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# **EBU Guidelines for the RRC-06**

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## EBU Guidelines for the RRC-06

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## 1 Introduction

The purpose of this document is to give guidance to EBU members in the preparations for and participation at the ITU Regional Radiocommunications Conference RRC-06. A similar document has been issued for the preparation of the first session of the Conference RRC-04 at which the technical parameters for planning and associated regulatory issues were agreed. The content of the document is based on the work of the relevant BMC groups and the views expressed by the Members.

## 2 The Scope of the RRC-06

### 2.1 What is the purpose of RRC-06?

The foundation for all terrestrial television planning in the European Broadcasting Area (EBA) is the Stockholm 61 Agreement (ST 61) which planned analogue television. In order to make the most efficient use of the available spectrum and to implement the full potential of digital technology, a new frequency plan is required.

The New Agreement and associated frequency plan will be agreed by RRC-06. The preparatory work was undertaken by the 1<sup>st</sup> Session (held in May 2004 in Geneva, RRC-04) which established the technical basis (planning criteria and parameters) for a new plan. The 2<sup>nd</sup> Session (to be held from 15<sup>th</sup> May to 16<sup>th</sup> June 2006, RRC-06) will adopt the New Agreement and associated frequency plans.

The 1<sup>st</sup> Session also agreed a work plan for the intersessional period, during which regulatory procedures and a draft Plan have been prepared. Annex 1 summarises the main activities performed during the intersessional period and the time schedule. See also Guideline 10 on further details of the organisation of the work.

The planning area covers Region 1 (parts of Region 1 situated to the west of meridian 170 °E and to the north of parallel 40 °S, except the territories of Mongolia) and the Islamic Republic of Iran.

Figure 2 in Annex 2 shows the extent of the planning area of the RRC-06 as determined by the ITU.

<sup>1</sup> April 2004: Last version before the first session of the RRC. February 2005: Update as per RRC-04 and preparations for RRC-06. September 2005: Update of Guideline 4.2 and Annex 9.

<sup>2</sup> March 2006: First version of 2<sup>nd</sup> issue before the RRC-06. May 2006: Second version of 2<sup>nd</sup> issue before the RRC-06

**EBU Position**

*The EBU has made, and will continue to make, technical contributions relevant to the work of the intersessional period and the Conference.*

*The EBU will carry out planning exercises, as far as necessary, for the EBA countries to assist in the preparations of the new Plan.*

*The EBU Technical Department has contributed to the ITU Bureau des Radiocommunications (ITU BR) with a software package for the planning process and is heavily involved in the work of the Planning Exercises Team (PXT) which monitors all the work related to the planning exercises to be performed by the ITU BR during the intersessional period and the RRC-06.*

**2.2 What is the mandate of the Conference?**

The mandate of the RRC-06 covers Band III (174 to 230 MHz) and Band IV/V (470 to 862 MHz) only (as given in ITU Council Resolution 1224 (this resolution replaces and supersedes Resolution 1185 (modified 2003)). The RRC-06 will establish a new regional agreement and associated frequency plans for these bands for terrestrial digital broadcasting (T-DAB and DVB-T).

The establishment of the new agreement implies that portions of the ST 61 and GE 89 Agreements will have to be revised or abrogated. This will be done at two separate short Conferences immediately following the 2<sup>nd</sup> Session of the RRC.

**EBU Position**

*The EBU is in favour of the inclusion of T-DAB and DVB-T in Band III and DVB-T in Band IV/V.*

**2.3 Which digital standards are to be included in the planning?**

The DVB-T standard is the one to be used to plan terrestrial digital television. The T-DAB standard is used to plan terrestrial digital radio. No other standards have been considered when defining the planning criteria in the report prepared by the 1<sup>st</sup> Session of the RRC.

EBU members consider that the new plan should be 'flexible' enough to cope with future developments of digital technology including new systems. Such flexibility can be achieved by:

- **The DVB-T system** itself which allows for a number of system variants giving different data capacities that provide a range of picture qualities and for different reception modes (fixed, portable and mobile);
- **The "envelope" concept introduced by the CEPT<sup>1</sup>**. The idea is to consider the DVB-T and T-DAB standards as envelopes that define the interference caused by the digital transmission and the protection required by it. Planning is then carried out using these envelopes. Other terrestrial service or transmission systems can be used provided that such use does not cause more interference in any direction than would be caused by the broadcasting assignment/allotment it replaces or require greater protection than would be given to the broadcasting assignment/allotment it replaces;
- **Allotment planning**. In allotment planning nothing is known of the actual location of the transmitter sites, or of the specific transmission characteristics to be used. The only parameters available are: a definition of the area to be covered, the channel to be used and technical criteria to describe outgoing interference;

<sup>1</sup> This concept has now been described as the spectrum power density approach: the peak power density in any 4 kHz shall not exceed the spectral power density in the same 4 kHz of the notified digital broadcasting assignments.

- Procedures for modifications to the Plan. The Article 4 Procedures in the ST 61 Agreement, allowed the number of stations included in the plan to increase from the original 5300 stations in Bands III and IV/V to about 85 000 stations which are operating now.

#### **EBU Position**

*EBU members have adopted the DVB-T and T-DAB system for digital broadcasting in the VHF and UHF bands. Not all EBU members have yet implemented the systems.*

*EBU members are of the opinion that the new Plan should permit the evolution of broadcasting in the next decades as for example the introduction of DVB-H or HDTV. The procedures for modifications to the Plan to be agreed at the RRC-06 should be at least as flexible as the ones in ST61 to allow for such evolutions in the future.*

### **3 Service aspects**

#### **3.1 Should DVB-T planning be based on rooftop, portable, or mobile reception?**

In case of the planning of DVB-T for portable or mobile reception<sup>1</sup>, the following points should be noted:

- Portable and mobile reception will require a larger number of transmitters and channel frequencies or a reduction in the number of programmes transmitted to obtain a given coverage, as compared to fixed reception.
- If the number of transmitters and channel frequencies used for portable and mobile reception are the same as those used for digital fixed reception and the same number of programmes are transmitted, either the area covered will be dramatically reduced (and hence the percentage of population served reduces) or the data capacity allocated per programme will have to be drastically reduced (and hence the image quality drastically worsens).
- Portable and mobile reception of terrestrial transmissions offer services to the users which cable and satellite broadcasting are unable to provide, in addition to providing an alternative to those delivery methods.

Another reception mode, handheld portable reception (reception by handheld devices indoor, outdoor at pedestrian speed and in moving vehicles), is emerging as a feature of the DVB-H system and a variant of the T-DAB system (see also Guideline 3.2).

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<sup>1</sup> For DVB-T planning,

Fixed antenna reception is defined as reception where a directional receiving antenna mounted at roof level is used.

Portable antenna reception is defined as:

Outdoor: being reception where a portable receiver with an attached antenna is used (at no less than 1.5 m above ground level);

Indoor (ground floor): being reception where a portable receiver with an attached antenna is used:

- indoors at no less than 1.5 m above floor level in rooms;
- on the ground floor;
- with a window in an external wall
- optimal receiving conditions will be found by moving the antenna up to 0.5 metres in any direction
- extreme cases, such as reception in completely shielded rooms, are disregarded.

In both cases (outdoor and indoor portable reception), it is assumed that the portable receiver is not moved during reception.

Mobile reception is defined as being the reception while in motion, where the term motion covers speeds from a walking person to a car driven on a motorway.

The Report from the 1<sup>st</sup> Session includes fixed, portable and mobile reception for DVB-T.

### EBU Position

*EBU members will base DVB-T planning on fixed, portable indoor and mobile reception. The Plan should provide for all of these reception modes.*

## 3.2 How to introduce broadcasting to handhelds (DVB-H/T-DMB) in the future Plan?

Handheld reception was not taken into account during the first session of RRC as it was not then standardised. Therefore no technical characteristics for planning were defined.

If an administration intends to implement DVB-H/T-DMB, it is possible to employ a DVB-T/T-DAB entry to the plan for DVB-H/T-DMB (envelope concept Guideline 2.3), provided it does not create more interference than the DVB-T/T-DAB entry and does not claim more protection.

This option has to be taken with care as technical parameters (antenna gain, C/N ...) are more demanding for DVB-H/T-DMB and a check of the intended coverage is necessary. DVB-H should preferably be implemented in a DVB-T requirement initially planned for portable indoor or mobile/portable outdoor; T-DMB should preferably be implemented in a T-DAB requirement initially planned for portable indoor. The use of requirements initially planned for other reception modes will impose further additional constraints on the implementation of DVB-H/T-DMB networks. This issue needs further studies.

Complete coverages to handheld receivers will require denser networks and the associated increase of network costs.

### EBU Position

*EBU members that have the intention to use part of the digital Plan for DVB-H/T-DMB in the future should already take this into account in the requirements for the RRC-06. In this case, for DVB-H implementations, it is advisable to formulate DVB-T requirements for portable indoor or at least portable outdoor reception, and for T-DMB implementations to formulate T-DAB requirements for portable indoor.*

## 3.3 What T-DAB input requirements should be sent to the RRC-06?

In Europe at least, Band III is intended to be planned for DVB-T and T-DAB. Each administration can decide how much of the Band III spectrum is to be given to T-DAB, how much to DVB-T and how much is already blocked by other primary services.

Many EBU members have expressed the need for additional T-DAB coverage requirements compared to the ones in the WI 95 Agreement<sup>1</sup>. In most countries Band III will be available for both T-DAB and DVB-T. T-DAB is currently concentrated in the Band 216 to 230 MHz.

It would be possible to get a complete area coverage for a DVB-T service using the remainder of Band III, if no additional T-DAB services are allocated below 216 MHz. On the other hand, if Band III is planned for T-DAB only, up to six complete T-DAB coverages (depending on the type of reception, mobile or portable indoor) could be achieved in the absence of any constraints due to DVB-T in neighbouring counties, analogue television or other primary services.

<sup>1</sup> CEPT T-DAB Planning Meeting (Maastricht, 2002) for the revision of the Special Arrangement of the European Conference of Postal and Telecommunications Administrations (CEPT) relating to the use of the bands 47 – 68 MHz, 87.5 – 108 MHz, 174 – 230 MHz, 230 – 240 MHz and 1452 – 1492 MHz for the introduction of Terrestrial Digital Audio Broadcasting (T-DAB), Wiesbaden, 1995, as revised by the CEPT T-DAB planning meeting (2), Bonn, 1996



There are no plans, or even formal proposals, to introduce T-DAB transmissions in Band IV/V, currently to be planned for DVB-T. This means there may be a need for a compromise between the use of T-DAB and DVB-T in Band III.

The WI 95 Plan was based on mobile vehicle reception for T-DAB. However, most EBU members consider that portable indoor reception<sup>1</sup> is required for the success of T-DAB.

The final report of RRC-04 includes portable indoor and mobile reception for T-DAB.

When considering whether to update the WI 95 T-DAB services for indoor reception, the following points should be noted:

- Planning for indoor coverage will also provide mobile coverage;
- If the transmitter network configuration and the required location probability remain the same, the area covered for portable indoor reception will be less than for mobile reception;
- In order to obtain the same coverage area and location probability, indoor reception will require higher transmitter powers and/or more transmitters than mobile reception;
- Because of interaction between T-DAB and Other Services, it may be necessary to co-ordinate any increase in the transmitter powers.

Generally each EBU member should encourage its administration to find solutions - by means of national, bi-lateral and multi-lateral agreements - which will facilitate the implementation of T-DAB networks for indoor reception for all T-DAB requirements.

#### ***EBU Position related to input of the updated WI 95 Plan***

*Most of the EBU members are of the opinion that the WI 95 Plan is a good foundation for submitting Band III T-DAB requirements for the RRC.*

*However, portable T-DAB indoor reception is important and the EBU would advise that planning T-DAB services be based on this reception mode.*

*Additionally, some countries see a need for modifications in the updated WI 95 plan. These modifications could for example mean a change of allotment areas, merge of small allotments into larger ones, change of frequency in order to concentrate T-DAB services into one part of Band III to reduce the number of TV channels used. EBU is of the opinion that such modifications could improve spectrum utilisation in Band III.*

*Therefore, each EBU member:*

- *should ask its administration to submit their WI 95 allotments (or modified WI 95 allotments), to the extent to which the broadcasters wish to maintain them, as a basis for its T-DAB requirements to the RRC-06.*

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<sup>1</sup> For T-DAB planning:

Mobile reception is defined as being the reception of a T-DAB signal while in motion, where the term motion covers speeds from a walking person to a car driven on a motorway.

Portable indoor reception can be defined as being reception by means of a portable receiver with a built-in antenna used indoors at no less than 1.5 m above floor level in rooms;

- on the ground floor;
- with a window in an external wall.

It is also assumed that:

Optimal receiving conditions will be found by moving the antenna up to 0.5 metres in any direction

The portable receiver is not moved during reception.

Extreme cases, such as reception in completely shielded rooms, are disregarded.

- *should advise its administration, where appropriate, that the desired reception mode for the required WI 95 allotments be portable indoor reception.*

*In some countries it is also important for the broadcasters to make their administrations aware that the WI 95 Agreement should not be abrogated completely since there are WI 95 T-DAB allotments in Band I and in channel 13 (230-240 MHz), which may need to be retained after the second session of the RRC.*

#### ***EBU Position related to input of new T-DAB requirements***

There is a preference for at least one additional national T-DAB coverage in Band III in most countries. Some countries have expressed a preference for two or more additional national T-DAB coverages in Band III.

*Therefore, each EBU member is recommended to:*

- *ask its administration to submit, if wanted, T-DAB allotments in addition to those in WI 95 as input requirements to the RRC-06.*
- *in the case where the same target service area is desired as in WI 95, ask its administration to submit new T-DAB requirements using the same allotment areas as in the WI 95 plan, in order to make use of the same transmitter network structure. However, additional requirements for regional and local T-DAB coverages may also be needed.*
- *ask its administration to submit its T-DAB requirements with the same reception mode (preferably portable indoor) for the sake of spectrum efficiency.*
- *ask its administration to try to concentrate T-DAB allotments within a limited number of TV channels in Band III, in order to allow for additional DVB-T coverage at VHF. This should also improve spectrum utilisation.*

## **4 System aspects**

### **4.1 What system aspects (video, audio, data and additional services) are needed in a multiplex, and what bit rate is needed?**

If a constant bit-rate is assigned to a digital television service, then to achieve a particular target quality it is necessary to set the video bit-rate relatively high to code the most challenging material with sufficient quality. However, at times when the picture material is easy to code that same bit-rate will be more than sufficient to achieve the desired quality; bit-rate will then, in effect, be wasted. In practice the choice of constant bit-rate will be an awkward compromise between “average” quality and the number of channels to be carried within the same multiplex – the usual result is that there will be some marked degradation in picture quality for the most challenging pictures.

Rather than setting a constant bit-rate to suit the most challenging material, an alternative strategy is to attempt to code pictures to a constant quality and allow the resultant video bit-rate to be demand-driven. This is one form of “variable bit-rate” coding and in essence is the technique used for DVDs.

Using variable bit-rate coding the amount of coded data and hence the bit-rate required will change markedly from shot to shot, from item to item and from programme to programme. In this case the variation in quality which would result from coding at constant bit-rate is exchanged for a variation in bit-rate with variable bit-rate coding.

The problem with having a rapidly changing service bit-rate is that digital television delivery systems such as DVB-T actually convey a fixed and relatively limited total bit rate to the consumer.

Whilst the average bit-rate required for a variable bit-rate service may be 4 Mbit/s it becomes a considerable challenge to multiplex that service with several others if the peak requirement is 12 Mbit/s for any one service and the practical maximum deliverable bit-rate is only 24 Mbit/s (as for example in DVB-T using 64 QAM code rate 2/3 and a guard interval of 1/32). If other DVB-T system variants are used, or a larger guard interval is required (for SFN operation), the maximum bit-rate will be lower.

One approach to this problem is to co-ordinate the individual bit-rate demands of a group of variable bit-rate coders so that the aggregate bit-rate is always kept within given bounds - e.g. never to exceed a pre-set transport stream rate. In this case it is assumed that any "peaks" in demand from one coder can be met from contemporary "troughs" in demand from the others. Within relatively narrow bounds such a system will come close to coding the bundle<sup>1</sup> of co-ordinated services to approximately constant quality. However, when several of the services clamour simultaneously for more bit-rate, the control system must arbitrate between these conflicting demands and some short-term compromise in quality usually ensues. Such "load balancing" is central to statistical multiplexing. The methods of arbitration, rate of update and means of prioritisation of services however differ between the various manufacturers. Statistical multiplexing works best when the multiplex has a high data capacity, enabling several services to be accommodated.

The coding parameters, which can usually be adjusted, are few. They include the bit-rate per service - this will be expressed as a fixed value for constant bit-rate coding or in other parametric terms if the service is being statistically multiplexed. If statistically multiplexed then the rate may be expressed as the average or "target" bit-rate together with a minimum and a maximum for that service. Alternatively, the control system may expect the user to specify a minimum and maximum together with a priority measure. In either case for any practicable coder implementation, the greater the average bit-rate, the greater the quality. In reality, there are good coders and "less-good" ones, so that manufacturer A's coder at 3 Mbit/s may result in better coded picture quality than that of manufacturer B at 4 Mbit/s.

#### **EBU Position**

*The EBU supports the use of statistical multiplexing.*

*In order to provide an acceptable video and audio quality in conventional displays (see Guideline 4.2 concerning flat panel displays), EBU members believe that 3 to 4 programmes can be accommodated in a 16 QAM code rate 2/3 multiplex and 5 to 6 programmes in a 64 QAM code rate 2/3 multiplex (but 64 QAM provides a less rugged solution than does 16 QAM). The average data capacity allocated to each programme could be from 3 to 4 Mbit/s depending on the DVB-T variant used and depending on the statistical multiplexing, if used.*

*In a DVB-T multiplex the data allocated will be mainly for video (and its associated audio) and services associated with the video transmissions.*

*Two examples of data allocation within a multiplex are given in Annex 3:*

- *the first corresponds to a DVB-T multiplex with 4 video programmes transmitted in Berlin (using 8k, 16 QAM, code rate 2/3, a guard interval of 1/8, and a total data capacity of 14.74 Mbit/s);*
- *the other corresponds to a DVB-T multiplex with 5 video programmes transmitted in Finland (using 8k, 64 QAM, code rate 2/3, a guard interval of 1/8, and a total data capacity of 22.1 Mbit/s).*

<sup>1</sup> The term "bundle" is taken to mean a group of services whose components (particularly video) are statistically multiplexed together.

## 4.2 What are the capacity requirements for services, including HD, to flat panel displays?

Two eventualities may call for new internal arrangements in established digital multiplexes, or for new thinking in future multiplexes.

- The first would be the widespread use of large screen 16:9 flat panel displays with 'WideXGA' format with the continued broadcast of 'standard' definition television (SDTV). Manufacturers of flat panel displays say that the SD (but no higher) capable flat panel displays, the WideVGA, will no longer be made after about 2007, so WideXGA (HD capable) is the future of television receivers. Viewers who have them will find (as is even the case with today's more common WideVGA display) that 4-5 Mbit/s bit rate MPEG-2 conventional quality pictures can appear impaired, and are worse than the quality they see with SD DVDs. Conventional quality DVDs use the same compression system as today's DVB-T, but high end DVDs are adjusted separately for quality for each shot, and operate at peak rates of up to 8 to 9 Mbit/s. **To provide comparable SD picture broadcasters will need to approximately double their current broadcasting bit rates.** Digital satellite operators can work in a different way than digital terrestrial operators because they have a larger multiplex. They can use 'statistical multiplexing' more effectively. Even so, some satellite Pay TV sports channels have peak rates of 8-9 Mbit/s today, and are thus more 'flat panel friendly'.
- The second eventuality would be the widespread use of the same WideXGA displays but the provision to them of 'High Definition Television' (HD) - which they are capable of displaying. If such services are to be provided, about 8-12 Mbit/s will be needed on average if one of the new compression systems is used - MPEG4/AVC or VC1. This is about two and a half times the currently used MPEG-2 bit rates for conventional quality digital terrestrial television. Though the new compression systems need lower average bit rates than the MPEG-2 compression system, describing their performance needs more explanation, because the peak bit rates they need are not reduced by such a large amount as the average bit rates.<sup>1</sup>

The multiplex available from a terrestrial television channel will have a capacity of 14 to 24 Mbit/s, depending on the quality-of-service requirement. Broadcasters could, in principle, provide for either of the above eventualities in terrestrial multiplexes, provided they accept the corresponding constraints in the number of programmes carried (compared to the number possible with 4-5 Mbit/s services). In addition, more multimedia and surround sound may also be necessary, in which case there will be further demands on the channel capacity.

In the case of DVB-T reception by large flat panel displays of standard definition services, the following points should be noted:

- In the large screen flat panel world, the total number of conventional quality programmes free from artefacts that it is possible to transmit in the same spectrum will be half or less than for DVB-T reception on standard CRT moderate sized displays;
- If the total number of programmes to be transmitted remains the same, either the total amount of spectrum required will have to double, or otherwise the area covered will have to

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<sup>1</sup> At this time we believe the MPEG4/AVC system performs approximately as follows. We assume here a 720p/50 HD format. 10-20% higher bit rates would be needed for the 1080i/50 format.

- For packaged media such as a DVD where there is no statistical multiplex, about 14-16 Mbit/s is needed (of the elementary stream) for virtual HD transparency.
- In a multiplex of two HD channels, except for the more exacting condition of two sports channels, about 24 Mbit/s is needed for virtual transparency. However, terrestrial multiplexes are likely to be more practical with one HD and one SD channel than with two HD channels if virtual transparency is needed.
- In a DVB-S2 multiplex of 54Mbit/s, with no simultaneous sports channels, 4-5 HD channels can be carried.
- In a DVB-S1 multiplex of 38 Mbit/s, with no simultaneous sports channels, 3 HD services could be carried.

be reduced<sup>1</sup> (i.e. the percentage of population covered reduced). The total amount of spectrum available is fixed and given by the bands under consideration at the RRC-06 (Bands III and IV/V).

- If the bit rates used today for digital terrestrial television in Europe, and the amount of spectrum both remain the same, artefacts will be visible on large flat panel displays;
- Most of today's satellite based digital television broadcasts use about 4-5 Mbit/s per programme although there are exceptions which depend on programme content, and statistical multiplexing can be used to allow higher peak bit rates. However, there is much more spectrum capacity available to satellite broadcasting than to terrestrial broadcasting, and it should be possible to provide virtually any capacity needed for large screen displays via satellite.

Large flat panel displays will fall in price to be within reach of the general public in the next five years. Within this time, all flat panels sold in Europe will be capable of displaying high definition quality (i.e. WideXGA) - though this HD would only be visible if HD is provided from a source such as broadcasting or DVDs.

HD-DVDs are expected to be rolled out in Europe in 2007/8 (though the present arguments between the two proposed formats could delay the roll out).

A number of Pay TV HD services by satellite will begin in late 2005 and early 2006. These may become a benchmark for quality for those with HD-ready receivers (WideXGA) and viewers who have both satellite and terrestrial services will notice a striking difference in quality.

There are two main technologies currently available for flat panel screen, the AC-PDP and the LCD. There are some differences in the performances and display life-times. LCD displays are usually smaller sized screens - up to 36", and AC-PDPs are usually larger sized screens - 42" and above. In general the points above apply to both, though LCDs in early generations seemed not to show up artefacts in the source signal to the same extent as AC-PDPs. However, their performance improves, and they are likely to be equally critical in the longer term. Eventually we expect LCDs to dominate the market, and for all sizes to be available.

**In implementing HDTV in terrestrial networks, the following aspects need to be taken into account:**

- 1 The DVB-T (digital terrestrial television system) standard allows for different DVB-T variants as a function of the modulation scheme, FEC rates and guard intervals resulting in different bit rates going up to 24 Mbit/s. The DVB-T Standard is used to implement different terrestrial TV networks providing different types of reception modes (fixed roof top antenna, portable indoor and mobile reception).
- 2 The DVB-T variants that allow for high bit rates are less rugged and require a higher C/N; therefore, they are more suitable for fixed roof top reception. The variants which allow for low bit rates are more rugged and require lower C/N; therefore they are more suitable for portable indoor or mobile reception.
- 3 Within a network the data rate to be broadcast is defined based on the required type of services.
- 4 In principle, the network can be used to deliver any quality (including HDTV) that can fit into the available capacity.

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<sup>1</sup>It would only be possible to maintain the same number of programmes where the existing coverage is achieved by a 16 QAM system variant and a change is made to use a 64 QAM system variant. (A similar effect could be achieved by changing a QPSK variant to a 16 QAM variant). In both cases coverage would be reduced. If the existing coverage is achieved by using a 64 QAM variant, then it is not possible to trade the coverage against the number of programmes.

- 5 HDTV terrestrial services will have to be based on conventional channels of 7 or 8 MHz, and the consequent size of digital multiplexes.
- 6 HDTV requires high data capacity and is mainly to be displayed on large flat panel displays and it is then primarily for fixed roof top antenna reception. If the network is planned for fixed reception mode it can be used for all formats including LDTV, SDTV and HDTV.
- 7.1 HDTV transmitted through a network planned for fixed reception will have available a maximum capacity of 20 to 24 Mbit/s depending on the network structure. Using MPEG4/AVC or VC1 that will allow for a maximum of 2 HDTV programmes with critical content to 4 HDTV programmes with uncritical content to be transmitted in a DVB-T multiplex.
- 7.2 If the network is planned for mobile or portable indoor reception only and using MPEG-4/AVC, 1 HDTV programme with critical content to 2 HDTV programmes with uncritical content or 1 HDTV programme with uncritical content plus some SDTV programmes could be provided depending on the DVB-T variant.

It can be expected that future compression systems will allow for a higher number of programmes to be included in a multiplex, though changing the compression system may render existing receivers unusable.
- 8 It is assumed that without further studies the protection ratios for planning HDTV and SDTV are the same when the same modulation is used (or assumed).
- 9 HDTV services may be required by viewers when many other HD sources are available to compare with. For broadcasters who do have terrestrial capacity, HD broadcasting may be an attractive option. Some European countries have already started HDTV transmissions via satellite.
- 10 For some countries, creating a small number of 'high value' channels in HDTV may also be more attractive than creating a large number of standard definition channels.

***EBU Position***

*Broadcasters are recommended to take account of large flat panel receivers, which are inherently, in any event, more demanding than CRT displays in terms of the required bit rate per programme.*

*In formulating requirements, broadcasters should take into account that large flat panel displays (wide XGA) require a higher bit rate per programme than CRT displays:*

- 8-10 Mbit/s for Standard Definition using MPEG-2,*
- 12-14 Mbits for High Definition using MPEG-4/AVC or VC1.*

*HDTV programming will be intended for large screen receivers.*

*For that, high capacity DVB-T variants in a statistical multiplex and fixed rooftop antenna together with advanced AVC coding should be used.*

*DVB-T frequency planning for HDTV should be based on that.*

*See Annex 4 for further details of the EBU position.*

## 5 Frequency management aspects

### 5.1 Should DVB-T for mobile reception be concentrated in a separate part of the VHF or UHF band?

One of the limitations of mobile reception is the speed which results in a Doppler frequency shift. The maximum Doppler frequency that can be permitted is directly proportional to the inter-carrier spacing of the 2-k or 8-k OFDM ('Orthogonal Frequency Division Multiplex') signal and inversely proportional to the transmission frequency used (Band III or Band IV/V). The network design and the system variant chosen will have an important impact on mobile reception quality.

Due to its propagation advantages, Band III offers the best characteristics for DVB-T mobile reception as the effect of Doppler frequency shift is reduced. However, this Band presents a difficult frequency-planning situation:

- the small number of channels available;
- the need for DVB-T and T-DAB to co-exist;
- the protection of analogue television stations in neighbouring countries which are not planning for digital in the near future;
- the different channel rasters (7 or 8 MHz) used in different countries, or even in the same country;
- overlapping channels due to the different channel rasters;
- the use of parts of the Band by other services, e.g. PMR ('Private Mobile Radio'), in some countries;

Due to the above factors, in-depth planning exercises are required to investigate the possibility of planning for DVB-T mobile reception in Band III.

Another possibility would be to plan for DVB-T mobile reception in Band IV/V. In this frequency range, the lower part of Band IV offers better propagation characteristics than the upper part of Band V and also lower Doppler frequency shift than the upper part of Band V. At the same time, in Band IV/V the frequency planning possibilities are simpler than in Band III as these bands are not expected to be planned for T-DAB and the same 8 MHz television channel raster is used throughout the planning area.

A further limitation of mobile reception using hand-held equipment is the physical antenna size. In order to minimise the size, the use of the upper part of Band V is preferred, which of course maximises the effect of the Doppler shift compared to Band IV. On the other hand, if the handheld receiver is also to be used for GSM reception, a minimum duplex distance should be respected in order to guarantee compatibility with the GSM signals using the 900 MHz band.

The use of very small antenna sizes implies very low antenna gains and therefore requires very high field strength values. Due to the transmitted power limitations on human health grounds, very dense, low-power, networks may be required. It may not be feasible to provide (DVB-T) wideband reception to handheld receivers moving at high speeds, due to network limitations (network costs and, in the case of a dense SFN, the additional cost of linking all of the transmitter sites).

#### **EBU Position**

*EBU members believe that it may be very difficult to agree on a common allocation for any reception mode in specific parts of the bands on an international basis and prefer that RRC-06 planning is not constrained by the need to plan specific reception modes in specific bands or parts of bands.*

## 5.2 What could be the future of Band II?

This Band is not part of the revision of the ST 61 Agreement. However, Band II is widely used for FM sound broadcasting and some countries are still using this Band for analogue television transmissions, for example Russia.

### *EBU Position*

*At present, Band II is intensively used for FM sound broadcasting. It is assumed that sometime in the future many of these FM services will be replaced by T-DAB services in other bands (either Band III or the 1.5 GHz band). However, the availability and sale of T-DAB receivers has not taken off as rapidly as expected in some countries. Therefore re-allocation of even parts of Band II cannot yet be considered.*

*Moreover, there are strong arguments for continuing VHF/FM services in this band. At present, it seems that requirements with single-programme needs can better use FM than T-DAB (typically local station requirements). This does not mean that such stations will necessarily remain as FM-only for the indefinite future. However, at present there are no proposals for digital transmission systems that fully meet the needs of local radio stations.*

*It is foreseeable that Band II will use digital audio systems; however, it is too early to say which digital technology will be used in the future in Band II.*

## 5.3 What particular aspects have to be taken into account when aiming at DVB-T portable indoor reception?

### Minimum field strength values and spectrum requirements

For a given DVB-T system variant, portable indoor reception requires higher minimum field strengths as compared to fixed, portable outdoor or mobile reception, and a larger number of frequency channels is needed to achieve the same coverage. (See also Guideline 6.1 and, e.g., summary Table 1 and 2 in Annex 6 for the case of 95% locations coverage<sup>1</sup>, 100% pixel coverage<sup>2</sup> and MFN. The tables have been extracted from BPN 038.)

Higher field strengths at the receiving location can be achieved by an increase of the power of the transmitters or by an increase of the density of transmitters in the network.

### Measures to reduce the transmitter power and spectrum requirements

The use of a more robust DVB-T system variant, e.g., QPSK or 16QAM instead of 64QAM, reduces the required minimum field strength, i.e. the required transmitter power, and the spectrum requirements. However, more robustness goes along with less usable data capacity. Here, the use of 16QAM for portable indoor reception seems to be a good compromise between data capacity, robustness and spectrum requirements.

The reduction of the extent of the coverage, i.e. reducing the pixel coverage from 100% (percentage for complete coverage) to lower percentages, will reduce the spectrum requirements. See example for 70% pixel coverage in the summary Table 4 in Annex 6. In practice this could mean that in a country a full coverage is planned only for population centres. However, it is not recommended to reduce the location coverage of 95% within the targeted areas, since this might lower the coverage quality to an unacceptable level.

<sup>1</sup> Within a small area, say 100 m x 100 m, there will be a random variation of signal level with location which is due to local terrain irregularities. The statistics of this type of variation are generally characterised by a log-normal distribution for the signal levels. The term '% locations' characterises the percentage of locations within a small area which are covered. It defines the "quality" of the coverage achieved.

<sup>2</sup> The concept of 'percentage of pixels covered' can be outlined as follows: "The provision of complete coverage, where the signal from at least one transmitter is receivable at any location, is described as 100% pixel coverage". It defines the "quantity" (the extent) of the coverage achieved.



Changing the network mode from the MFN to the SFN approach may reduce the spectrum requirements, in particular, when the size of the SFN areas exceeds the re-use distance needed for the applied DVB-T system variant. See example for SFN coverage in the summary Table 5 in Annex 6.

### Further considerations

A large reduction in terms of the required C/N ratio for portable or mobile reception is achieved when using diversity receivers<sup>1</sup>, leading to lower minimum field strength values, which allow for the reduction of transmitter powers, or for improvement of the indoor reception for a given transmitter power.

#### *EBU Position*

*In order to avoid too high transmitter power and/or spectrum requirements when planning for DVB-T indoor reception, it is recommended to*

- *use the SFN network mode approach instead of the MFN approach,*
- *use a DVB-T variant with moderate or high robustness (QPSK or 16AQM with CR = 1/2, 2/3 or 3/4),*
- *consider not aiming for full area coverage in a country but only for full coverage in population centres.*

*The EBU considers that it is desirable that receivers intended for portable or mobile reception should be equipped with diversity reception, although this should not be taken into account in the planning process as mandatory.*

## 5.4 How does spectrum “refarming” affect the revision of ST 61?

Because about four standard definition terrestrial digital television services can be accommodated in the same bandwidth that is currently required to transmit a single analogue television service for fixed reception, it is often claimed that the introduction of digital broadcasting will bring about ‘the end of spectrum scarcity’.

Governments and spectrum regulators are hoping that the revision of the Stockholm Plan and the introduction of digital broadcasting will allow them to reallocate (“refarm”) some spectrum currently used by broadcasting to other users including, e.g. new types of broadcasting. For that reason one of the agenda items for WRC-10 is to consider mobile allocations in the channels 63 to 69 following the transition from analogue to digital television.

However, in Europe, analogue and digital broadcasting will have to coexist for many years, as the timescales for the transition to digital broadcasting vary from country to country. Most broadcasting planners consider that little spectrum will be available for reallocation until the end of the transition period, but that view is not necessarily shared by all European administrations.

See also Guideline 5.8.

#### *EBU Position*

*The EBU does not support any ‘refarming’ in Bands III or IV/V, at least until the RRC-06 Plan has been implemented. In addition, in order to develop an interesting and competitive platform for T-DAB and DVB-T, all of the spectrum in these bands should be available for broadcasting planning at RRC-06.*

<sup>1</sup> In a diversity receiver, output signals obtained from several antennas are linearly combined using adjustable complex weight factors  $\{w_i\}_i$  before being decoded using the standard DVB-T decoding algorithm.

## 5.5 How can T-DAB and DVB-T in Band III and analogue television services in North Africa work together?

The Report from RRC-04 contains provisions which will take into account the wishes of individual Administrations with regard to the protection of analogue television services in Band III and Band IV/V (see §5.1.5.2 and §5.1.2.3 of the RRC-04 report).

How analogue television services will be protected and how that will be dealt with by the planning process is further detailed in Guideline 7.2. Two main general options are provided by the RRC-04. One option, considers the case of Administrations which request protection of their analogue services to be ensured by the planning process. In that case, the digital plan may be sub-optimal because the spectrum available for the digital plan will be limited by the analogue services to be protected.

The second option considers the case of Administrations that do not request protection of their analogue services by the planning process but only during the transition period through special regulatory procedures. In that case a near optimal digital plan could be realised but the transition period will be more difficult for digital services than in the case of the first option.

In both options, in most practical cases the protection of analogue services will impose constraints to digital services (see also Guideline 7.1).

### ***EBU Position***

*In order to relax the constraints to digital services (DVB-T and T-DAB) during the transition period, bi- and multi-lateral co-ordination will permit the Administrations of adjacent countries to reach mutually satisfactory solutions.*

*After the transition period, all constraints on digital services should be suppressed.*

*See Guidelines 7.1 and 7.2 for further details on how analogue services should be dealt with by the RRC.*

## 5.6 Is sharing of DVB-T and broadcasting satellite in Band V acceptable?

The French administration has presented a Highly Elliptical Orbit (HEO) satellite project to be allocated in the UHF frequency Band between 620-790 MHz and covering almost all of Europe. The purpose of the system is to offer a wide range of content to mobile terminals in a mass-market environment by means of the use of highly efficient compression, coding and multiplexing techniques. The proposed system is claimed to consist of:

- a user segment with low cost user terminals;
- a constellation of 3 satellites in HEO; each satellite, over its 24-hour orbit period, will be visible within the service area during 8 hours with an elevation angle of more than 60°;
- a gateway station interconnected with terrestrial networks for the transfer of information to the user terminal via the satellite constellation.

The satellite will transmit a digital carrier of 170 MHz bandwidth (occupying the entire 620-790 MHz band) carrying 10 Mbit/s of useful data repeated throughout the 170 MHz bandwidth using time and frequency diversity techniques. The aim of this technique is to cope with the interference coming from terrestrial services using the band.

The 620-790 MHz Band is allocated to the television broadcasting satellite service through footnote S5.311 in the ITU Radio Regulations:

*S5.311 Within the frequency Band 620-790 MHz, assignments may be made to television stations using frequency modulation in the broadcasting-satellite service subject to*

*agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected (see Resolutions 33 (Rev. WRC-97) and 507). Such stations shall not produce a power flux-density in excess of the value - 129 dB(W/m<sup>2</sup>) for angles of arrival less than 20° (see Recommendation 705) within the territories of other countries without the consent of the administrations of those countries.*

At WRC-03 a further Resolution regarding satellite usage of the 620-790 MHz Band was agreed (see [Annex 5](#) for the full text):

“resolves 1 that the processing of submissions of GSO BSS networks and non-GSO BSS satellite networks or systems in the frequency Band 620-790 MHz received by the Bureau and not brought into use prior to 5 July 2003, irrespective of their date of receipt, shall be suspended pending WRC-07 decisions on the sharing criteria, including the pfd required to protect the terrestrial services in this frequency band;”

Calculations performed by the EBU show that protection of existing analogue services from the HEO systems, as presented by France, may be more difficult than protection of the DVB-T services. The values agreed at the CEPT level include the values of minimum field strength to be protected in areas with nominal reception of analogue services and also values to take account of critical, but relatively common, fringe area reception situations.

Discussions are still on going at ITU-R levels to agree on the sharing parameters in relation to WRC-07 agenda item 1.11.

#### ***EBU Position***

*Adequate provisions should be made to protect existing and planned terrestrial broadcasting systems in the 620 to 790 MHz Band against potential interference from HEO satellite systems and from any BSS system, in particular by insisting on protection of realistic field strength values.*

*The EBU should also seek to ensure that the development of terrestrial broadcasting is not constrained by protection restrictions for HEO and BSS systems.*

*The EBU should continue to protect terrestrial broadcasting services.*

### **5.7 Should the EBU defend the status quo regarding broadcasting frequency allocations?**

In order to meet the needs of its Members, the EBU defends the status quo as necessary regarding broadcasting frequency allocations. BPN 045 *‘Frequency bands allocated to broadcasting’* summarises the EBU positions with respect to the different broadcasting bands. These positions depend on the particular circumstances encountered.

For example for Band I and the 20 GHz and 40 GHz bands, the EBU does not defend the status quo.

However, for the bands covered by the RRC-06 (Band III and Band IV/V) EBU defends the status quo. In the digital era, extra services will be needed so that T-DAB and DVB-T can compete with other delivery platforms in the range of programme services that it can offer - it is acknowledged in the case of DVB-T that around six multiplexes may be needed in all countries.

BPN 038<sup>1</sup> shows that, even under the most optimistic conditions, all or nearly all of the existing Band IV/V spectrum will be needed to provide these six multiplexes with the universal coverage that is implicit in the public service mission for digital television broadcasting. The exact number of multiplexes will vary from country to country depending on the reception mode adopted, on the

<sup>1</sup> EBU/UER B/CAI-FM24 Report of March 2001 on spectrum requirements for DVB-T implementation.

spectrum available for broadcasting, the geographic situation and on other considerations in each individual country.

Practical situations will be yet more demanding, because six multiplexes may not provide enough capacity in a plan that takes account of portable reception, the use of new types of home receiver or the requirements of higher definition flat-panel displays, let alone the provision of spectrum for interactive applications. These latter are under development in EBU member organisations.

The EBU is also very alert when interference to broadcasting services may occur due to license-free operations of certain applications such as Power Line Transmissions (PLT), Ultra Wide Band applications and Short Range Devices. The EBU is working to find practical solutions for limiting interference to broadcasting services.

Interference from PLT may presently affect the MF and HF bands; in future when higher frequencies are being used it may also affect Band III.

#### ***EBU Position***

*Regarding broadcasting frequency allocations, EBU should defend the status quo as necessary. Concerning the frequency bands of the RRC-06, EBU defends the status quo. Theoretical calculations on spectrum requirements for DVB-T (see BPN 038) have shown that if the expected requirement per country is to implement 6 multiplexes, at least the whole Band IV/V is needed in most countries. It is considered important that all of the spectrum in Bands III, and IV/V should be available for use at the RRC-06. In this, the needs of commercial broadcasters as well as public service broadcasters are taken into account.*

*Most countries have no firm plans yet to switch-off analogue transmissions. In addition, secondary services, for example SAB/SAP<sup>1</sup> and ENG/OB<sup>2</sup>, which are essential for broadcasting, will also need to be accommodated in the same frequency bands covered by the new plan. All these services will remain in use for a long time.*

*EBU members are asked to inform their Administrations on the potential danger of interference from license-free applications (such as Power Line Transmissions (PLT), Ultra Wide Band (UWB) and Short Range Devices (SRD)) into broadcasting services and to support the EBU agreed limits.*

## **5.8 What is “digital dividend” and will it affect broadcasting?**

The EBU considers that the digital dividend can be viewed in two ways:

1. The same number of digital programme services as transmitted on the existing analogue networks can be transmitted in less spectrum than is presently used;
2. More digital programme and associated services (including interactive multimedia ones) than the existing number of analogue programmes can be carried in the spectrum that is presently occupied by the analogue programme services.

For EBU Members, digitisation of broadcasting creates opportunities to provide, within the present broadcasting spectrum, a new range of services such as HDTV, mobile reception, interactivity etc, in addition to the existing television programmes. Furthermore, digital television receivers are projected to become the most widespread means for the general public to access entertainment, education, news and E-commerce as well as digital TV programmes. For that, broadcasters need adequate and stable spectrum both now and in the future.

<sup>1</sup> Services Associated with Broadcasting / Services Associated with Programme making.

<sup>2</sup> Electronic News Gathering / Outside Broadcasts.

On the question of how best to use the spectrum dividend in the context of the switchover, the Radio Spectrum Policy Group (RSPG) of the EU advised to distinguish three categories of spectrum demands<sup>1</sup>:

- Spectrum needed for the improvement of terrestrial broadcasting services: e.g. services with higher technical quality (notably HDTV), increased number of programmes and/or enhancement of TV experience (e.g. multi-camera angles for sports, individual news streams and other quasi-interactive options);
- Radio resources needed for "converged" broadcasting services which are expected to be primarily "hybrids" of traditional broadcasting and mobile communication services;
- Frequencies to be allocated to new "uses" which do not belong to the broadcasting family of applications. Some of these potential new "uses" of the spectrum dividend are future services and applications which are not yet marketed and others are existing ones which do not operate yet in these frequencies (e.g. extensions of 3G services, short range radio applications).

At the meeting of the Council of the European Union held on the 1-5 December 2005, the communication from the Commission COM(2005) 461 final<sup>2</sup> was discussed and the following was recorded in the corresponding press release: *'Many delegations noted the importance of the digital dividend to be released by the switchover from analogue television. The wide range of potential uses for the frequencies thus made available needed to be discussed further.'*

Current preparations for the RRC-06 indicate that:

- The digital demands of almost all Member States far exceeds the spectrum available. The available spectrum cannot satisfy the apparent broadcasting needs of Member States.
- The use of the broadcasting spectrum is critically dependent on national circumstances (such as topography, penetration of satellite/cable services and requirements for regional services).
- Many of the requirements submitted to the ITU specified particular channels which makes European harmonisation of spectrum bands for use by other services in the future virtually impossible.

If parts of the broadcasting spectrum are to be used by other services, in depth compatibility checks are needed to ensure that the other service does not create more interference than the digital entry in the Plan. Constraints on digital broadcasting which will limit its value to users are to be avoided. Digital broadcasting is characterised by a rapid transition from near perfect reception to no reception at all - and thus it is even more critical to limit interference than it is for analogue broadcasting.

#### ***EBU Position***

*Terrestrial broadcasting is a key delivery platform that must be considered along with the satellite and cable platforms. These multiple platforms will compete to offer choice to the general public, and will promote growth in a fair and competitive horizontal market.*

*Terrestrial broadcasting uses new technologies to enable it to expand its radio and television services to meet the future demands of consumers.*

<sup>1</sup> The RSPG Opinion on the "Impact on spectrum of the switchover to digital broadcasting", ref. RSPG04-55, <http://rspg.groups.eu.int>

<sup>2</sup> 'EU spectrum policy priorities for the digital switchover in the context of the upcoming ITU Regional Radiocommunication Conference 2006 (RRC-06)'

*Digital broadcasting makes more efficient use of the spectrum than analogue broadcasting. It is, however, too early in the current phase of frequency planning to categorically state that the present broadcasting spectrum will be under-occupied after the switchover. The occupation of the broadcasting spectrum will critically depend on national circumstances. It should also be borne in mind that the provision of 'universal' coverage is an obligation placed on the public service broadcasters by their governments.*

*In the digital environment, it is clear that the public will expect more from the broadcasters. The public will demand a greater choice of services; otherwise they will see no reason to buy digital receivers. Digital broadcasting enters a world where the public expects a wide choice of services on a range of receivers from large flat panel displays with HD capability to handheld sets. These services can only be provided if the present spectrum remains available for broadcasting.*

## **5.9 What is secondary trading of spectrum and how does it affect the results of RRC-06?**

The European Commission definitions are:

Secondary Trading means: "Transfer of spectrum usage rights between parties in a secondary market"

Liberalisation means: "Relaxation of restrictions on the services and technologies associated with spectrum usage rights"

The Radio Spectrum Policy Group (RSPG) of the EU issued on the 19 November 2004 an opinion on secondary trading of rights to use the radio spectrum. The RSPG concludes, among other things, that secondary trading in bands allocated to terrestrial and satellite broadcasting should be avoided or introduced only after careful studies.

Concerning how the spectrum trading will influence the RRC-06 the following should be noted:

For terrestrial broadcasting in the Bands III, IV and V it may be considered to introduce spectrum trading with a review of the case for liberalisation following the ITU planning Regional Radiocommunications Conference (RRC) in 2006. However, the RRC-06 only allows input requirements for DVB-T and T-DAB with certain technical parameters. These technical foundations were decided by the first session of the Conference RRC-04. The use of this spectrum by other services is limited by what is entered in the MIFR by the 31<sup>st</sup> October 2005. Nevertheless, in the RRC-04 report it is stated that the agreement could also contain provisions to enable use of an assignment/allotment for purposes other than broadcasting provided that no more interference is caused and no more protection is claimed.

### ***EBU Position***

*In the broadcasting case, international plans should be respected to ensure that equal opportunities are given to all countries (equitable access to the spectrum) and to ensure that interference and compatibility issues are respected.*

*Public Service Broadcasters (PSBs) have an important public mission that includes promoting national culture and social cohesion and providing reliable, unbiased information and varied and balanced programming for all sections of the population.*

*PSBs in Europe are also required to approach "universal" coverage, which means that public service programmes should be available to virtually every citizen throughout the national territory. To this end, PSBs need adequate and stable radio spectrum for transmitting their programmes and services both now and in the future.*

## 6 Quality aspects

### 6.1 What does portable reception mean in terms of coverage?

Compared to fixed reception, portable and mobile reception will require a larger number of transmitters and channel frequencies (see summary Tables 1 and 2 in [Annex 6](#)) or a reduction in the number of programmes transmitted to obtain the same extent of coverage compared to that for fixed digital reception. (Consequently, the network cost per programme, both to build the network and to maintain it, is higher).

If the number of transmitters and channel frequencies used for portable and mobile reception is the same as those used for fixed digital reception and the same number of programmes are transmitted, either:

- the area covered will be substantially reduced (and hence the percentage of population served is reduced, see Figure A below) or
- the data capacity allocated per programme will have to be significantly reduced (and hence the image quality is significantly worsened).

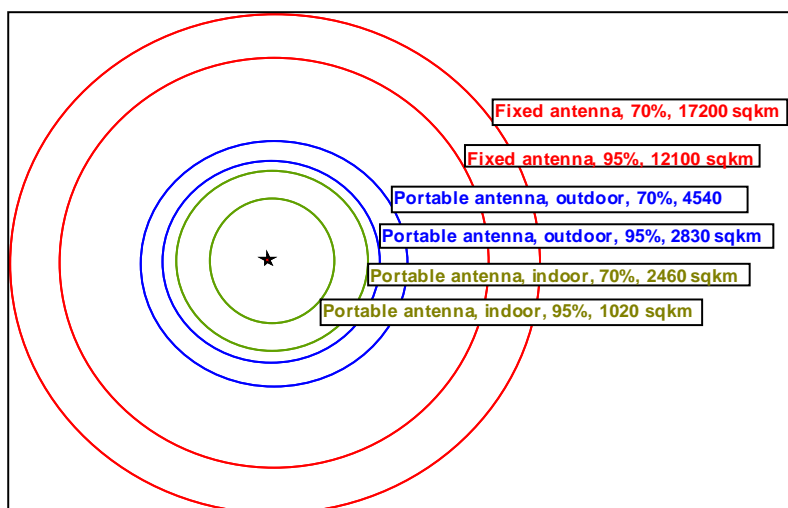


Figure A - Example of achieved coverage (percentage of locations served) by a transmitter in function of the reception mode in the ideal case of a flat area.

#### **EBU Position**

*The EBU is of the opinion that some ways to partially overcome the difference between fixed and portable reception include the following possibilities:*

*increasing the number of transmitters in SFN mode;*

*lowering the planning criteria and thus accepting lower coverage (see Guideline 5.4);*

*using diversity reception (see BPN 047 on 'Planning criteria for mobile reception') (see Guideline 5.4);*

*using domestic repeaters (see BPN 032 on 'Considerations on domestic repeaters');*

*using Wireless LANs (further studies are required on this).*

## 6.2 EBU members have a universal coverage mission. What does this mean in practical terms for terrestrial broadcasting?

EBU members have a public service mission to serve 'the citizen', and this is taken to mean all citizens. Thus the public service mission is taken to mean 'universal coverage'. In some countries, public service broadcasters are also required by national law to provide universal coverage.

In many countries, most of the population is concentrated in the main urban areas; for those countries it would be possible to cover 70 % of the population by covering about 50 % of the country area. That would only require, in some countries, just a few transmitters (and frequencies). However to provide coverage to 98 % or more of the population (i.e. coverage of almost 100 % of the country area) requires many more transmitters and more spectrum.

Theoretical calculations of spectrum requirements for DVB-T have shown that around 50 % more spectrum is required for 100 % area coverage compared to 50 % of area coverage.

### *EBU Position*

*For public service broadcasters, coverage of close to 100 % of the national population has to be planned, at least for fixed antenna reception. In terms of spectrum requirements for terrestrial broadcasting, it may mean that public service broadcasters need more spectrum to achieve their mission than do commercial broadcasters if the latter wish to cover only the areas where there is a high density of population.*

## 7 Input requirements for the RRC-06

### 7.1 What are the implications of the transition period and how long will it last?

In the RRC-04 report, the transition period is defined as follows (§7.4):

*During the transition period, the existing and planned analogue assignments will continue to be used and protected by the new digital plan. After this period, analogue assignments may continue to be used provided that:*

- *protection is afforded to the new digital plan and its modifications; and*
- *no protection is claimed from the new digital plan and its modifications.*

*This period starts at the date of entry into force of the new agreement and ends on a date to be agreed by the second session of the conference.*

*Two options have been identified so far with respect to this second date:*

- *Option 1: as early as possible and preferably not later than 2015; however, longer or shorter transition periods may be agreed multilaterally provided they do not affect other administrations concerned.*
- *Option 2: no earlier than 2028 and no later than 2038; however, shorter transition periods may be agreed multilaterally.*

*It is up to each administration to decide on the date as of which its analogue transmissions will cease.*

In most practical cases, analogue television signals are more vulnerable to interference from digital signals than from analogue television signals. In these cases, to ensure protection of analogue assignments from digital broadcasting emissions, during the transition period, there will be the need to impose constraints on the digital signals. The erp will have to be reduced and therefore the



wanted coverage of the digital signals will be reduced, compared to the coverage guaranteed in the all-digital Plan, or the wanted reception mode will be achieved in a smaller area. It should be noted that the regulatory procedures and criteria to be applied during the transition period to protect analogue requirements were not defined at the RRC-04 and will have to be agreed at the RRC-06.

If the RRC-06 agrees on a very long transition period (as identified in Option 2), the constraints imposed on digital broadcasting to protect analogue assignments will last for a very long time. That will have an impact on the implementation and deployment of DVB-T and T-DAB services, which will be slowed down, and also on the success of these digital services.

The official CEPT position is contained in a European Common Proposal (ECP) and reads as follows: 'The transition period should end not later than 2012. The Agreement should contain provisions under which analogue assignments may be operated after the end of the transition period provided they do not affect other administrations concerned'.

#### **EBU Position**

*The EBU is of the opinion that the transition period should be as short as possible (as identified in option 1) to minimise the time period where digital broadcasting will suffer from constraints imposed to protect analogue services and to maximise the guarantees of success of DVB-T and T-DAB services. At the same time longer transition periods may be agreed multilaterally to allow for longer transition periods to those countries where the start of digital broadcasting has longer time schedules. Co-operation between affected countries will then be required to relax constraints on the digital services as much as possible or to accept some degradation of quality of the affected analogue services during the transition period.*

## **7.2 Protection of analogue television services. How will that be dealt with by the planning process? How to protect them during the transition period?**

The term "protection of existing and planned analogue assignments" refers to two important aspects in the context of the RRC-06:

- the design of the digital plan;
- the implementation of stations in the digital plan.

The implementation aspect is reflected by the fact that the RRC-06 is required to produce a digital plan that is to protect existing and planned analogue assignments in the transition period. This protection will be ensured by procedures to be given by the RRC-06 as described in §7.4 of the RRC-04 report (see Annex 7 for definitions and interpretations).

On the other hand, when the digital plan itself is established, analogue assignments have to be taken into account according to the wishes of administrations. Two relevant approaches are described in §5.1.5.3 of the RRC-04 report.

**APPROACH 1:** Existing and planned analogue television assignments are taken into account in the design of the new digital plan.

As a consequence, these analogue assignments will automatically be compatible with the new digital plan and hence are protected in the new digital plan up to the end of the transition period.

#### Possible effects:

- fewer implementation problems during the transition period;
- fully compatible digital requirements can be implemented immediately after the new agreement comes into force when the concerned administration desires;

- if all existing and planned analogue television assignments are taken into account in the design of the digital plan a sub-optimal digital plan may result because there will be less spectrum available for the digital plan.

**APPROACH 2:** Existing and planned analogue television assignments are not taken into account in the design of the new digital plan.

As pointed out in §7.4 of the RRC-04 report, existing and planned analogue assignments will be protected by the application of appropriate procedures in the implementation of the new plan up to the end of the transition period. If these analogue assignments are not taken into account in the design of the plan, it is very likely that many of them will not be compatible with the new digital plan.

Possible effects:

- a near optimal digital plan could be realised (more digital requirements accommodated);
- the new digital plan may not be fully operable until the relevant existing and planned analogue assignments have been switched-off or until the end of the transition period.

It has to be emphasised that an administration does not need to apply exclusively either Approach 1 or Approach 2 to its requirements as a whole. Rather, this choice can be taken on a case-by-case basis, i.e. the choice is open for an administration with regard to an individual analogue assignment whether or not to include it in the list of assignments not to be taken into account. However, if an administration does not make any statement to the contrary all its existing and planned analogue assignments will be taken into account in the design of the digital plan.

### **Mutual impact between approaches**

If different approaches are employed by neighbouring administrations then they should be aware of the consequences.

The administration which applies Approach 1

- would be able to get more requirements into the plan along the border with the administration applying Approach 2 compared to the case when Approach 1 would be applied on both sides. Therefore the Approach 1 administration benefits directly from the application of Approach 2 by its neighbour.

The administration which applies Approach 2

- would generally get less requirements into the plan along the border with the administration applying Approach 1 compared to the case when Approach 2 would be applied on both sides. Therefore the Approach 2 administration may suffer directly from the application of Approach 1 by its neighbour.

If both administrations apply the same Approach to the requirements that are in the common border area, it is more likely that an equitable result will be obtained.

### **Planning process**

The term “planning process”, even though employed frequently throughout the entire RRC-04 report, is not explicitly defined in the report in terms of what detailed activities are covered by this process.

Four different phases of the planning process can be identified. These are

- (a) compatibility analyses,
- (b) incorporation of administrative declarations,

- (c) synthesis of a new digital frequency plan and
- (d) a complementary compatibility analysis as described in section §5.3.1.1.5 of the RRC-04 report.

The notifications by administrations of which of their existing and planned analogue assignments are not to be taken into account in the design of the plan have a direct impact on steps (a) - (c).

Step (d) is not related to the generation of the new frequency plan. It is related to the identification of what aggregate interference is to be expected for a plan entry and can include the identification of those existing and planned analogue assignments that are not protected by the digital plan but are to be protected during the transition period by means of application of the procedures for the implementation of the digital plan. This information can thus also identify those digital requirements that may be subject to implementation constraints.

The difference between the two approaches to deal with the existing and planned analogue assignments is that in Approach 1 the protection of analogue assignments is taken into account during the compatibility analyses that precede a synthesis and this ensures that the digital plan which results from the synthesis automatically ensures that protection.

In Approach 2, however, in order to ensure that the protection of analogue assignments does not act as a constraint on the digital plan, the analogue assignments are not taken into account during the compatibility analyses which lead to a synthesis. It follows that the synthesis does not take them into account either. Thus the digital plan will not necessarily be compatible with many of the existing and planned analogue assignments.

For the 1<sup>st</sup> Planning Exercise and for the Draft Plan, the CEPT recommended not requesting for analogue assignments to be taken into account in the design of the Plan as they could be protected during the transition period by regulatory procedures to be developed.

#### **EBU Position**

*Regarding the establishment of the new digital plan it is expected that within EBU members' countries both Approaches 1 and 2 may be applied and it is not possible to recommend the use of either Approach exclusively. However, it is to be noted that many EBU members consider that Approach 2 offers significant advantages in terms of the spectrum utilisation that could be achieved by the digital plan. In any case, EBU members should request their administrations to take the following positions when preparing their requirements and, in the transition period, when implementing the digital plan:*

- 1 Following Resolution COM 5/1 (Note 1) administrations should notify the ITU which of their existing and planned analogue assignments do not need to be taken into account in the design of the new digital plan.*
- 2 In any case, administrations should be encouraged to relax the constraints on the new digital requirements as far as possible and as early as possible by means of active co-operation (e.g. bilateral agreements, etc.).*
- 3 In order to facilitate the rapid introduction of the digital plan, administrations should, in general, neither bring planned analogue television assignments into operation, nor introduce new analogue assignments during the transition period. However, modifying or implementing analogue assignments may be acceptable if it facilitates the introduction of digital requirements.*
- 4 Administrations are encouraged to 'switch-off' existing analogue television stations as early as convenient before the end of the transition period, and suppress the corresponding analogue television assignment in ST61 or GE89.*

*EBU members should request their Administrations to support the abrogation of the analogue Plans after the transition period. EBU members believe that after this period, analogue assignments may continue to be used provided that:*

- *protection is afforded to the new digital plan and its modifications; and*
- *no protection is claimed from the new digital plan and its modifications.*

*This is in line with the proposal from RPG to the RRC-06 on the 'Draft example regulatory text for the new regional Agreement' (document RPG/12-E) and in particular with the item 12.5 of Article 12.*

### **7.3 How should existing and planned digital assignments/allotments be dealt with in the planning process?**

In some European countries, non-commercial and commercial DVB-T transmissions have already started. Since ST61 and GE89 procedures allow for such a use of the bands, there are existing DVB-T assignments in the ST61 and GE89 plans. Concerning existing and planned T-DAB allotments, which are entries in the WI 95 agreement, they have not been registered by the ITU BR because the ST61/GE89 procedures do not allow for such a use.

The following two cases can be identified regarding existing and planned digital assignments/allotments:

- (a) existing and planned digital assignments/allotments intended to enter into the new digital plan,
- (b) existing and planned digital assignments/allotments not intended to enter into the new digital plan, but required to continue to operate for a part or all of the transition period.

In the first case (see (a) above) these existing and planned digital assignments/allotments shall be submitted as requirements to the RRC-06 planning process. In the planning process, they will be treated in the same manner as the other digital broadcasting requirements.

If they are successful, i.e. they enter into the new digital plan unchanged, they remain as compatible as they currently are with the existing analogue assignments that appear in the ST61 and GE89 plans.

If they are not successful in the planning process, even when taking into account administrative declarations, they will presumably be included in the list of unresolved cases, together with other unsuccessful requirements, to be resolved by means of bi- and multilateral co-ordination within a limited time period after the conference. It was a practice at some previous planning conferences that such a list is attached to the final acts.

In the second case (see (b) above) it is unclear from the RRC-04 report how these existing and planned digital assignments/allotments are to be taken into account in the planning process. According to the definition given in §1.7.1 footnote 1, these digital assignments and allotments shall not be given more protection than other digital and analogue entries in the new plan.

However, the RRC-04 report does not make specific provisions for these existing and planned digital assignments/allotments to be protected during the transition period. Therefore the EBU members should advise their administrations to seek compatibility by means of bilateral or multilateral agreements, preferably in the pre-co-ordination phase before the RRC-06.

#### ***EBU Position***

*In summary, it is recommended that the EBU members should advise their administrations:*

- *to submit, as far as appropriate, the existing and planned digital assignments/ allotments as requirements for the new digital plan.*

- *to seek protection during the transition period for the existing and planned digital assignments/allotments that will not enter into the new digital plan, by means of bilateral or multilateral agreements.*

#### **7.4 What are the main issues related to the preparation of input requirements for the RRC-06?**

It is the responsibility of administrations to submit input requirements for RRC-06. In many cases, however, EBU members may wish to understand this process and/or assist their administrations with their contributions.

The following data must have been submitted by Administrations:

- requirements for digital broadcasting assignments and/or allotments: DVB-T and/or T-DAB in Band III and DVB-T in Band IV/V, including requirements for existing and/or planned digital broadcasting assignments;
- a list of existing and planned analogue stations not to be taken into account by the planning;
- a list of Other primary Services to be taken into account by the planning.

For the preparation of input requirements for the 1<sup>st</sup> iteration to be performed during the RRC-06, Administrations should submit their modified digital requirements before:

- 21 April 2006 23:59 (Geneva time) for the 1<sup>st</sup> iteration during the RRC-06.

The submission of the corresponding Administrative Declarations should be done before 19 May 2006 18:00 (Geneva time).

31 October 2005 was the date for the establishment of the Reference Situation, at which time existing broadcasting services and other primary services to be taken into account by the planning process must have been co-ordinated with affected Administrations. Since there was no way for administrations responsible for the assignment to Other Primary Services to identify before 31.10.05 those administrations which initiated the plan modification procedure before that date and whose analogue assignments might be affected, the ITU BR has reviewed the reference situation with respect to Other Primary Services taking into account additional information relating to coordination agreements concluded between administrations.

A process of bi- or multi-lateral negotiations that agree mutually compatible requirements before submission may allow for a more satisfactory outcome of the planning process than if requirements are not "pre-co-ordinated".

#### **Acceptable, available and assigned channels**

When preparing its input requirements, administrations have to indicate for each requirement the channel(s) to be considered by the compatibility analysis calculations.

A channel indicated in the input data of a requirement is referred to as an 'acceptable' channel, because that channel is acceptable to the submitting administration for the requirement in question. The compatibility analysis determines whether an 'acceptable' channel is 'available' to the requirement in question during the synthesis process. 'Availability' means that no undue interference by the requirement in question would be caused to existing analogue television or other primary services and that no undue interference to the requirement in question will be caused by the existing analogue television or other primary services.

The synthesis process determines whether an 'available' channel can be 'assigned' to the requirement in question taking into account its compatibility with other digital requirements having the same available channel.

**EBU Position**

*EBU members should formulate their needs and aspirations in terms that are compatible with the RRC-06 rules. EBU members are encouraged to discuss their requirements with their administration to ensure that they are understood before input requirements are submitted.*

*EBU members should request that their administrations engage in suitable bi- or multi-lateral negotiations, and are encouraged to assist them wherever possible in this task.*

## **7.5 How should Administrative Declarations be used in the Production of the Plan?**

Administrations may use administrative declarations in the preparation of the Plan, to indicate, irrespective of the results of the compatibility calculations, that:

- a given digital broadcasting requirement and another digital broadcasting requirement are declared compatible. This is equivalent to declaring that the two digital requirements can share a channel or a frequency block; or
- a given digital broadcasting requirement and an analogue TV assignment, or an assignment of other primary terrestrial services are declared compatible. This is equivalent to declaring that the requirement may use a particular channel or a frequency block.

An administrative declaration between two requirements or between a requirement and an assignment (analogue television or other services) means that both requirements are declared compatible or that the requirement and the assignment are declared compatible.

See [Annex 8](#) for further details on how to use administrative declarations.

### **Possible side-effects of administrative declarations**

Internal declarations may lead to non-equitable situations in the planning process. An example of this is where an administration submits a number of mutually incompatible requirements (often involving overlapping areas) and also (internally) declares them to be compatible. In order to maximize the number of satisfied requirements, the synthesis process may well accommodate these requirements at the expense of those of some other administration which has not adopted the same doubtful approach.

The 'conditional declarations' may also lead to unintended situations if conditions are not clearly specified. For example all of a given administration's digital requirements are declared compatible with some or all of some other administration's OS assignments. The planning can proceed with no difficulty. However, when it comes to the time when the first administration wishes to implement its requirements, the second administration require very stringent protection conditions to be met. The result is likely to be that the relevant digital broadcasting entries could not be implemented in any reasonable way.

Excessive use of administrative declarations, both external and internal, may lead to a situation where the interference levels for digital broadcasting are generally high and coverage areas reduced.

**EBU Position**

*EBU members should assist their administration in the preparation of Administrative declarations with their neighbours by bi or multi lateral coordination but also between their own requirements.*

*It should be noted that the Administrative Declarations make compatible two requirements that appear as incompatible after the compatibility analysis but do not remove any real interference. In other words, any interference that does occur is assumed acceptable.*

*The current rule that all declarations must be symmetrical has some disadvantages, in particular in those cases where symmetrical declarations are not submitted and asymmetrical declarations alone could remove planning constraints. EBU is in favour of allowing asymmetrical declarations.*

*At least the existences of those Administrative declarations having a special condition in the Agreement that may have an impact on the implementation phase are to be indicated in the Plan.*

*EBU members would also like that those details of the agreement that may be necessary for the implementation phase are made available.*

*EBU members should bring to the attention of their administrations possible unforeseen restrictions to digital broadcasting entries due to possible side-effects of administrative declarations.*

## **7.6 Should it be possible to make modifications to the requirements during the Conference?**

Some administrations identified the need to reconsider the manner in which the requirements are submitted, including the possibility to submit modified or refined requirements possibly after the 31 October 2005. At this stage, it was concluded that no changes to the requirements submitted by administrations will be allowed after 31 October 2005 unless agreed by the Second Session. Administrations agreed to allow modifications to the requirements and their corresponding administrative declarations during the conference. Such modifications would be voluntary and are expected to be in the direction of improvement of the Plan.

### ***EBU Position***

*EBU members should ask their administration to support the possibility of modifying the requirements during the Conference. Those modifications should help in resolving incompatibilities between requirements and should facilitate the planning and therefore improve the quality of the Plan.*

## **7.7 How to assure equitable access to the spectrum?**

Despite long discussions between administrations, it has not been possible to agree on a common definition of 'equitable access' that can be incorporated in the planning software to assure an equitable access to the spectrum for all the involved parties in the RRC.

### ***EBU Position***

*EBU members should ask and support their administration to reach by bi- or multi- lateral discussions the objective of equitable access.*

# **8 Analyses of the planning exercises**

## **8.1 Which are the conclusions from the results of the first planning exercise/Draft plan?**

The results of the Draft Plan (for the second synthesis run<sup>1</sup>) are given in the tables below. These results have been analysed on a global level. A consideration on a purely local level (i.e. by individual administrations) is not reasonable due to the many and complex interactions with neighbouring administrations. However, for a detailed analysis also a consideration of the results on

<sup>1</sup> After the deadline of 20 March 2006 for submission of Administrative declarations there was a second run of the synthesis software.

a local level is useful, and the danger of making too many generalisations from a global analysis has to be avoided.

Band III						
Study case 1			Study case 2			
	T-DAB	DVB-T	Total	T-DAB	DVB-T	Total
Yes	5353 54.5%	4056 53.7%	9409 54.1%	5365 54.6%	4073 53.9%	9438 54.3%
No	4477 45.5%	3494 46.3%	7971 45.9%	4465 45.4%	3477 46.1%	7942 45.7%
Total	9830	7550	17380	9830	7550	17380
Study case 3			Study case 4			
	T-DAB	DVB-T	Total	T-DAB	DVB-T	Total
Yes	6692 68.1%	4622 61.2%	11314 65.1%	6673 67.9%	4629 61.3%	11302 65.0%
No	3138 31.9%	2928 38.8%	6066 34.9%	3157 32.1%	2921 38.7%	6078 35.0%
Total	9830	7550	17380	9830	7550	17380

Key: Yes = number of requirements with a channel or frequency block assigned

No = number of requirements without a channel or frequency block assigned

### Results for Band III

The results for Band III show that, in general, there are too many requirements for the available spectrum, since in Band III 46 % of requirements are not assigned a channel or frequency block. However, the results have significantly improved compared to the results of the 1<sup>st</sup> Planning Exercise.

A similar percentage of T-DAB requirements (compared to DVB-T) is satisfied.

If the existing analogue assignments (3899 assignments to be protected) are excluded from the exercise (i.e. Cases 3 and 4), there is around 10% improvement in the number of requirements fulfilled reaching 65% of successful requirements. In those cases, higher percentage of T-DAB requirements (compared to DVB-T) is satisfied.

If other primary services (5622 assignments to be protected) are excluded from the exercise (i.e. Cases 2 and 4), there is only a small improvement in the number of requirements satisfied.



Band IV/V								
	Study case 1		Study case 2		Study case 3		Study case 4	
Yes	38090	68.2%	38317	68.6%	42629	76.3%	42823	76.7%
No	17759	31.8%	17532	31.4%	13220	23.7%	13026	23.3%
<b>Total:</b>	<b>55849</b>	<b>-</b>	<b>55849</b>	<b>-</b>	<b>55849</b>	<b>-</b>	<b>55849</b>	<b>-</b>

Key: Yes = number of requirements with a channel or frequency block assigned

No = number of requirements without a channel or frequency block assigned

### Results for Bands IV V

The results show that in Band IV/V there are too many requirements for the available spectrum as around 32% of requirements are not assigned a channel. However, the results have improved by 30% compared to the 1<sup>st</sup> Planning Exercise. It is because there has been a higher number of Administrative Declarations for the Draft Plan and because a higher number of analogue assignments have been withdrawn from the planning process.

A bigger proportion of requirements are fulfilled in Band IV/V than in Band III for all cases. However, compared to the 1<sup>st</sup> planning exercise, the improvement in Band III has been higher than in Band IV/V.

If the existing analogue assignments (14788 assignments to be protected) are excluded from the exercise (i.e. Cases 3 and 4), there is an improvement in the number of requirements fulfilled, such that around 23% of Band IV/V input requirements are not assigned a channel or frequency block. However, the improvement is lower than in the 1<sup>st</sup> Planning Exercise. It may be because for the Draft Plan a lower number of analogue assignments have been included in the planning process compared to the 1<sup>st</sup> Planning Exercise.

If other primary services (2600 assignments to be protected) are excluded from the exercise (i.e. Cases 2 and 4), there is only a small improvement in the number of requirements satisfied.

### Analysis of the results in terms of MIGs<sup>1</sup>

A "Mutually Incompatible Group" (called "MIG" henceforth) is a set of requirements, each of which is incompatible with every other requirement in the group. That is, no pair of requirements in the group can share a channel in a compatible manner. The size of a MIG (the number of the requirements contained in the group) is an indication of the number of channels/blocks (that is the amount of spectrum) needed to satisfy all the requirements in the MIG in a compatible manner.

If the size of the MIG is sufficiently large, the spectrum needed to satisfy all of these requirements in a compatible way will be larger than the spectrum available to the requirements in the MIG; there is said to be an "excess". The ratio of the spectrum needed by the requirements in the MIG to the spectrum available to the requirements in the MIG, expressed as a per cent, is termed the "relative spectrum demand" (called "RSD" henceforth).

RSD larger than 100% means that more spectrum is required than is available (for example, 500% means five times as much spectrum would be needed, 5200% means 52 times as much spectrum would be needed to satisfy the requirements in the MIG), and this indicates that a planning problem exists, for which the possible solutions might be:

- some of the requirements must be deleted or, at least, deleted from the MIG
- additional channels must be made available to the requirements of the MIG

<sup>1</sup> Further information can be found in documents B/BCP 140, B/BCP 166 and IPG-2/28rev1-E from Terry O'Leary.

- administrative declarations must be made, i.e. the relevant administrations must be willing to accept more interference or reduced coverage area size.

As an example, Annex 9 gives an overall view of the results (of the 1<sup>st</sup> synthesis for the Draft Plan), listed by Administration, for Band IV/V Study case 4. The following information is shown in the annex:

- "MAX MIG", the size of the largest MIG for a requirement of that administration
- "MAX RSD", the largest RSD for a requirement of that administration
- "AVE MIG", the average size of the MIGs with excess for requirements of that administration
- "AVE RSD", the average RSD for the requirements of that administration having RSD > 100%.

It should be noted that it is difficult to evaluate the magnitude of the coordination difficulties associated with MIGs with positive excess, i.e. with RSD greater than 100%. Two examples will demonstrate the important aspects. In both examples RSD = 800% is used. For simplicity, UHF requirements will be considered.

**Example 1 - MIG size = 8, Available Channels = 1  $\Rightarrow$  RSD = 800% (in this case, the excess requirements number '7')**

To resolve the congestion in this case either:

- a total of 8 distinct available channels must be found, one for each requirement in the MIG or
- 28 symmetrical administrative declarations must be developed or
- 7 of the requirements must be deleted
- a combination of additional available channels, administrative declarations, requirement deletions must be arranged.

The difficulty of resolution in this situation can only be measured in terms of the difficulty of finding additional available channels, the time needed to achieve administrative declarations, or the pain of deleting requirements. This is a subjective determination and can be evaluated only by the administrations concerned.

**Example 2 - MIG size = 320, Available Channels = 40  $\Rightarrow$  RSD = 800% (in this case, the excess requirements number '280')**

To resolve the congestion in this case either:

- at most a total of 9 additional distinct available channels could be found, one for each requirement in the MIG (this is only a partial solution at best) or
- 50260 symmetrical administrative declarations must be developed (at least) or
- 280 of the requirements must be deleted
- a combination of additional available channels, administrative declarations, requirement deletions must be arranged.

Again, the difficulty of resolution in this situation can only be measured in terms of the difficulty of finding additional available channels, the time needed to achieve administrative declarations, or the pain of deleting requirements. This is a subjective determination and can be evaluated only by the administrations concerned.

In both examples RSD = 800%, but in Example 1 the XS = 7 and in Example 2 the XS = 280. Whereas a limited number of administrative declarations would be needed in Example 1, an exorbitant number would be needed in Example 2. Thus it would be simpler, in terms of coordination, to simply delete a very large number of the requirements in Example 2.

#### ***EBU Position***

*The following measures could help to reduce the number of incompatibilities and increase the proportion of requirements satisfied:*

- *Administrations to reduce the number of their requirements*

*The number of requirements that can be satisfied by the available spectrum is limited. Although reducing the number of requirements is unlikely to increase the number of successful allocations, it could have the advantage that it allows the administration concerned to direct the synthesis process towards a solution more acceptable to it by selecting those requirements which should be excluded from the Plan.*

- *Administrations to make more effective use of appropriate internal administrative declarations*

*Analysis of many administrations' requirements shows a high number of mutually incompatible groups of requirements that are purely internal to that administration. Where these relate to requirements which have only a single acceptable channel or block, the planning process will be unable to allocate a channel or block to all of these requirements unless an appropriate administrative declaration is in place. As it is unlikely that an administration would have submitted requirements with only one acceptable channel or block unless they were compatible internally, such declarations should not cause any difficulties by their submission.*

- *Administrations to make more use of appropriate bi-lateral administrative declarations*

*The RRC-04 report encourages administrations, as far as possible, to attempt to "pre-coordinate" their requirements with their neighbours. Where this has been done, appropriate administrative declarations should be submitted. These need to be submitted by both administrations concerned in order to be effective.*

- *Administrations to increase the number of acceptable and available channels per requirement*

*Many requirements were submitted with only one acceptable channel/block, but by virtue of protection required by either analogue broadcasting assignments or other services, the requested channel/block was not available. Increasing the number of channels/blocks that are acceptable for a requirement, or indirectly increasing those available by removing protection for analogue broadcasting or other services, should increase the chances of a channel/block being allocated to that requirement.*

- *Administrations to consider the use of technical criteria that are more compatible with their neighbours*

*Many incompatibilities are "asymmetric", that is that one requirement can interfere with a second, but not vice versa. In this case, it can be difficult for both administrations to agree "pre-coordination". If one of the administrations is able to change its requirement to have characteristics more similar to those of its neighbour, pre-coordination may be easier to achieve.*

- *Do not ask, as far as possible, for protection of the analogue assignments in the establishment of the digital Plan but rely if needed on the protection during the transition period.*

*However, a warning must be given. Making a declaration that two (or more) requirements can share a channel does NOT necessarily mean that the requirements are compatible. There are many examples among the requirements where they are clearly not compatible but have been declared to be compatible. One such example is where there are several requirements covering the same area and all using the same channel which have been declared to be compatible. This will not mean that several channels will be available for use in the intended coverage area. At best, there will be a single channel.*

## 8.2 What is the impact of the relaxation of planning criteria?

One of the identified measures that could help to reduce the number of incompatibilities and increase the proportion of requirements satisfied was the relaxation of given technical parameters: percentage of locations and protection margin.

The following table gives the results (in % requirements) of these additional exercises for the Draft Plan (for the first synthesis run) for Band IV/V:

	Band IV/V			
	Study case 4	Study case 4 (90% locations)	Study case 4 (3 dB margin reduction)	Study case 4 (90% locations 3 dB margin reduction)
Yes	66.2%	68.4%	68.8%	71.3%
No	33.8%	31.6%	31.2%	28.7%

Key: Yes = number of requirements with a channel or frequency block assigned in percentage

No = number of requirements without a channel or frequency block assigned in percentage

Results for Band IV/V

### **EBU Position**

*The impact of the relaxation of technical parameters is not so important in terms of additional satisfied requirements but it may introduce difficulties in the implementation of the Plan as these relaxations introduce higher levels of interference.*

## 9 What could be the purpose of the 'Complementary Plan analysis' and the regulatory status of its results?

After the compatibility analysis and the synthesis calculations, there is a need to perform a complementary compatibility analysis of the Final Plan to establish the interference situation between each digital plan entry:

- and other digital assignments/allotments in order to have an interference analysis of the final digital Plan;
- and an analogue television assignment that has not been taken into account during the design of the Plan *but that should be protected during the transition period.*

The EBU views are that it is not needed to perform a complementary compatibility analysis to establish the interference situation between each digital plan entry:

- and an assignment to other primary services if it has not been taken into account during the design of the Plan *but that should be protected anyway.*

If an Other Service is not requested by the Administration responsible to be protected by the Plan, then it is not to be protected anyway.

Administrations have agreed that provisions need to be made for the complementary analysis (and its scope) to be carried out during the Conference after each planning iteration and before the final plan be approved by the Plenary. The ITU BR will make a proposal to be considered at the beginning of the Conference.

After the RRC-06, the results of the digital to digital complementary analysis may be used during the implementation phase. For example the interference sum at each of the test points of an allotment can be used as the reference against which a proposed plan implementation or modification can be assessed. However, it should be noted that this interference analysis of the final digital Plan will not take into account Administrative Declarations and therefore the coverage results may not reflect the overall situation.

The results of the digital to analogue interference calculations of the complementary analysis are to be used by Administrations to identify possible restrictions on the implementation of digital requirements during the transition period but they should not have any regulatory status after the RRC-06.

#### **EBU Position**

*After the compatibility analysis and the synthesis calculations, there is a need to perform a complementary compatibility analysis of the Final Plan to establish the interference situation between each digital plan entry:*

- and other digital assignments/allotments in order to have an interference analysis of the final digital Plan;*
- and an analogue television assignment that has not been taken into account during the design of the Plan but that should be protected during the transition period.*

*Moreover, It would be useful to have such a complementary compatibility analysis before the Final Plan is approved and also after each iteration performed during the RRC-06 in order to have a complete picture of its results at every stage of the planning process.*

## **10 How does the EBU communicate its views?**

The 1<sup>st</sup> Session of the RRC agreed to establish an intersessional planning group (IPG), open to participation on the same basis as the RRC, to monitor the intersessional activities in respect of the development of the Draft Plan and supervise the activities of the planning exercise team (PXT) (led by the ITU BR and assisted by experts nominated by the respective geographical groups).

It was also agreed to establish a Regulatory/Procedural Group (RPG) with a working party to study regulatory/procedural matters relating to the relevant parts of the RRC-06 agenda, and the agendas of the short conferences associated with RRC-06, to revise the Regional Agreements ST61 and GE89.

See [Annex 1](#) for the organisation of the intersessional activities.

The EBU Technical Department has contributed to the ITU BR with a software package for the planning process and is heavily involved in the work of the PXT which monitors all the work related to the planning exercises to be performed by the ITU BR during the intersessional period and the RRC-06. The EBU Technical Department also participates in the IPG and RPG works.

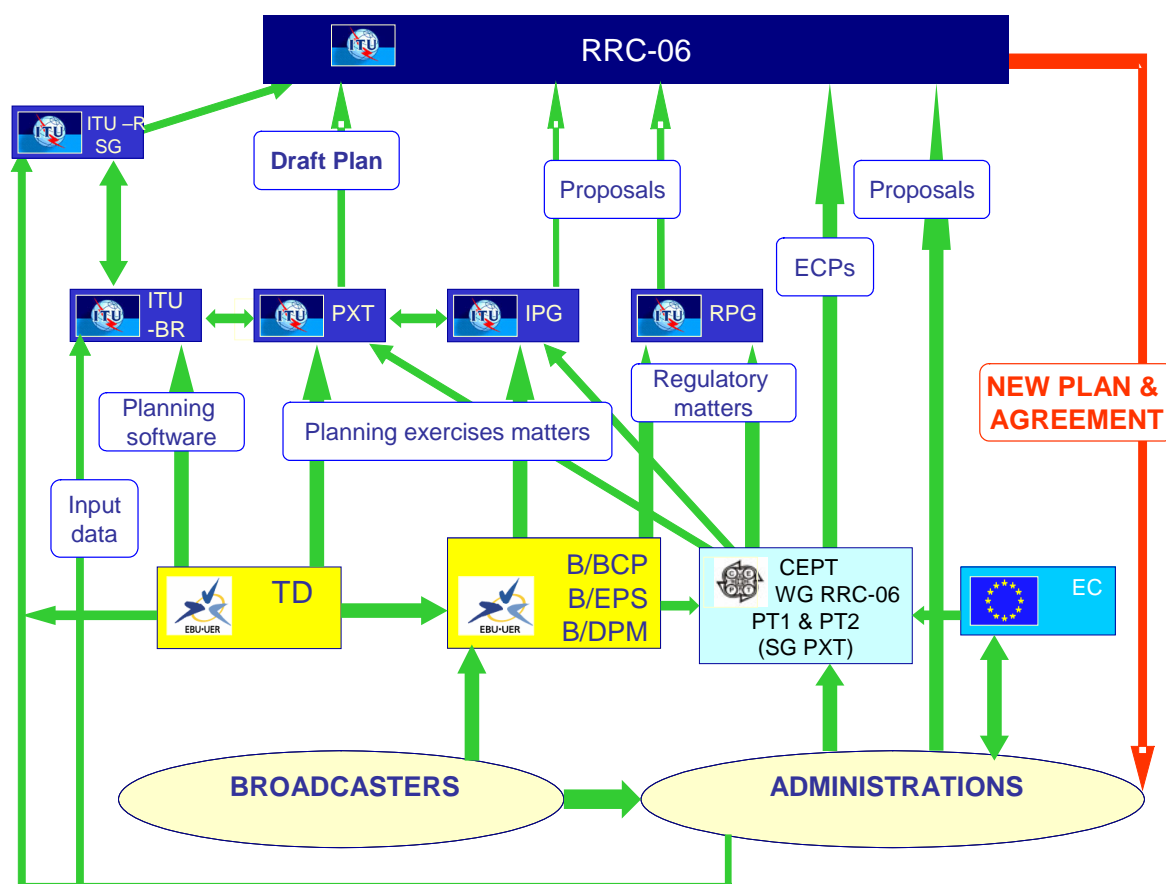


Figure B - Organisation of the intersessional work for RRC-06.

The EBU, through its project groups and the Technical Department, is actively supporting the preparations of the RRC-06 and is promoting its ideas to relevant groups in CEPT, ITU and DigiTAG and it will continue to do so, in particular where administrations are present because it will be the Administrations who will sign the New Plan.

Clearly, there is an ongoing requirement for close inter-organisational co-operation during the intersessional period. See in Figure B above the organised working groups to prepare for RRC-06. In addition, EBU has been collaborating with other broadcasting unions on the preparations for the Conference.

The main related BPN documents developed by EBU are listed in Table 6 of [Annex 10](#). Many other documents have been prepared and submitted to ITU and CEPT and the ideas contained in those documents can be found in the Report of RRC-04.

#### **EBU Position**

*The EBU Technical Department and Members should participate in all relevant CEPT and ITU groups. The EBU points of view should be expressed and supported by EBU Members.*

## Annex 1: Time schedule for the intersessional activities

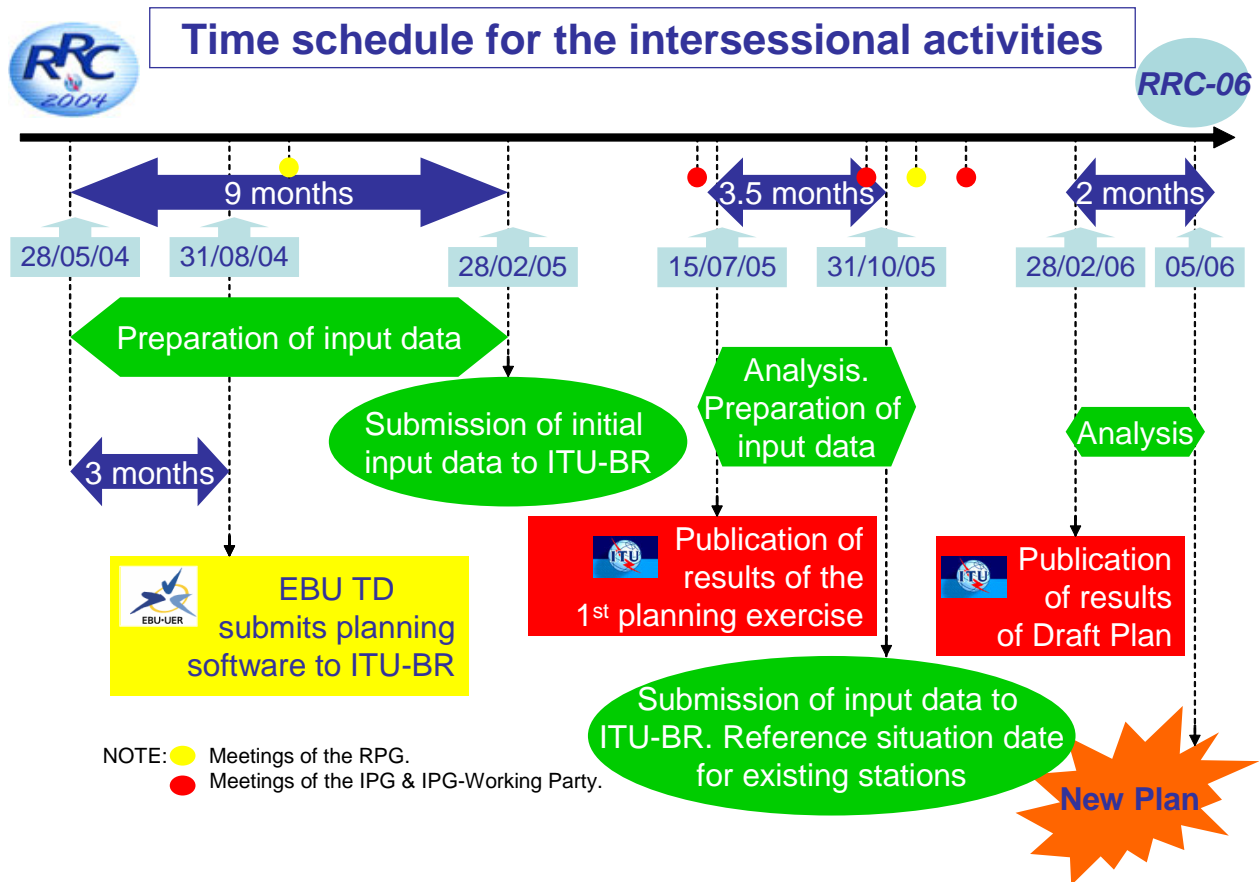


Figure 1 - Time schedule for the main activities to be performed during the intersessional period.

NOTE: The activities shown in green are to be performed by Administrations.





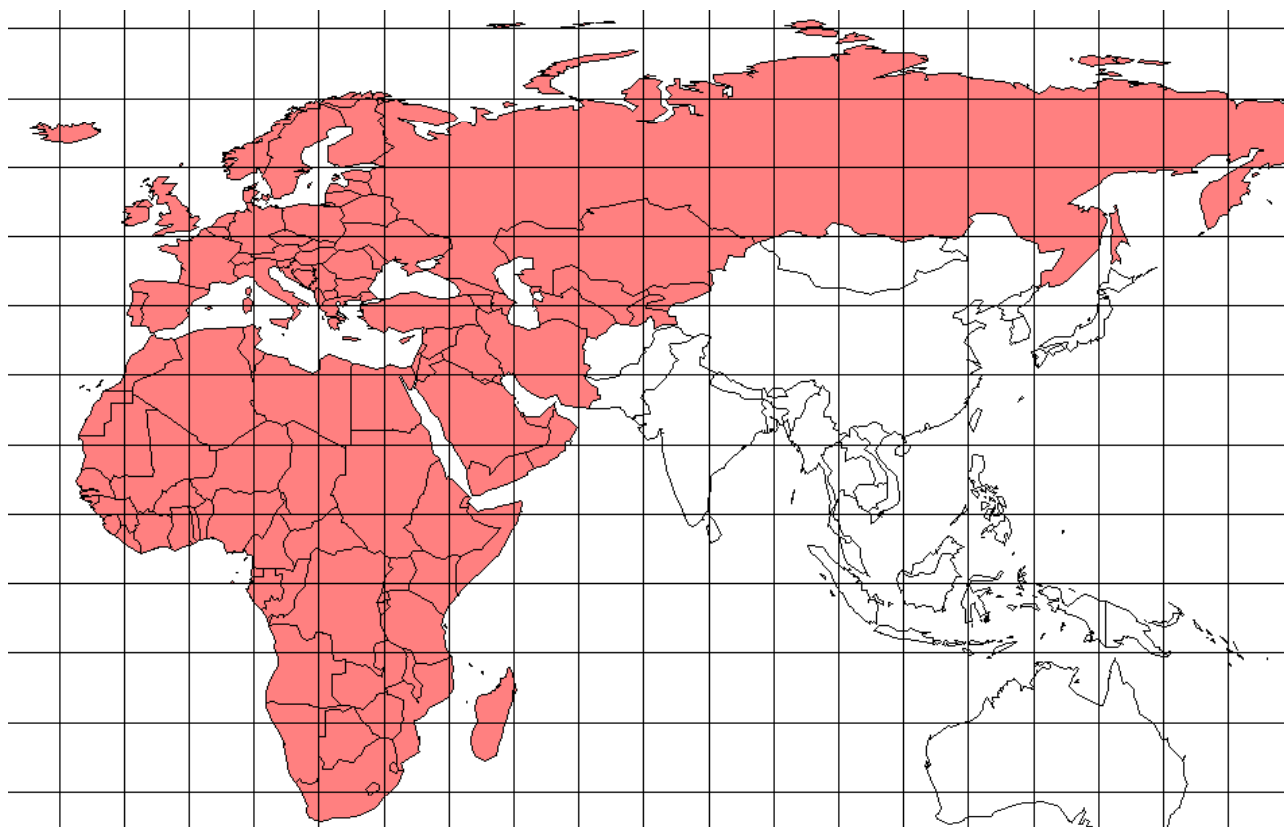
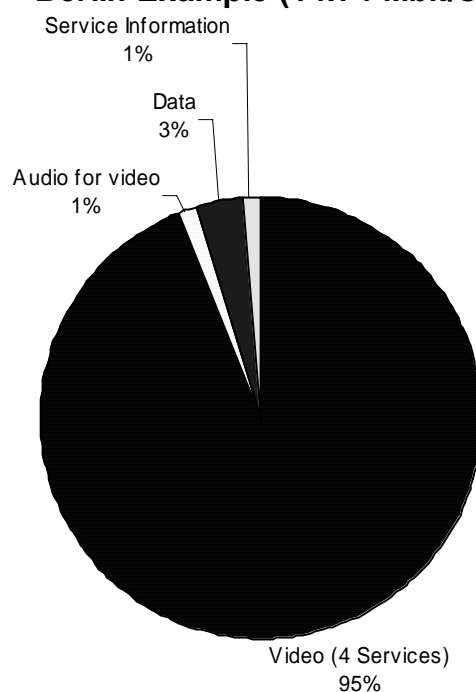
**Annex 2: Extent of the planning area for the RRC-06**

Figure 2 - The extent of the planning area for the RRC-06

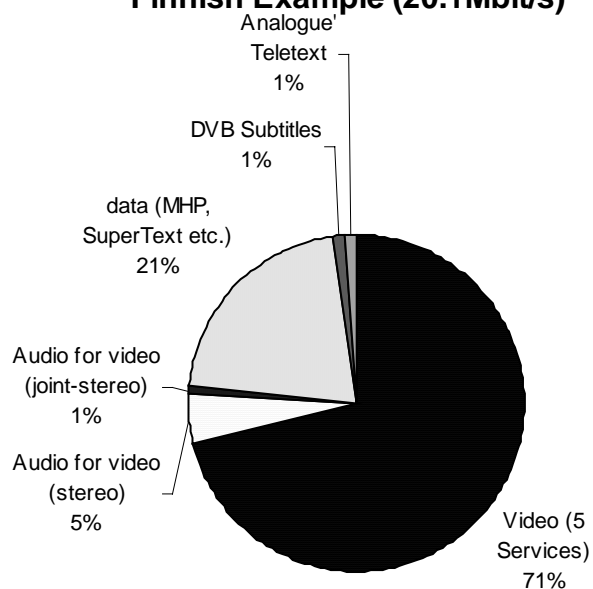


### Annex 3: Examples of data distribution within a DVB-T multiplex

#### Berlin Example (14.74 Mbit/s)



#### Finnish Example (20.1Mbit/s)





## **Annex 4: Issues concerning flat panel displays and high definition television**

4.1 'Picture quality' is a very complex subject. To specify the picture quality that systems deliver, we need to consider a range of factors.

- Picture content may be more or less difficult to compress ('critical') for a given system.
- Displays may be more or less 'transparent' to the incoming signal.
- Viewing may be done closer to or further from the screen.
- The content itself may be, of itself, more or less eye catching.

Thus, evaluations of picture quality need to be understood for what they are. They are ways of understanding what average viewers see in conditions which are 'not unduly critical'. It is a mistake to see them as laws of physics that always apply. They must be seen with the caveats surrounding them.

4.2 Figs. 3 and 4 attached to this Annex are a set of indicative curves for the different quality levels currently being considered for broadcasting digital television. They are assembled from the collective experience of EBU members. The curves relate quality to bit rate for currently used MPEG-2 compression technology, for material which is generally 'critical but not unduly so'. The assessments assume that an evaluation is made with the major kind of large screen display that is likely to be used in future (42" and 50" Flat Panel displays). Thus the viewing conditions are 'critical but not unduly so'. Fig. 3 gives indicative curves assuming that a Wide XGA display is being used (768p). Fig. 4 gives indicative curves assuming a Wide UXGA display is being used (1080p). Traditionally, the threshold of transparency is taken to occur when quality falls by 12 % with respect to uncompressed quality.

4.3 There is a family of curves for the scanning formats under discussion in the EBU. Note that the results of evaluations would be significantly influenced by the viewing distance. If the viewer moves back, he is less able to discern higher quality, because the eye becomes saturated with detail. If the viewing were done at 3H or 2.5H, the results would probably be close to those shown. If the viewing were done at another distance, say 12H, the differences between the quality levels would close up, and the lower quality levels would apparently move up the graph toward the higher levels. There will still be some differences between the levels at 12 H, but they would be much smaller.

4.4 Today, most Flat Panel displays on sale are the 'Wide VGA' format. This is transparent to the conventional quality level but not higher. The next higher Flat Panel format is the Wide XGA (see Fig.3). This is transparent to the high definition quality level, but not higher. Wide XGA displays are available to the public today, but the cost is more than that of the Wide VGA. However, manufacturers claim that Wide XGA prices will fall, and that in the second half of the decade, no Wide VGA displays will be made. We may assume that by 2010, Wide XGA receivers will be in wide use, and might be used in up to about 20 % of European homes. Some higher resolution Flat Panels are being made today with Wide UXGA (1080 by 1920) (see Fig. 4). These are transparent to all the levels given in Fig. 4. The roll out rate of Flat panels with this format is not known, but it seems inevitable that at some future date, it will supersede the Wide XGA, in the same way that Wide XGA will supersede Wide VGA. Planning for several decades ahead should take this into account.

4.5 The curves given in Figs. 3 and 4 assume that the compression system is MPEG-2 (used today for digital television broadcasting). If the figure had been prepared with one of the more

modern compression formats, such as VC1 or MPEG-4/AVC, the results would have been different. The most substantial effect would be that the curves would squeeze up to the left so that given qualities are achieved at lower bit rates. Curves for these are not included in this report at the time of writing, because we do not yet have enough experience with the new compression schemes. The Figures attached are, nevertheless, intended to give an idea of the 'landscape' of different quality levels.

However, for services that have already started on MPEG-2, at least for SDTV services, it will be necessary to retain this compression system to serve existing receivers. Mixing compression systems in the same multiplex may be possible, though not trivial, but earlier receivers would not be able to decode the later compression system.

- 4.6 If curves were prepared using Wide VGA receivers at 4H viewing distance, we would see that to achieve impairment free pictures at conventional quality, about 8-10 Mbit/s second is needed. Digital broadcasts in Europe today use between 2.5 Mbit/s (occasionally lower) and 5 Mbit/s (occasionally higher). To provide good quality pictures on Flat Panel display with Wide VGA receivers with MPEG-2 compression, about double the bit-rates used today will be needed.
- 4.7 From the curves in Fig. 3 and 4 we see that the most quality efficient delivery format for HD today is the 720p/50 format<sup>1</sup>. This provides a 'coding gain' of about 2 Mbit/s compared to 1080i/25 at qualities in the range of acceptability. For MPEG-2 delivery, about 18 Mbit/s will be needed for good quality 720p pictures. A progressive scanning delivery channel has several advantages for delivery to Flat Panels. Note that at relatively low bit rates, between 8 and 12 Mbit/s, while the quality of the 720p has fallen compared to the high bit rate quality, it is nonetheless still better than conventional quality at the same bit rate.
- 4.8 Fig. 4 includes a projection of the curve for 1080p. Using a 1080p deliver channel would be quality efficient (compared to 1080i), and would give European broadcasters a world technical lead in picture quality, as happened at conventional quality with PAL and SECAM. However, there is no certainty of availability of 1080p displays or production equipment.

#### **EBU Guidance**

*For EBU members who have not yet started their digital terrestrial television services, using one of the new more advanced compression systems would be an option. Using one of the systems will allow broadcasts at about 4-5 Mbit/s to provide adequate conventional picture quality on large screen (42") flat panel displays. However, MPEG-2 SDTV DTT receivers are now available in volume at very low prices, whilst the price and availability of SDTV receivers with one of the new compression systems is unknown, so this could weigh in favour of maintaining MPEG-2 for SDTV broadcasting.*

*For EBU members who have already begun SDTV digital television broadcasting using MPEG-2 and who believe their broadcasts should do justice to flat panel receivers, there will be a need to increase MPEG-2 delivered bit rates by at least a factor of 2 in the next ten years. The time at which this will be needed will depend on policy and may be, for instance, when flat panel displays are used in 10-20% of homes. This penetration is likely to be achieved toward the end of the decade.*

*EBU members who wish to start HD services using MPEG-4 Part 10 (given reasonable license conditions) will probably need to allocate 10-12 Mbit/s per channel for less critical content and up to 16-18 Mbit/s for (e.g.) sports with a 720p/50 delivery system. Interlace scanning systems offer no technical advantage over progressive systems for delivery and display in the flat panel environment.*

*Broadcasting of 1080p/50 HDTV is currently under study.*

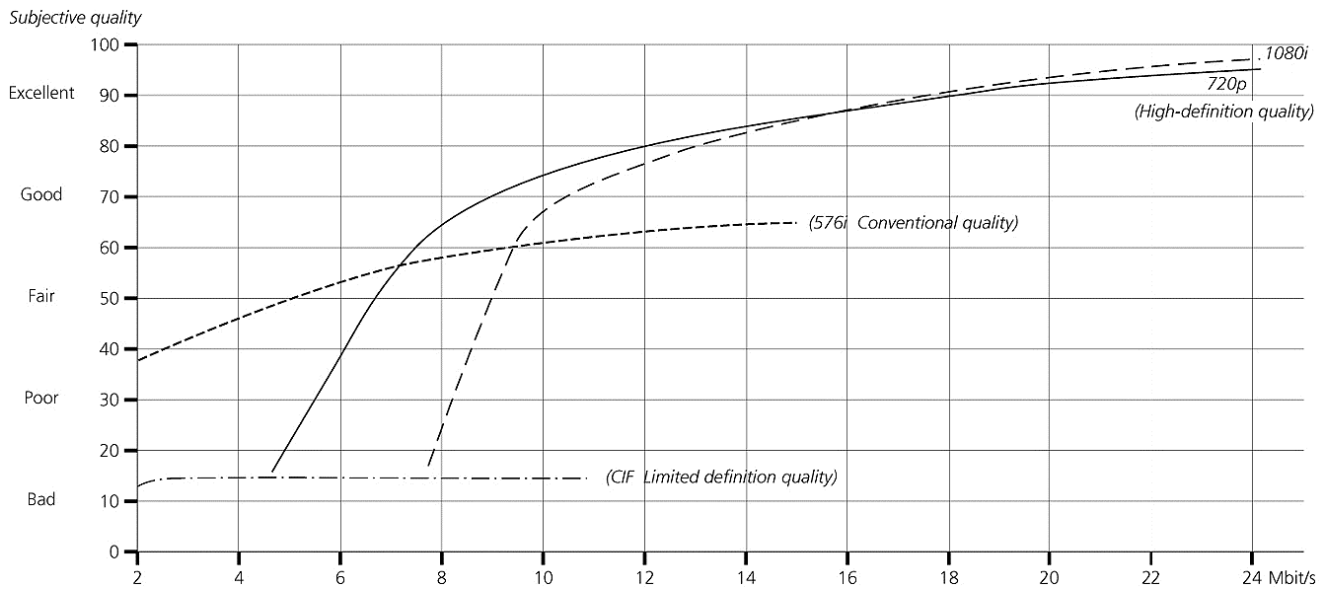


Figure 3  
Indicative curves of relative quality versus compressed MPEG-2 bit rate WideXGA FP display, 3H viewing distance

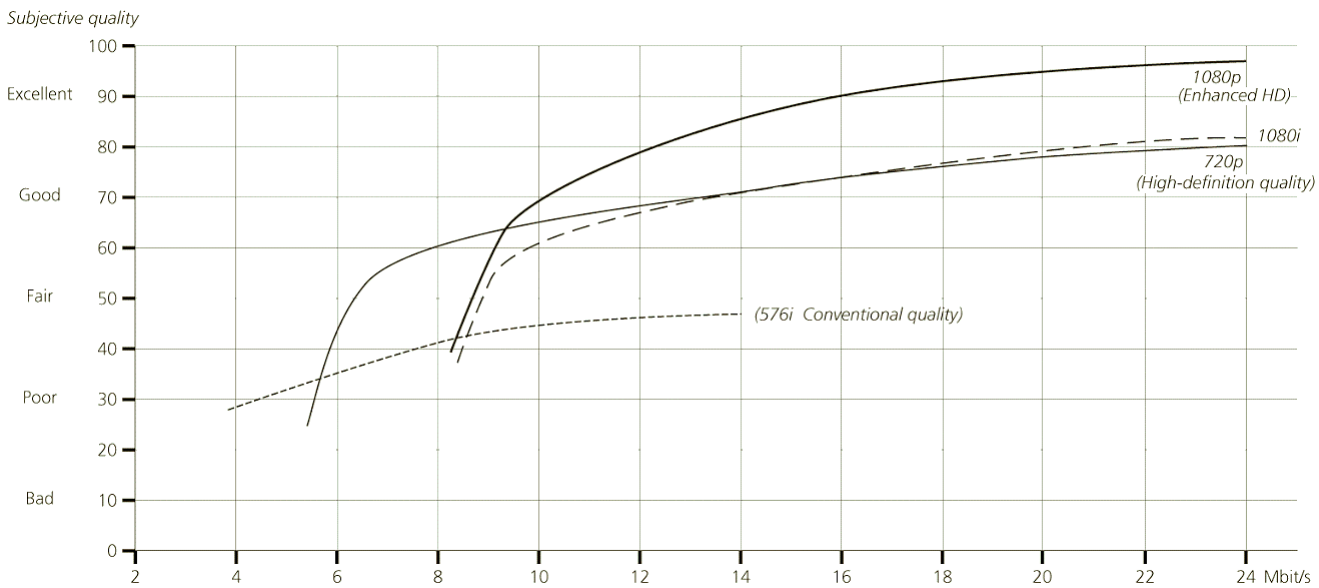


Figure 4  
Indicative curves of relative quality versus compressed MPEG-2 bit rate WideSXGA FP display, 2.5H viewing distance

<sup>1</sup> See also EBU Tech doc 3258





**Annex 5: RESOLUTION [COM4/5] (WRC-03)**

Technical and regulatory procedures relating to the broadcasting-satellite service networks operating in the 620-790 MHz band

The World Radiocommunication Conference (Geneva, 2003),

*considering*

- a) that No. 5.311 provides the conditions under which the Band 620-790 MHz may be used for assignments to television stations using frequency modulation in the broadcasting-satellite service (BSS);
- b) that it is necessary to adequately protect terrestrial services including the terrestrial television broadcasting systems in this band;
- c) that the sharing and associated provisions for satellite networks are under study in ITU-R with respect to the impact of such systems on the terrestrial services;
- d) that geostationary-satellite (GSO) BSS networks and non-geostationary (non-GSO) BSS satellite networks or systems are at the stage of advance publication or co-ordination, or have been notified in the 620-790 MHz frequency band;
- e) that studies are being undertaken to determine, inter alia, the planning criteria to be used for the Regional Radiocommunication Conference (RRC-04/06) for Region 1 and one country in Region 3;
- f) that the impact of these GSO BSS networks and non-GSO BSS satellite networks or systems on terrestrial services including digital and analogue television broadcasting systems has yet to be examined;
- g) that there are at present few GSO networks operating in accordance with No. 5.311;
- h) that it would be inappropriate to draw any conclusions regarding the form and levels of the protection criteria and their application to GSO BSS networks and non-GSO BSS satellite networks or systems until the completion of relevant studies and the approval of corresponding ITU-R Recommendations;
- i) that many administrations have extensive infrastructure for the transmission and reception of analogue and digital television services between 620 MHz and 790 MHz,

*noting*

- a) that the protection of terrestrial television services in the Band 620-790 MHz requires more study before any conclusion can be made about the appropriate pfd values;
- b) that studies called for in Recommendation 705 have been recently initiated but not completed;
- c) that the reference bandwidth of the pfd limit in No. 5.311 is undefined and guidance is urgently needed and has been requested by the Radiocommunication Bureau;
- d) that the existing provisions related to the Band 620-790 MHz are ambiguous and have been difficult to apply by administrations and the Radiocommunication Bureau,

*resolves*

- 1 that the processing of submissions of GSO BSS networks and non-GSO BSS satellite networks or systems in the frequency Band 620-790 MHz received by the Bureau and not brought into use prior to 5 July 2003, irrespective of their date of receipt, shall be suspended pending WRC-07 decisions on the sharing criteria, including the pfd required to protect the terrestrial services in this frequency band;
- 2 to suspend the application of No. 5.311 and Recommendation 705 until the end of WRC-07 with respect to the GSO BSS networks and non-GSO BSS satellite networks or systems in the frequency Band 620-790 MHz and for which notification is received between 5 July 2003 and the end of WRC-07;
- 3 that GSO BSS networks and non-GSO BSS satellite networks or systems in the frequency Band 620-790 MHz other than those notified, brought into use and the date of bringing into use confirmed before the end of WRC-03, shall not be brought into use before the end of WRC-07;
- 4 that the notified date of bringing into use referred in Nos. 11.44 and 11.48 for GSO BSS networks and non-GSO BSS satellite networks or systems in this frequency Band for which the Bureau receives notification prior to 5 July 2003 shall be extended by the length of the period from the date of receipt by the Bureau of the complete advanced publication information to the end of WRC-07;
- 5 that the BSS systems referred to in *resolves* 1 above shall not be taken into account in the application of *resolves* 3.1C and 3.4 of Council Resolution 1185;
- 6 that in the Band 620-790 MHz, No. 22.2 shall continue to apply to assignments to non-GSO satellite systems in the BSS for which complete notification information is considered to have been received by the Bureau prior to 5 July 2003 in respect of assignments to GSO satellite networks in the BSS for which complete co-ordination information is considered to have been received by the Bureau prior to 5 July 2003. The relationship between GSO networks and non-GSO satellite networks or systems for which complete Appendix 4 information has been received by the Bureau after 4 July 2003 in the Band 620-790 MHz is subject to the procedures to be decided at WRC-07,

*invites ITU-R*

to conduct studies as a matter of urgency, and develop sharing criteria and regulatory provisions, prior to WRC-07, for the protection of terrestrial services, in particular terrestrial television broadcasting services, in the 620-790 MHz Band from GSO BSS networks and non-GSO BSS satellite networks or systems which it is planned to operate in this band,

*instructs the Director of the Radiocommunication Bureau*

subject to the decisions taken by WRC-07, to resume, as appropriate, the application of Nos. 5.311, 9.34 and 11.30 and other relevant associated provisions of the Radio Regulations,

*instructs the Secretary-General*

to bring this Resolution to the attention of the Regional Radiocommunication Conference (RRC-04/06).

ADD COM4/364/29 (B22/388/26)

## Annex 6: Spectrum requirements for portable indoor reception

Table 1: Case of fixed antenna reception, 95 % locations, 100 % pixels covered for MFN.

MFN - Fixed antenna reception 95 % locations, 100 % pixel, distance between transmitters 50 - 100 km						
Effective Antenna	Number of channels			Equivalent number of channels <sup>1</sup>		
Height	64 QAM	16 QAM	QPSK	64 QAM	16 QAM	QPSK
150 m	9	6	4	9	9	12
300 m	6	4	3	6	6	9

Table 2: Case of portable indoor antenna reception, 95 % locations, 100 % pixels covered for MFN.

MFN - Portable indoor antenna reception 95 % locations, 100 % pixel, distance between transmitters 60 km						
Effective Antenna	Number of channels			Equivalent number of channels		
Height	64 QAM	16 QAM	QPSK	64 QAM	16 QAM	QPSK
150 m	25	18	20	25	27	60
300 m	18	13	14	18	20	42

Table 3: Case of portable indoor antenna reception 70 % locations, 100 % pixels for MFN.

MFN - Portable indoor antenna reception 70 % locations, 100 % pixel, distance between transmitters 25 - 60 km						
Effective Antenna	Number of channels			Equivalent number of channels		
Height	64 QAM	16 QAM	QPSK	64 QAM	16 QAM	QPSK
150 m	18	12	8	18	18	24
300 m	13	9	6	13	13	18

<sup>1</sup> it has been assumed that the term 'equivalent number of channels' used in the tables represents a data rate of about 24 Mbit/s which requires: 1 multiplex using 64 QAM 2/3, or 1.5 multiplexes using 16 QAM 2/3, or 3 multiplexes using QPSK 2/3 (with each the guard interval of 1/32).

Table 4: Case of portable indoor antenna reception 70 % locations, 70 % pixels for MFN.

MFN - Portable indoor antenna reception 70 % locations, 70 % pixel, distance between transmitters 25 - 60 km						
Effective Antenna Height	Number of channels			Equivalent number of channels		
	64 QAM	16 QAM	QPSK	64 QAM	16 QAM	QPSK
150 m	13	8	6	13	12	18
300 m	8	5	4	8	8	12

Table 5: Case of portable indoor antenna reception, 95% locations, 100% pixels covered for MFN and SFN cases.

Portable indoor reception 95 % locations, 100 % pixel, distance between transmitters 50 - 60 km. 300 m effective antenna height				
	Number of channels		Equivalent number of channels	
	64 QAM	16 QAM	64 QAM	16 QAM
MFN	25	18	25	27
SFN (50 km service area diameter)	16	12	16	18
SFN (150 km service area diameter)	4	4	4	6

## **Annex 7: Definitions/interpretations related to existing and planned analogue assignments**

### **A) 'Definitions'/interpretations:**

#### **A.1 "establishment of the plans"**

This is considered to mean (§ 7.2 of the RRC-04 report) the planning process carried out during RRC-06 (the 5 week period in May/June 2006) resulting, at the end, in

A.1.1 the "digital plan" containing "existing and planned assignments and allotments, as defined in § 1.7 of this report, in addition to the assignments and allotments proposed by administrations and approved by the conference at its second session" and in

A.1.2 the "analogue plan" containing "existing and planned analogue assignments as defined in § 1.7 of this report."

**Note 1:** The treatment during the transition period of existing and planned digital assignments that should not enter into the digital plan is not clear. This issue must be discussed further. It is assumed that in A.1.1, the references to "assignments and allotments" relates to digital assignments and allotments.

#### **A.2 "synthesis of the digital plan"**

"Synthesis" describes the process by which digital requirements are assigned frequencies by the computer (or otherwise) during the establishment of the plans, taking into account, or not, the protection to be afforded to the existing and planned analogue TV services by the digital requirements.

#### **A.3 "implementation of the plans"**

This is considered to mean the bringing into service of the new digital requirements contained in the digital plan.

#### **A.4 "the transition period"**

"This period starts at the date of entry into force of the new agreement and ends on a date to be agreed by the second session of the conference." (§ 7.4)

During the transition period "the existing and planned analogue assignments will continue to be used and protected by the new digital plan." (§ 7.4)

After the end of the transition period "analogue assignments may continue to be used provided that protection is afforded to the new digital plan and its modifications; and no protection is claimed from the new digital plan and its modifications." (§ 7.4)

**Note 2:** The "analogue switch-off" date is not necessarily the end of the transition period; administrations may choose to end ("switch-off") analogue TV transmissions before that final deadline.

#### **A.5 "compatibility during the transition period"**

See text in "§ 7.5.4.1.1", below.

## B) Other relevant Report texts:

### § 5.1.5.1

"... - In order to facilitate the planning process, administrations are encouraged to state which of their existing and planned assignments defined in §1.7 they would like to be protected

in the establishment of the plan and/or

in the implementation of the plans in the transition period..."

### Res Com 5/1 Annex 2

"Administrations shall indicate those existing and planned broadcasting assignments/allotments that are not to be taken into account in the planning process; ..."

**Note 3:** it seems from 5.1.5.1 that administrations must indicate their analogue television assignments which they wish to have protected, whereas Res. Com 5/1 says the opposite, i.e. that administrations must indicate their analogue services that they don't wish to have protected. The ITU has in the meantime decided that the latter method is to be used (see ITU CL217,\$7).

**Note 4:** it seems that the following possibilities are available: existing and planned analogue television assignments are protected:

- (a) during the transition period but not in the synthesis of the plan
- (b) in the synthesis of the plan and during the transition period
- (c) not at all

It is thought that most administrations may follow either possibility (a) or (b); some may follow possibility (c).

### § 5.1.5.1

"... - Administrations are encouraged, as part of the planning process, to agree, on a bilateral and multilateral basis, the mutual compatibility between the input requirements of digital terrestrial broadcasting services **and the compatibility between those input requirements and other assignments and services**. Such agreements need to be notified to the ITU Radiocommunication Bureau in order to assist the planning process..."

**Note 5:** It seems that the ITU is to be notified of agreements before October 31, 2005, in order to be used in synthesising the first draft plan. How is this to be done? One possibility is to make the compatibility calculations in the normal way and then to take account of the 'co-ordination' information when preparing the files that are needed for the synthesis process. This means that it is only at that stage that what has been calculated is ignored if the interfered with or interfering station belongs to one of the administrations in the co-ordination list.

By ignoring the results in such a case, the process makes the assumption that there is no incompatibility to be taken into account and there is thus no impact on the set of available channels nor is there any mutual incompatibility between digital requirements. An alternative approach would be to consider that all such agreements should relate only to individual requirements and their mutual compatibility or their compatibility with assignments of existing or planned analogue and Other Services.

### § 5.1.5.3

"One approach is to ensure compatibility between the new digital plan and existing and planned assignments/allotments in the design of the new plan, without the need for any procedures at the stage of implementation of the new plan. This approach, however, results in non-optimum use of spectrum, hence less capacity available per country for satisfying its future digital requirements."

"Another approach, by which spectrum efficiency may be maximised, is not to take into account existing and planned assignments/allotments in the design of the plan, but to ensure compatibility between them and the new plan at the stage of implementation of the new plan by the application of appropriate procedures (see Chapter 7). In this approach, it is likely that many assignments in the new plan could not be brought into service without restrictions before the end of the transition period."

#### § 7.5.4.1.1

##### **"Specific procedures for co-ordinating an assignment / allotment in one of the plans with existing and planned broadcasting assignments during the transition period"**

Compatibility of some assignments/allotments in one of the plans with existing and planned broadcasting assignments during the transition period may need to be ensured after the second session of the conference by the application of a specific procedure<sup>3</sup>. This could be implemented by specifying, under a specific section of the new agreement, that before an assignment in one of the plans, or an assignment obtained by conversion of an allotment in the digital plan, is brought into service, co-ordination is to be effected with the existing and planned digital or analogue assignments in the relevant plans which may be affected. In the application of this specific procedure, equitable access to frequency resources should be preserved."

#### § 1.7.1

##### **"Existing and planned assignments and allotments of the broadcasting service"**

Existing and planned assignments and allotments of the broadcasting service are defined as follows.

- For the territories covered by the ST61 or the GE89 Agreements, or both:
  - analogue and digital<sup>1,2</sup> assignments contained in the ST61 and/or GE89 Plans on 31 October 2005;
  - analogue and digital<sup>1,2</sup> assignments successfully co-ordinated under the procedures of Article 4 of the ST61 and/or GE89 Agreements by 31 October 2005;
  - T-DAB allotments and assignments successfully co-ordinated by 31 October 2005 with all administrations affected, the territories of which are inside the RRC planning area<sup>1,2</sup>;
  - assignments recorded in the Master International Frequency Register (MIFR) by 31 December 1989 with a favourable finding with respect to the applicable provisions of the Radio Regulations, and without complaint of harmful interference received by the Radiocommunication Bureau;
  - analogue broadcasting assignments to be submitted to the Radiocommunication Bureau by Iraq within three months after the end of the first session of the conference under the procedure and conditions mentioned in Note 4 below.
- For the territories not covered by the ST61 or the GE89 Agreements:
  - analogue and digital<sup>2</sup> assignments successfully co-ordinated by 31 October 2005 with all administrations concerned belonging to the RRC planning area;

---

<sup>3</sup> This may be the case, in particular, between countries wishing to implement different planning approaches"

<sup>1</sup> These digital assignments and allotments shall not be given more protection than other digital and analogue entries in the new plan."

<sup>2</sup> The criteria to be used for co-ordination of T-DAB with respect to other analogue and digital assignments and allotments of the broadcasting service and assignments of the other primary services are contained in §A.1.2.2 of the report. In this regard, these criteria are to be applied provisionally as part of Article 4 procedures of the ST61 and GE89 Agreements."

- assignments contained in the "RCC List"<sup>3</sup> successfully co-ordinated by 31 October 2005 with all affected<sup>4</sup> administrations, the territories of which are inside the RRC planning area.

NOTE 1: Equitable access needs to be considered when taking into account existing and planned assignments of the broadcasting service.

NOTE 2: In order to avoid undue constraints on the planning, there may be a need to encourage administrations to remove unnecessary entries from the plans.

NOTE 3: It is to be noted that in Morocco, pursuant to RR No. 5.229, the band 162-230 MHz is allocated to the broadcasting service. Since channel M5 (170-177 MHz) is both concerned by the planning of this conference and outside the bands dealt with by the conference, it may require particular consideration in the planning.

NOTE 4:

- 1 Iraq will submit by 28 August 2004 a list of its analogue broadcasting assignments to the Radiocommunication Bureau and other administrations concerned. The Radiocommunication Bureau will examine this list by applying the relevant procedures of the GE89 and the ST61 Agreements, identify the assignments of other administrations in the planning areas that are likely to be affected and send the results to the administrations concerned before the first planning exercise.
- 2 Iraq and the administrations concerned will make every possible effort to co-ordinate these assignments, in accordance with the provisions of the GE89 and the ST61 Agreements, as appropriate, taking into consideration the special situation of Iraq and allowing the Iraqi case to be tested before the finalisation of the first planning exercise.
- 3 The assignments contained in the above-mentioned list will be taken into account in the planning exercise that will be performed in the intersessional period.
- 4 Those assignments in the list referred to above which are successfully co-ordinated with all administrations concerned, following step 2 above, will continue to be considered in the production of the draft plan. The uncoordinated assignments will be submitted to the second session of the conference for consideration and further action, as appropriate."

### § 5.3.1.1.5

#### ***"Analysis of final plan(s)"***

The approach given in § 5.3.1.2.4 will be used to calculate the position of the test points delineating the service area of all assignments in the final plan(s), noting that it is necessary to calculate protection margins instead of wanted field strength in order to take interference into account. For allotments, the analysis will consist of calculating the protection margins for the test point locations specified by the administration concerned."

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<sup>3</sup> This "list" of frequency assignments to television broadcasting stations has been produced by the countries in the extended planning area defined in Council Resolution 1185 (modified, 2003) and set out in the Annex to Circular Letter CR/209."

<sup>4</sup> The criteria to be used for co-ordination of the broadcasting assignments in the "RCC List" with respect to existing and planned analogue and digital assignments and allotments of the broadcasting service and existing and planned assignments of other primary services are contained in §A.1.2.4 of the report. These criteria are to be used by the Radiocommunication Bureau to ensure that co-ordination with all affected administrations has been successfully completed."



## **Annex 8: Administrative declarations**

### **Basic Characteristics of Declarations**

Administrative declarations can be used to specify compatibility between digital broadcasting requirements and:

- other digital broadcasting requirements,
- analogue broadcasting assignments, or
- assignments of other primary services.

It is not possible to declare two requirements to be incompatible.

All declarations between two administrations must be submitted by both administrations concerned to have effect, even if the incompatibility being addressed is asymmetrical.

Note that a declaration concerning any particular requirement must post-date the submission of that requirement to the ITU BR. Should a requirement be modified, all previous declarations concerning that requirement will be invalidated and if they are still to be taken into account, must be re-submitted. Further new declarations might also be required.

It is possible to withdraw administrative declarations after submission. This must be done before the start of the synthesis process.

It should be noted that an administrative declaration indicates that administrations recognise the calculated incompatibility between the two requirements/assignments but wish this incompatibility to be ignored in the planning process. However, the administrative declaration does not remove any real interference. In other words, any interference which does occur between the two requirements is assumed to be acceptable.

### **Global Declarations**

ITU-R circular letter CR/246 introduced the concept of Global Declarations, by which single requirements may be declared to be compatible with:

- all of another administration's digital requirements,
- all of another administration's analogue broadcasting assignments, or
- all of another administration's other services.

The details on how to accomplish this are given in the Addendum to Circular letter CR/246. Note that these declarations must still be submitted by both concerned administrations.

When an administration is submitting a global declaration (i.e. all-to-one), to make it usable the symmetrical declaration (one-to-all) has to be provided to ITU BR.

It should be noted that the symmetrical declaration to an all-to-all global declaration has also to be an all-to-all global declaration, and not many one-to-one or one-to-all declarations.

### **Submission of Declarations**

All declarations from an administration must be submitted to the ITU BR in a single electronic file as far as possible. Two permissible file formats are proposed. There is a column allowed for optional remarks - note that these will have no impact on the planning process undertaken by the ITU BR.

The format is specified in more detail in the Addendum 1 to Circular letter CR/246.

The ITU BR publishes the declaration files immediately upon receipt and then examines and cross-checks the declarations, but does not inform the administrations of any errors detected (and hence declarations omitted) until after the deadline for submissions.

Should any declarations need to be re-submitted (for example, because of a modification to a relevant requirement) circular letter CR/246 implies that the administration's ENTIRE declaration file must be re-submitted.

### **Use of the fields "Coord\_a" and "Coord\_o"**

For input requirements submitted or modified after 31 October 2005, the fields "Coord\_a" and "Coord\_o" are no longer used in the planning process. If administrations wish to modify input requirements then, it is recommended that they should only use administrative declarations to indicate administrations with which coordination was successfully completed.

For the inputs submitted before 1 November 2005, BR has generated a file containing administrative declarations equivalent to the information contained in the "Coord\_a" and "Coord\_o" field (by generating the corresponding one to all declarations) and has made this file available on the ITU website ([www.itu.int/ITU-R/terrestrial/pub-reg/rrc/admdecl/index.html](http://www.itu.int/ITU-R/terrestrial/pub-reg/rrc/admdecl/index.html)). The relevant administrative declarations will be kept in a separate file and therefore do not have to be provided again by administrations except if one of the corresponding requirement is modified.

### **Draft Plan**

For the production of the Draft Plan, the use of Administrative Declarations is given in the ITU-R circular letter CR/246 and its addendum for further detailed information.

### **Timescales**

Input requirements made by administrations by 31 October 2005 were published by the ITU BR no later than the 13 January 2006 (in fact many were validated and published immediately after). Administrations must submitted declarations no later than 27 January 2006.

It should be noted that the declarations made for the first planning exercise (July 2005) were not taken into account by the ITU BR in the production of the Draft Plan. New declarations must have been submitted if they are to be taken into account.

Additional declarations to be taken into account in the publication of additional synthesis results should have been submitted by 20 March 2006.

### **During RRC-06**

At the second session of RRC, it is foreseen that there will be iterations of the planning process, and there will be scope for submission and/or withdrawal of declarations for each of these.

### **Tentative Timescales**

The Administrative declarations during the Conference should be submitted before:

- Friday 19 May 2006 18:00 (Geneva time) for the 1<sup>st</sup> iteration;
- Friday 26 May 2006 18:00 (Geneva time) for the 2<sup>nd</sup> iteration;
- Friday 2 June 2006 18:00 (Geneva time) for the 3<sup>rd</sup> iteration;
- Friday 9 June 2006 20:00 (Geneva time) for the 4<sup>th</sup> iteration.

## Conditional Declarations

Regarding the impact on the implementation phase, there are two main types of Administrative Declarations: Administrative Declarations which are used to indicate compatibility between requirements without any special condition imposed to the implementation of those requirements (for example, that type can be used to take account of topographic characteristics which limit the real interference between two requirements) and Administrative Declarations which are used to indicate compatibility between requirements with some special conditions imposed to the implementation of those requirements.

The format of the administrative declarations will be changed in order to add a new field so that administrations may indicate if the administrative declarations are conditional. Administrations may indicate through a "Y" in this field that the corresponding administrative declarations are conditional. Other values will imply that the corresponding administrative declarations are unconditional. No crosscheck validation will be performed for this field.

For the first planning iteration, if no additional administrative declarations are submitted, the administrative declarations already submitted for the draft Plan will be used and regarded as **unconditional** declarations. The Bureau will inform administrations via a CR, on the new format of administrative declarations to be used during the RRC-06.

## Declarations having an effect in the results of the Plan

Among the administrative declarations submitted by the administrations some of them have no impact on the preparation of the definitive Plan. There will be an indication in some way in the Plan that a given administrative declaration was effectively used in the preparation of the definitive Plan (i.e. without this administrative declaration the corresponding assignment/allotment would not have been compatible).

ITU BR has been requested to provide a list of those that had an impact on the preparation of the definitive Plan as soon as possible after the last iteration of the RRC-06. It is concluded that internal administrative declarations should not be included in the list.

It is also recommended that Administrative declarations, which do not have any impact on the preparation of the definitive Plan, should not be reflected in the plan and that the details of the coordination agreements should not be published in the Plan.

## Submission of Declarations

For the first planning iteration at the RRC-06 administrations are strongly recommended to provide all their administrative declarations in a single file, as far as practicable.

For the following iterations, they may need to indicate the appropriate action with regard to the administrative declarations submitted to ITU BR:

- Deletion (when the corresponding administrative declarations should be deleted).
- Modification (when the corresponding administrative declarations should be modified).
- Addition (when the corresponding administrative declarations should be added).

This implies that the format of the administrative declarations will need to be modified to indicate the corresponding action.

According to the currently implemented mechanism all declarations between two administrations must be submitted by both administrations concerned to have effect, even if the incompatibility being addressed is asymmetrical. In the view of the EBU there are disadvantages of this approach, in particular in those cases where symmetrical declarations are not submitted and asymmetrical declarations alone could remove planning constraints. Currently the asymmetrical declarations are considered invalid.

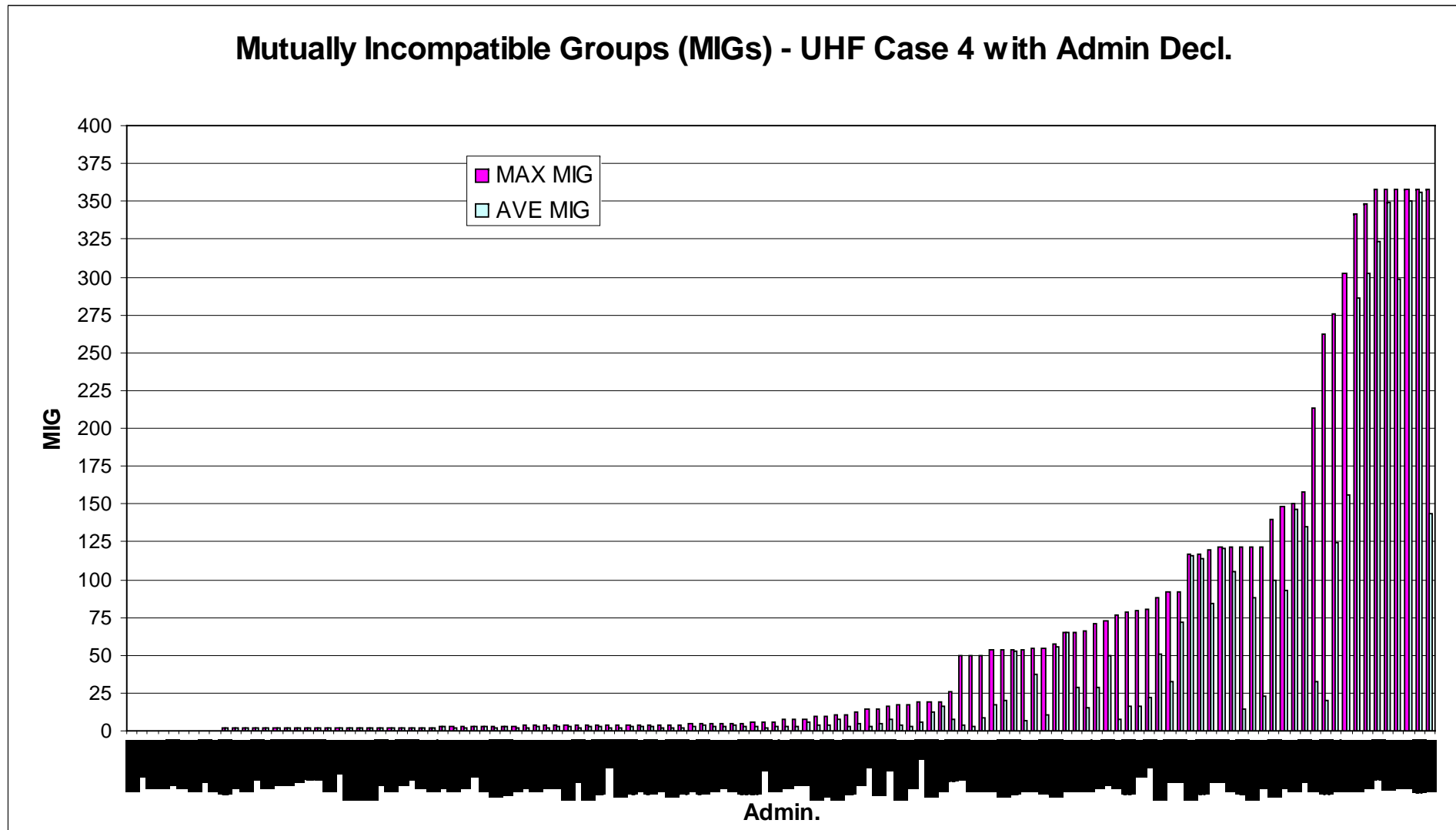
Furthermore, it is expected that the addendum to the CR/254 will clarify whether or not declarations in order to be considered symmetrical must be both conditional or both unconditional.

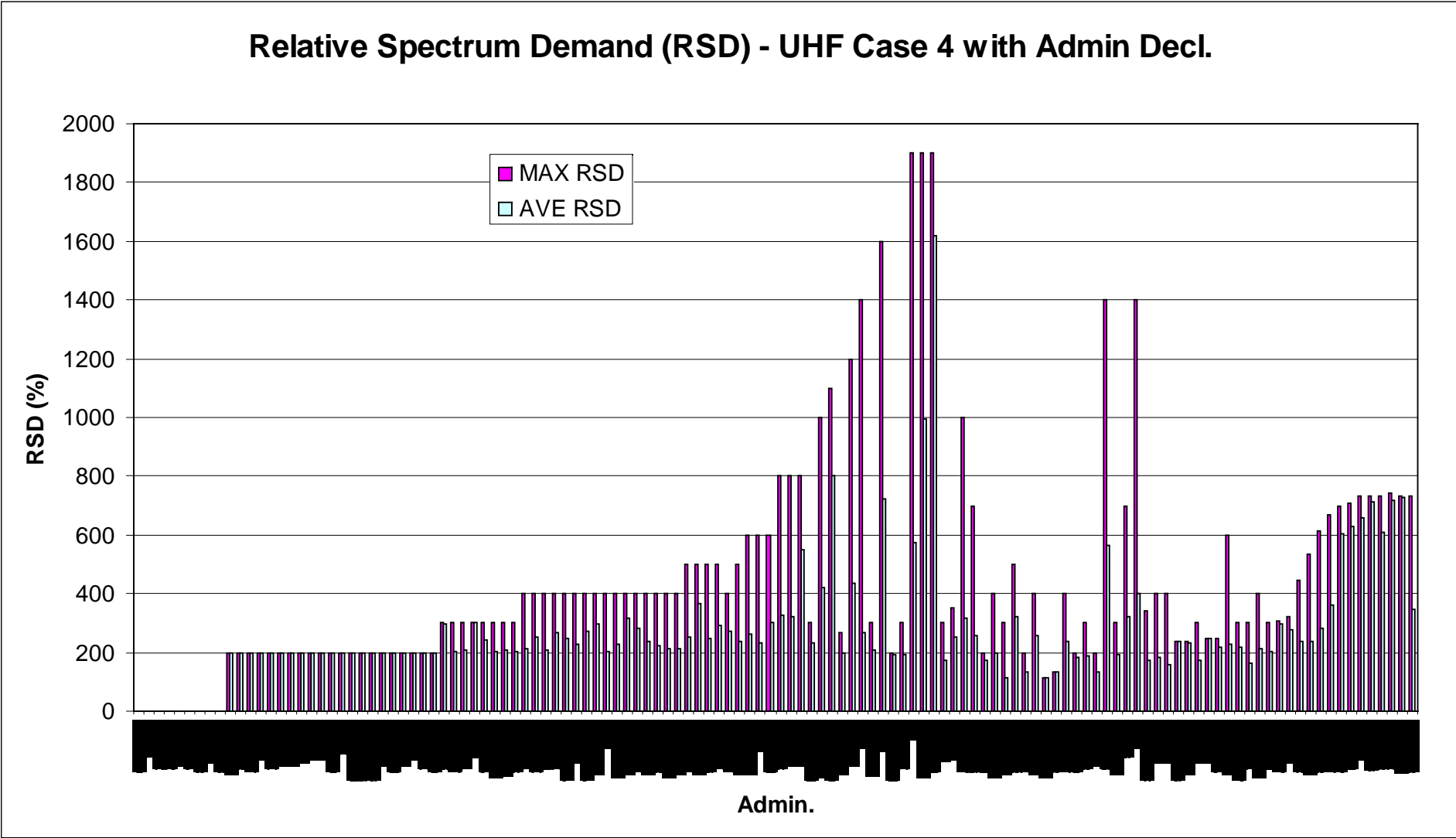
### **Status of declarations after the RRC-06**

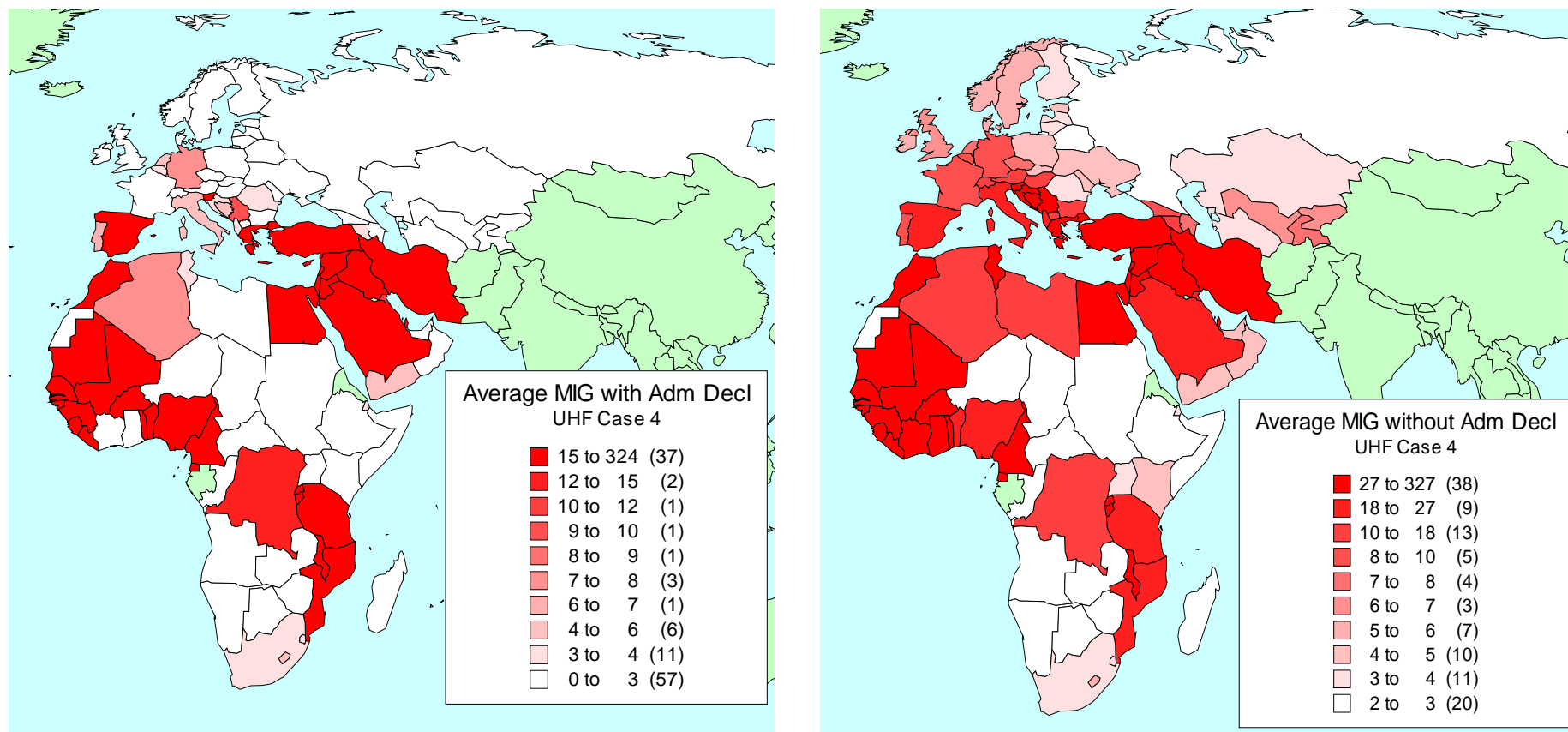
The regulatory status of the declarations after the RRC-06 is an issue to be solved/decided by the Conference. It is expected that only those administrative declarations that will have an impact in the implementation phase will remain relevant and should be recorded in the Plan.

One proposal is that administrative declarations should not have any additional regulatory status to that of a bilateral agreement, the content of which is not known to other parties. In that case only a reference to the relevant declarations would be sufficient.

Another proposal is to record in the Plan the conditions associated with administrative declarations in order to be used in the conformity check.

**Annex 9: MIGs and RSDs for UHF, Study case 4**





**Figure 5: Average sizes of the MIGs with excess of requirements for UHF, Study case 4 taking into account Administrative declarations on the left and without taking into account Administrative Declarations on the right side - Relative to the results of the first synthesis for the Draft Plan.**

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## Annex 10: EBU BPN documents related to RRC-06 technical work

Table 6 - List of BPN documents developed by EBU and related to the RRC-04/06 technical work.

DVB-T PLANNING	
BPN 005	Terrestrial Digital Television Planning and Implementation Considerations - Edition 3
BPN 018	ERC/EBU Report on Planning and Introduction of Terrestrial Digital Television (DVB-T) in Europe
BPN 024	The Return Channel for Interactive DVB-T
BPN 032	Considerations on Domestic Repeaters
BPN 033	Ideas on Migration from Analogue to Digital Television in the European Broadcasting Area
BPN 038	Report from Ad-hoc Group B/CAI-FM24 to B/MDT and FM PT24 on spectrum requirements for DVB-T
BPN 047	Planning Criteria for Mobile DVB-T
BPN 053	Planning methods for use at a Conference
DVB-T AND T-DAB PLANNING	
BPN 043	Issues concerning DVB-T and T-DAB in Band III
BPN 066	Guide on SFN frequency planning and network implementation with regard to T-DAB and DVB-T
T-DAB PLANNING	
BPN 003	Technical Bases for T-DAB Services Network Planning and Compatibility with existing Broadcasting Services
BPN 008	Review of results and implications of the T-DAB Planning meeting Wiesbaden 95
BPN 020	Implementing T-DAB networks, problems and solutions
BPN 028	Regional and local sound broadcasting services in the digital era
BPN 030	Planning Parameters and Reference Networks at 1.5 GHz
DVB-H Issues	
BPN 067	Broadcasting to Handhelds: Systems and services considerations