the UHF band (compared to higher frequencies) can be best exploited when a large area is covered with high power signals (typically used by broadcasting and broadcasting-like applications, one-to-many). If the same is done by cellular networks (typically one-to-one) to cover a reduced number of users this could result in a less efficient use of the spectrum.

It is then important to consider all related technical issues before regulatory actions are undertaken:

- Compatibility studies between the broadcasting service and the fixed/mobile services (including uplinks) should be undertaken to assess the feasibility of sharing the bands. Results from preliminary sharing studies between broadcasting and mobile services show the difficulties of sharing between mobile services and broadcast services. The studies

conclude that it would be necessary to use an exclusive sub-band for the mobile service in order to minimise the frequency planning constraints to be imposed on both services.

- As mentioned in paragraph 2 above, in the GE06 Agreement the frequencies associated with a given digital multiplex (coverage or layer) are usually scattered across the whole band. A sub-band for exclusive use by the fixed/mobile service could affect all digital broadcasting multiplexes as the loss of certain frequencies would create 'holes' in the multiplexes (i.e. produce areas with no coverage).
- The remaining part of the band would have to be replanned to obtain the original envisaged DVB-T coverage requirements which may not be possible given the existing overload of the entire planned spectrum. The replanning process would be especially complex for those countries that have introduced DVB-T. It should be noted that, as of now, at least 14 European countries have already launched DVB-T and by the time a replanning process may have been completed, many more countries will have done so. In addition, the costs for modification of reception and transmission equipment implied by a frequency rearrangement should not be ignored.
- International coordination would also be required to protect the digital entries in the GE06 Agreement for countries not party to the replanning process. Interference coming from those countries would have to be accepted.
- Digital broadcasting is characterised by a rapid transition from near perfect reception to no reception at all - and thus it is more critical to limit interference than it was for analogue broadcasting. In many situations, it may be difficult to protect broadcasting services from interference created by uncontrolled mobile uplinks using adjacent channels. Such types of interference may also be difficult to identify and remedy rapidly.
- Results of the preliminary studies mentioned above also indicate that guard bands (unused spectrum) would be needed to avoid interference between uplinks and broadcasting applications using nearby adjacent channels. Although further studies are required, guard bands of 10 MHz or more have been suggested. As spectrum is a valuable public resource and the VHF and UHF bands are prime valuable frequencies, it does not seem reasonable to leave any digital dividend (or, indeed, any spectrum) unused for any purpose.

Even if, from a regulatory point of view, it may be feasible to allocate the entire UHF band to the fixed/mobile services, the sharing of spectrum highlights many technical issues to be solved. Pending further investigations, a possible way to reduce problems may be the installation of selective filters in the transmitters of mobile devices and their associate base stations.

EBU would like to emphasize the need for detailed compatibility studies. The introduction of other services in the broadcasting bands should be done in such a way that no interference is caused to broadcasting services which already exist or which were planned at RRC-06. The EBU will aim to ensure that suitable protection criteria are developed and will help in their development.

EBU is of the opinion that:

- Detailed compatibility studies are needed to identify technical solutions for the problems already identified of sharing between digital broadcasting and mobile services. These solutions should be identified before any allocation to the fixed/mobile services of the UHF band is implemented.
- Provided the technical problems are solved, the GE06 Agreement gives sufficient flexibility to introduce non-broadcasting services.
- An exclusive sub-band for mobile services would mean that Plan entries in that sub-band would have to be deleted from the GE06 Agreement and in addition a time

consuming replanning process for the remaining part of the band would be required, although it is not guaranteed that the coverage of existing digital TV services would be maintained.

- The use of guard bands (unused spectrum) between broadcasting and non-broadcasting services with uplinks is not an efficient use of valuable and scarce spectrum. The use of the digital dividend by applications which require guard bands should therefore not be pursued.

3. Other requirements

In some European countries, the VHF and UHF bands are also allocated to other services having primary status. Those services have been taken into account in developing the GE06 Agreement as far as requested by the national Administrations. Sharing the bands with other primary services represents a reduction of coverage area or a reduction in the number of frequencies available. In the digital dividend discussions, the utilisation of the VHF and UHF bands by other primary services should be brought into the equation.

There are also some other services which have access to these bands on a secondary basis, which means that they should not interfere with the broadcasting service and not claim protection from it. Although these services are not considered in international negotiations, on a national basis those services may be of great importance such the Radio Astronomy service and SAB/SAP services.

The EBU wants to stress that the bands in question are quite extensively used for Services Ancillary to Broadcasting or Ancillary to Programme making (SAB/SAP) which are essential for program production activities. The operational conditions of these services make it possible to find frequencies, on a temporary basis, with acceptable compatibility conditions within the existing broadcasting service infrastructure. The digitization of the terrestrial broadcasting service in Europe has already increased the constraints on these services, because of the increased number of frequency channels used in any given area, compared to the analogue situation. Any additional allocation to non-broadcasting services is likely to increase these constraints.

EBU is of the opinion that:

- The needs of existing services, including Services Ancillary to Broadcasting or Ancillary to Programme making (SAB/SAP), should be taken into account when considering digital dividend applications.
-