

# WBU-TC Position on the UHF band for WRC-19 and WRC-23

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## Introduction

This document aims to provide elements for an informed position for the World Broadcasting Unions (WBU) and their respective member organizations, as well as other broadcasting stakeholders, with regard to the subject of UHF spectrum allocation in future World Radio Communication Conferences, namely WRC-19 and WRC-23. Background Section 1 provides factual information concerning ITU, WRC and the current status of the Broadcasting spectrum allocation in the UHF band resulting from previous WRCs.

In section 2, the proposed global positions for the WBU Technical Committee (TC) towards WRC-19 and WRC-23 are described, taking into account region-specific considerations.

Section 3 gives a brief overview about the future developments of the digital terrestrial platform.

Annex 1 provides the WBU-TC position for use in public statements.

Finally, Annex 2 provides a brief overview of the standards developed by ITU-R study groups for terrestrial television broadcasting.

## 1. Background

### 1.1 International Telecommunication Union

The International Telecommunication Union (ITU) is the United Nations specialized agency for information and communication technologies. The ITU currently has a membership of 193 countries and almost 800 private-sector entities and academic institutions. The ITU is headquartered in Geneva, Switzerland, and has twelve regional and area offices around the world. The ITU allocates global radio spectrum and satellite orbits, and develops technical standards that ensure networks and technologies seamlessly interconnect to improve access to spectrum on a global basis.

For many decades, the development of sound and television broadcasting systems has focused on the Study Groups and Working Parties within the structure of the ITU. The ITU has been the sponsor of many initiatives related to the migration to digital broadcasting. Many countries follow the standards, specifications and service planning for broadcasting systems as recommended by the ITU.

### 1.2 What is a WRC?

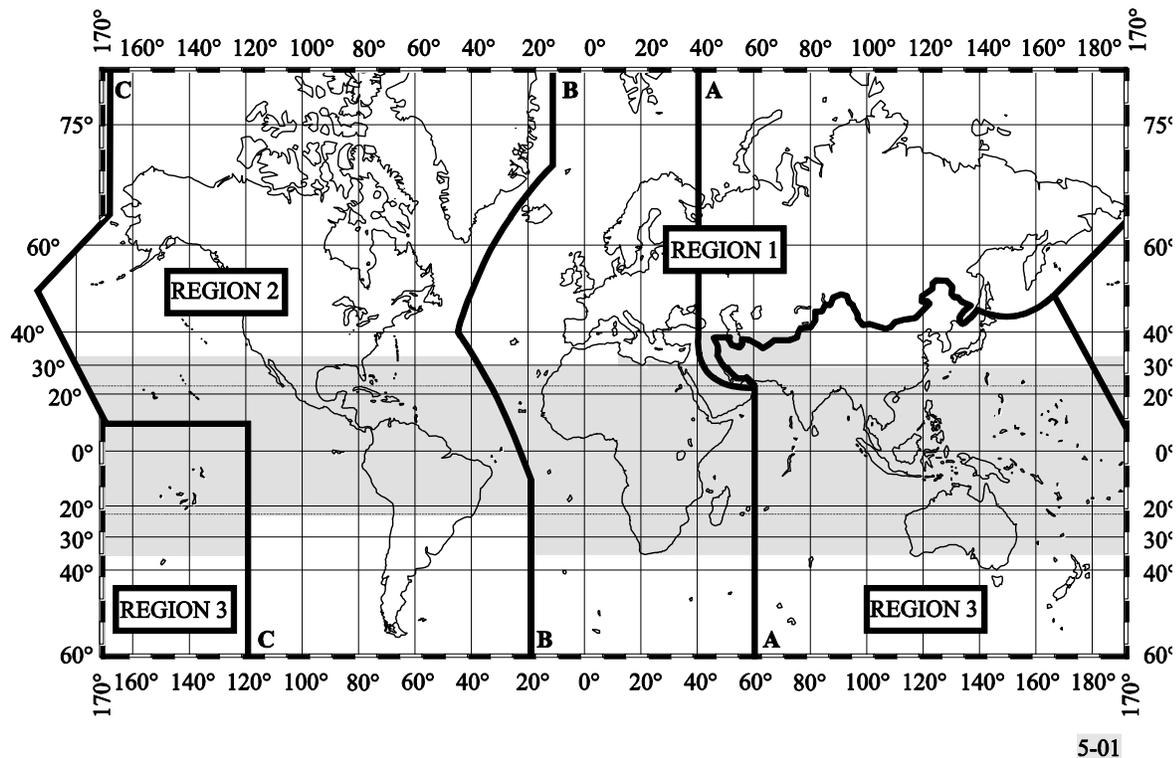
A World Radiocommunication Conference (WRC) is empowered by the ITU Constitution to change the Radio Regulations (RR) – the international treaty that defines how radio spectrum is used around the

world. They are held every three to four years, and work to an agenda set by the ITU Council, which takes into account recommendations made by the previous WRC. The RR set out the primary use for a band of spectrum. In particular, WRC agenda items focus on cross border use and harmonisation of spectrum use.

Individual countries do have a sovereign right on how they choose to use spectrum, however, the efforts by the ITU to harmonise spectrum-use globally do have a substantial influence on spectrum-use within all countries. Where countries use spectrum in ways not defined in the RR, they are obliged to prioritise the coordination of primary-use services with neighbouring countries. The economic and technical advantages of harmonisation between countries also limit the extent to which non-primary allocations are made. In practice, therefore, a revision to the RR is usually seen by national administrations as a clear indication on how they should make spectrum allocation decisions in the years after the WRC.

As global harmonisation is often difficult to reach because of different legacy uses in different parts of the world, the WRC considers three large regions to assist with the process of harmonisation (see map below):

- Region 1 includes Africa, Europe, the Middle East and parts of Asia;
- Region 2 includes North, Central and South America;
- Region 3 includes most of Asia and Oceania.



The last WRC was held in 2015. It set the general scope of the agenda for the 2019 conference (WRC-19) and drafted a preliminary agenda for the 2023 conference (WRC-23).

### 1.3 What is the current regulatory status of broadcasters' spectrum?

Many of the lower frequency bands used by broadcasters (LF, MF, HF, VHF) are of little interest to other spectrum users and so allocation changes are discussed relatively rarely in WRCs. Rather, interest focusses on the higher bands, and in particular on the UHF band, used globally for television broadcasting (primarily digital but also some remaining analogue TV).

At successive WRCs (in 2007 and 2012), parts of the UHF broadcasting band from 862 MHz downwards were re-allocated to mobile, and subsequently there has been clearance in many countries of broadcasting from these bands to accommodate IMT (International Mobile Telecommunication, the ITU term that designates Mobile Broadband) systems. Reduction of spectrum for television broadcasting has placed restrictions on television broadcasting in some countries and constrained further development of television broadcasting in other countries.

At WRC-15, a broad agenda item considered the re-allocation of many bands from 470 MHz to 6 GHz to mobile with identification to IMT, on a global basis. For the UHF broadcasting band, no consensus was possible globally, so a variety of positions were reached for each region:

- In Region 1, no new mobile allocations were made at all below 694 MHz, but administrations agreed to review the entire band use at WRC-23 (see below), noting that in the African Broadcasting Area the band 606-614 MHz is also allocated on a primary basis to the radio astronomy service – see RR 5.304.
- In Region 2, mobile allocations were added or affirmed for use by IMT in five countries (the Bahamas, Barbados, Canada, the United States and Mexico) in the band 470-608 MHz or portions thereof, and in seven countries (the Bahamas, Barbados, Belize, Canada, Colombia, the United States and Mexico) in the band 614-698 MHz or portions thereof – see RR 5.295 and 5.308A.
- In Region 3, mobile allocations were added or affirmed for use by IMT in four countries (Micronesia, the Solomon Islands, Tuvalu and Vanuatu) in the band 470-698 MHz or portions thereof, and in three further countries (Bangladesh, Maldives and New Zealand) in 610-698 MHz, noting that in China the band 606-614 MHz and in India the band 608-614 MHz are also allocated on a primary basis to the radio astronomy service – see RR 5.296A, 5.305, 5.307 and 5.308.

In summary, a mobile allocation of the whole of the remaining UHF broadcasting band, with identification for IMT, was made in nine countries, with a partial allocation in a further five.

Another development has been that ITU-R Working Party 5D (IMT Systems) is developing frequency arrangements in the band 470–698 MHz for the operation of IMT systems. Working Party 5D is also developing reports on:

- National experiences on the use of terrestrial IMT Systems in UHF frequency bands around and below 1 GHz identified for IMT, and
- Audio-visual capabilities and applications supported by terrestrial IMT systems.

## 1.4 What is WBU-TC and why does WBU-TC need a position?

As the technical arm of the World Broadcasting Unions<sup>1</sup>, the Technical Committee (WBU-TC) is responsible for technical broadcasting issues of importance to the members of the World Broadcasting Unions. Its responsibilities include coordinating collective action on technical matters associated with broadcasting technologies in order to bring benefits to individual Broadcasting Unions and developing common positions for standards setting and regulatory bodies. Although much of the preparatory work for WRCs takes place in the regional broadcasting unions, WBU-TC can allow broadcasters across the world to speak with a single voice on matters of concern.

To defend the UHF frequency band 470-694/698 MHz from further mobile allocations and/or identification for IMT, an early position of WBU-TC on WRC-19 and WRC-23 is needed.

## 2. Proposed Position

### 2.1 General (global) position for WRC-19

The UHF broadcasting spectrum, originally 470-862 MHz, has come under substantial pressure in recent years specifically for identification for use by IMT.

Successive WRCs have agreed to make substantial changes to the status of the UHF band, changing the band from an exclusive primary allocation to broadcast services to designating parts of the UHF band as co-primary between broadcast and mobile services. The WRCs have further identified that the mobile services would be based upon IMT standards, and this has been followed by decisions of national and regional administrations to clear broadcasting from those bands in favour of mobile broadband. In some parts of the world, these successive encroachments have already led to a reduction of broadcasting services available, despite continued demand for access to TV services by the public. The WBU-TC believes that any further such re-allocation would lead to a reduction in services available, possibly fatally weakening the terrestrial TV offering in some countries.

Furthermore, reduction in spectrum for TV leads to a reduction in spectrum available for services ancillary to broadcasting – specifically, the radio microphones and talkback systems without which many TV programmes, film and theatrical productions would be impossible.

If global mobile allocations and global identification for IMT in the UHF band cannot be achieved, then the various Member States supporting IMT will likely seek to create Regional or sub-Regional<sup>2</sup> allocations and/or footnotes. Such a process would allow the member states to revisit the band allocation at future WRCs, either under a specific agenda item for IMT in the case of Regions not included in the allocation and/or footnote, or the standing agenda item (Agenda Item 8, relating to

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<sup>1</sup> Established in 1992, the World Broadcasting Unions (WBU) is the coordinating body for broadcasting unions who represent broadcaster networks across the globe. Since its foundation, WBU has provided global solutions on key issues for its member unions. The North American Broadcasters Association (NABA) acts as secretariat for the WBU, and the other Unions represented are the Asia-Pacific Broadcasting Union (ABU), the Arab States Broadcasting Union (ASBU), the African Union of Broadcasting (AUB), the Caribbean Broadcasting Union (CBU), the European Broadcasting Union (EBU), the International Association of Broadcasting (IAB/AIR), and the North American Broadcasters Association (NABA).

<sup>2</sup> Included in new multi-country footnotes.

consideration and action on requests from administrations to delete their country name from footnotes, and placed on every WRC agenda) in the case of sub-Regional (multi-country) footnotes.

The WBU-TC therefore opposes any allocation of further spectrum from the UHF broadcasting allocation to the mobile service at WRC-19 and/or identification for IMT. This includes the addition of any further countries to the existing footnotes Nos 5.293, 5.295, 5.296A, 5.297 and 5.308A.

The allocated spectrum for mobile with identification for IMT, including the globally harmonized 900 MHz, 800 MHz and 700 MHz bands, is still to be used in many countries. In addition, large portions of higher frequency bands are foreseen for allocation to and use by future mobile systems (*i.e.*, 5G, which is called IMT 2020 in ITU terms).

Co-Primary allocation to Mobile, with identification for IMT, creates difficulties to coordinate cross border use between IMT in one country and television broadcasting in another country. This is actually happening in the 700 MHz and the 800 MHz bands in several areas around the world.

ITU studies, described in ITU-R Report BT.2337, show how difficult it is to operate co-channel IMT and DTT in neighbouring countries. This is also confirmed by some Mobile/IMT stakeholders that confirmed the difficulty of spectrum sharing between IMT and DTT within a country and across countries' borders.

Transition to future broadcasting technologies is ongoing in several regions, and new services (UHD, etc.) are foreseen – see section 3 on Future Challenges.

## 2.2 Region-specific considerations

### 2.2.1 Region 1

In Region 1, there is no Primary allocation to the mobile service in the band 470-694 MHz, and consequently no footnote that can refer to such allocation. It is to be noted that there is an important secondary mobile allocation intended and used for applications ancillary to broadcasting and programme-making (footnote 5.296).

This situation was confirmed at WRC-15, and is the subject of a preliminary agenda item (agenda item 2.5) for WRC-23. Given that, there is no justification for any further regulatory action in this band at WRC-19.

The outcomes of WRC-19 with respect to proposed agenda item 2.5 for WRC-23 may have consequential effect on RR N° 5.296. This would need to be considered by WRC-19 in the establishing of WRC-23 Agenda.

Considerations specific to Region 1:

1. The band 470-694 MHz is used by DTT in the CEPT and RCC countries, providing a large number of services to the public.
2. The EU has decided to preserve this spectrum for broadcasting at least until 2030.

3. Band I spectrum (47-68 MHz) is not available and not used by Broadcasting in Region 1. There is limited access for DTT to Band III, which is mostly dedicated to Digital Sound Broadcasting. This makes the band 470-694 MHz essential for terrestrial television delivery in Region 1.
4. In Sub-Saharan Africa, DTT is being implemented in most countries, but additional time is needed to allow African countries to overcome the difficulties they are facing in this implementation. At this time, certainty in the spectrum allocation to broadcasting is essential to secure certainty of investment for both public and private broadcasters. There are clear examples of successful implementation and best practices that show the acceptance of DTT by the African public.
5. In MENA (Middle East and North African) countries, DTT is implemented or being implemented in most countries.

### 2.2.2 Region 2

In Region 2, there are footnotes allocating parts of the band 470-698 MHz to the mobile service on a primary basis in some countries, and a few countries also identified parts of that band for IMT at WRC-15.

Considerations specific to Region 2:

1. In the U.S., the incentive auction resulted in:
  - a. Frequencies from 614 MHz to 698 MHz being reassigned to mobile, for use by IMT.
  - b. Stations using channels in the 614 MHz-698 MHz band being “repacked” down to Band III and Band I, which are both available and used for broadcasting in North America and Region 2 generally, unlike other Regions in the world.
  - c. However, following the completion of the 600 MHz incentive auction, AT&T (one of the largest mobile companies in the U.S.) has decided to divest itself of the 600 MHz assignments it purchased in the auction.
  - d. FCC rules now allow broadcasters to SHARE a 6 MHz channel, which reduces their capacity, as manifest in the quality/quantity of programming that is broadcast.
  - e. The remaining broadcast spectrum is extremely crowded.
  - f. Users of wireless microphones and other secondary services have been significantly impacted.
  - g. Although the target date to complete the repack is 39 months (July 2020), it is uncertain if the process will be completed by then. (Reference: <https://www.fiercetelecom.com/installer/nab-says-fcc-s-repacking-timeline-too-inflexible-for-broadcasters>)
2. Canada, Mexico, and the U.S. have all established domestic mobile allocations at 614-698 MHz, for use by IMT. Spectrum below 608 MHz is domestically allocated for broadcasting only (with some land-mobile and fixed service allocations). This is different from the RR co-primary allocation below 608 MHz. [There is debate in the U.S. currently on whether it should withdraw from footnotes 5.295 and 5.297 providing co-primary status for broadcasting and IMT in the

entire UHF band.]

3. In North America, the transition from analogue to digital television is already completed. In many South-American countries, DTT is being implemented successfully and the digital switchover is ongoing. Meanwhile, most Central America and Caribbean countries still haven't started their DTT operations; some are beginning their transition, and some others haven't even decided on a DTT system to use.
4. In Region 2, choices were made by national regulators of different channel rasters and DTT systems in operation (6 MHz: ATSC 1.0, ISDB-T, DVB-T, DVB-T2 and DTMB; 8 MHz: DVB-T and DVB-T2). This results in a requirement for more spectrum resources to carry out cross-border coordination successfully.
5. An additional option for use in the U.S., ATSC 3.0, has recently been approved in the U.S. The forthcoming transition to ATSC 3.0, which differs substantially from the regulatory actions that were associated with the analog to digital (ATSC 1.0) transition, provides that:
  - a. Broadcasting ATSC 3.0 is completely voluntary, and there are no requirements on receivers or retransmission.
  - b. The FCC has required full-power TV stations that broadcast ATSC 3.0 to continue simulcasting in ATSC 1.0.
  - c. No additional spectrum is provided to broadcasters to assist in this transition.
  - d. Thus, in order to launch ATSC 3.0, most broadcasters will have to find a means to channel-share, in order to "create" spectrum for ATSC 3.0 services.
  - e. Consequently, there will be even more pressure on the remaining broadcast spectrum as the ATSC 3.0 transition proceeds, as broadcasters will literally have to "double up" to support simulcast of ATSC 1.0 and 3.0 with less spectrum than ever before.
6. According to information from the Caribbean area (44 territories belonging to 30 Administrations), the majority of territories in this area do not intend to use the band 470-698 MHz for IMT. Some territories say they intend to use only the band 614-698 MHz for IMT, some of them are not currently identified in the RR footnote 5.308A. None of the territories say they intend to use IMT below 614 MHz. However, an ITU coordination process<sup>3</sup>, to facilitate the processes of transition from Analog to Digital Television (DTT) and allocation of the Digital Dividend, is still ongoing in this area and the position of some countries has not been defined so far.

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<sup>3</sup> <https://www.itu.int/en/ITU-R/terrestrial/broadcast/Americas/Pages/default.aspx>

### 2.2.3 Region 3

In Region 3, there is a long-standing Primary allocation to Mobile in the band 470-890 MHz and at WRC-15; a few countries added an identification for IMT in the frequency band 470-698 MHz, or in portions thereof, through footnote 5.296A.

In a previous study cycle, the Asia Pacific Wireless Group (AWG) developed the Asia Pacific Telecommunity 700 MHz Band Plan for implementation of IMT in the band 698–806 MHz. In this study period (2015-2019) the AWG is developing a 600 MHz band plan for implementation of IMT in the band 614-698 MHz.

Considerations specific to Region 3:

1. In Region 3, the Analogue to Digital Switchover is still to be completed in many countries. Some countries do not currently have plans or funding for the migration from analogue to digital television.
2. However, DTT is very successful in some other Region 3 countries. Any further reduction of UHF band spectrum for terrestrial television broadcasting places a significant constraint on the future development of terrestrial television broadcasting in Region 3.

## 2.3 Position on the agenda for WRC-23

### 2.3.1 Region 1

The preliminary agenda for WRC-23 (Res 810 WRC-15) includes paragraph 2.5, which proposes that WRC-23 should:

*“review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with Resolution 235 (WRC-15);”*

The WBU-TC considers that the proposed review of spectrum use in the frequency band 470-960 MHz in Region 1 should include all services, including the mobile service and its use for IMT, with assessment of the actual level and efficiency of use of this spectrum.

For the reasons mentioned in 2.2.1 above, the WBU-TC believes that the outcome of this review will be that no further regulatory action will be needed in the frequency band 470-694 MHz in Region 1.

### 2.3.2 Regions 2 and 3

WBU-TC believes that WRC-23 will not need to consider any changes in the band 470-698 MHz in Regions 2 and 3, except deletion of country names from existing footnotes, for the following reasons:

- (i) In Regions 2 and 3, the Analogue to Digital Switchover is still to be completed in many countries. Until late 2017, only five countries out of approximately 38 countries in APAC have achieved ASO (Japan, Korea, Australia, New Zealand and Mongolia). Some countries do not currently have plans or funding for the migration from analogue to digital television.

- (ii) Any future identification of a sub-700 MHz band for IMT would make it more difficult for some countries to coordinate cross-border use between IMT in one country and television broadcasting in another country.
- (iii) Any further reduction of UHF band spectrum for terrestrial television broadcasting places a significant constraint on the future development of terrestrial television broadcasting.

### 3. Future challenges

#### 3.1 Introduction

Like many other technologies, terrestrial television broadcasting has been in a constant evolution since its initial launch in the 1930s.

Terrestrial television broadcasting fulfills an important public policy goal for the delivery of free-to-air public service broadcasting for many governments around the world. These services also form an important element within the radiocommunications infrastructure policy goals of many countries in all Regions.

Harmonisation of standards has been an important economic goal sought after by manufacturers of television broadcasting production, signal contribution / distribution systems, end-user receivers and other ancillary devices. Economies of scale can often guarantee low entry costs.

While the successive development of the television standards for analogue monochrome and colour television saw development of a number of regional standards, the development of digital television has seen a focus on fewer standards.

ITU-R Study Groups have been the forums which have achieved increasing development of regionally and globally harmonised standards for terrestrial television broadcasting. Refer to Annex 2.

#### 3.2 Future developments in terrestrial television broadcasting

One certainty in terrestrial television broadcasting, like so many other radiocommunications technologies, is the constant development of new services and technologies. Examples are:

- (i) In Region 1, in Europe for example, introducing latest modulation and compression techniques (DVB-T2 / HEVC) is ongoing with enhanced services (with trials of UHDTV, see ITU-R report BT.2343). Also, interactive services using the latest HbbTV standards are being introduced.
- (ii) In Region 2, in the United States, the ATSC 3.0 standardization process has been finalized and the standard has been approved by FCC for use on a voluntary basis.
- (iii) Meanwhile, Brazil has also started a multisector group (UHD-Brazil Project) to promote the introduction of a next generation of audio-visual services. The transition to a next-generation DTT service in Brazil (and in any other country following the same trend) will be challenging due to the lack of available spectrum.
- (iv) In Region 3, in February 2017, South Korea launched ATSC 3.0 4K broadcasting. Some TV channels in the 700 MHz band were assigned for the new UHD services in 2015.

All these developments, like so many other radiocommunications technologies, require radiofrequency spectrum for the migration to and deployment of the evolving television broadcasting technologies.

The frequency band, 470-698 MHz, allocated to broadcasting is an essential element for the continued strength and diversity of terrestrial television services and their long term global evolution.

## **Annex 1**

### **WBU-TC position on UHF spectrum allocation for Broadcasting**

#### **UHF band: essential for the current and future deployment of television systems globally**

At successive WRCs (in 2007 and 2012), parts of the UHF broadcasting band from 862 MHz downwards were re-allocated to mobile, and subsequently there has been clearance in many countries of broadcasting from these bands to accommodate IMT (International Mobile Telecommunication) systems. Reduction of spectrum for television broadcasting has placed restrictions on television broadcasting in some countries and constrained further development of television broadcasting in other countries.

The UHF broadcasting spectrum, originally 470-862 MHz, has come under substantial pressure in recent years specifically for identification for use by IMT.

Successive WRCs have agreed to make substantial changes to the status of the UHF band, changing the band from an exclusive primary allocation to broadcast services to designating parts of the UHF band as co-primary between broadcast and mobile services. The WRCs have further identified that the mobile services would be based upon IMT standards, and this has been followed by decisions of national and regional administrations to clear broadcasting from those bands in favour of mobile broadband. In some parts of the world, these successive encroachments have already led to a reduction of broadcasting services available, despite continued demand for access to TV services by viewers. The WBU-TC believes that any further such re-allocation would lead to a further reduction in services available, seriously compromising the terrestrial TV offering in some countries.

Analogue to Digital Switchover is still to be completed in many countries in all 3 ITU Regions. Some countries are still developing their plans for the migration from analogue to digital television.

Any future identification of a sub-700 MHz band for IMT would make it more difficult to coordinate cross-border use between IMT in one country and television broadcasting in another country and would place a significant constraint on the future development of terrestrial television broadcasting.

Furthermore, reduction in spectrum for Television Broadcasting leads to a reduction in spectrum available for services ancillary to broadcasting – specifically, the radio microphones and talkback systems without which many TV programmes, film and theatrical productions would be impossible.

As the technical arm of the World Broadcasting Unions, the Technical Committee (WBU-TC) is responsible for technical broadcasting issues of importance to the members of the World Broadcasting Unions. Its responsibilities include coordinating collective action on technical matters associated with broadcasting technologies in order to bring benefits to individual Broadcasting Unions and developing common positions for standards setting and regulatory bodies.

The WBU-TC therefore opposes the allocation of any further spectrum from the UHF broadcasting allocation to the mobile service.

## World Broadcasting Unions

Established in 1992, the World Broadcasting Unions (WBU) is the coordinating body for broadcasting unions who represent broadcaster networks across the globe. Since its foundation, WBU has provided global solutions on key issues for its member unions. The North American Broadcasters Association (NABA) acts as secretariat for the WBU, and the other Unions represented are the Asia-Pacific Broadcasting Union (ABU), the Arab States Broadcasting Union (ASBU), the African Union of Broadcasting (AUB), the Caribbean Broadcasting Union (CBU), the European Broadcasting Union (EBU), the International Association of Broadcasting (IAB/AIR), and the North American Broadcasters Association (NABA).

Refer - <https://worldbroadcastingunions.org/about/>

## International Telecommunication Union

The International Telecommunication Union (ITU) is the United Nations specialized agency for information and communication technologies. The ITU currently has a membership of 193 countries and almost 800 private-sector entities and academic institutions. The ITU is headquartered in Geneva, Switzerland, and has twelve regional and area offices around the world. The ITU allocates global radio spectrum and satellite orbits, and develops technical standards that ensure networks and technologies seamlessly interconnect to improve access to spectrum on a global basis.

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Refer - <http://www.itu.int/en/about/Pages/default.aspx>

## World Radio Conferences

A World Radiocommunication Conference (WRC) is held every three to four years. A WRC is empowered by the ITU Constitution to change the Radio Regulations (RR) – the international treaty that defines how radio spectrum is used around the world. They work to an agenda set by the ITU Council, which takes into account recommendations made by the previous WRC. The RR sets out the primary use that a band of spectrum can be used for; in particular, WRC agenda items focus on cross-border use and harmonisation of spectrum use.

The last WRC was held in 2015. It set the general scope of the agenda for the 2019 conference (WRC-19) and drafted a preliminary agenda for the 2023 conference (WRC-23).

Refer - <http://www.itu.int/en/ITU-R/conferences/wrc/Pages/default.aspx>

## Annex 2

### DEVELOPMENT OF REGIONALLY AND GLOBALLY HARMONISED STANDARDS FOR TERRESTRIAL TELEVISION BROADCASTING

ITU-R Study Groups have been the forums which have achieved increasing development of regionally and globally harmonised standards for terrestrial television broadcasting.

#### A2.1 Program production and quality assessment

ITU-R Working Party 6P and more recently Working Party 6C has achieved considerable success in the development of significant standards for program production and quality assessment for terrestrial television broadcasting, namely:

- Recommendation BT.601 "Studio encoding parameters of digital television for standard 4:3 and wide screen 16:9 aspect ratios"
- Recommendation BT.709 "Parameter values for the HDTV standards for production and international programme exchange"
- Recommendation BT.2020 "Parameter values for ultra-high definition television systems for production and international programme exchange"
- Recommendation BT.2100 "Image parameter values for high dynamic range television for use in production and international programme exchange"

Working Party 6C has within its current work development in relation to terrestrial television broadcasting:

- Rendering methods for advanced sound systems
- Specifications and alignment procedures for setting of brightness and contrast of High Dynamic Range, Hybrid Log-Gamma Displays
- Studies relating to Advanced Immersive Audio Visual (AIAV) systems for programme production and exchange for broadcasting
- Colour gamut conversion from Recommendation ITU-R BT.2020 to Recommendation ITU-R BT.709

#### A2.2 Broadcast service assembly and access

ITU-R Working Party 6B has achieved considerable success in the development of significant standards for broadcast service assembly and access for terrestrial television broadcasting, namely:

- Recommendation BT.656 "Interface for digital component video signals in 525-line and 625-line television systems operating at the 4:2:2 level of Recommendation ITU-R BT.601"
- Recommendation "BT.1120 Digital interfaces for HDTV studio signals"
- Recommendation "BT.2077 Real time serial digital interfaces for UHD TV"
- Recommendation "BT.2073 Use of the high efficiency video coding (HEVC) standard for UHD TV and HDTV broadcasting"

Working Party 6B has within its current work development in relation to terrestrial television broadcasting:

- Open and closed signing in digital television
- Usage guidelines for the audio definition model and multichannel audio files
- Bitrates for transmission of UHD TV signals through contribution, primary distribution and SNG networks using H.265/HEVC Codec.

### A2.3 Terrestrial delivery

ITU-R Working Party 6A has achieved considerable success in the development of significant standards for terrestrial delivery for terrestrial television broadcasting, namely:

- Recommendation BT.1306 Error correction, data framing, modulation and emission methods for digital terrestrial television broadcasting
- Recommendation BT.1368 Planning criteria, including protection ratios, for digital terrestrial television services in the VHF/UHF bands
- Recommendation BT.1877 Error-correction, data framing, modulation and emission methods for second generation of digital terrestrial television broadcasting systems
- Recommendation BT.2033 Planning criteria, including protection ratios, for second generation of digital terrestrial television broadcasting systems in the VHF/UHF bands

Working Party 6A has within its current work development in relation to terrestrial television broadcasting:

- Characteristics of a reference receiving system for frequency planning of digital terrestrial television systems
- Digital terrestrial broadcasting: Design and implementation of single frequency networks (SFN)
- Planning parameters for DTT coordination in Central American and Caribbean Region
- Use of MER to assess impact of anomalous propagation on co-channel interference
- Inclusion of ATSC 3.0 in ITU-R documentation on DTT distribution standards