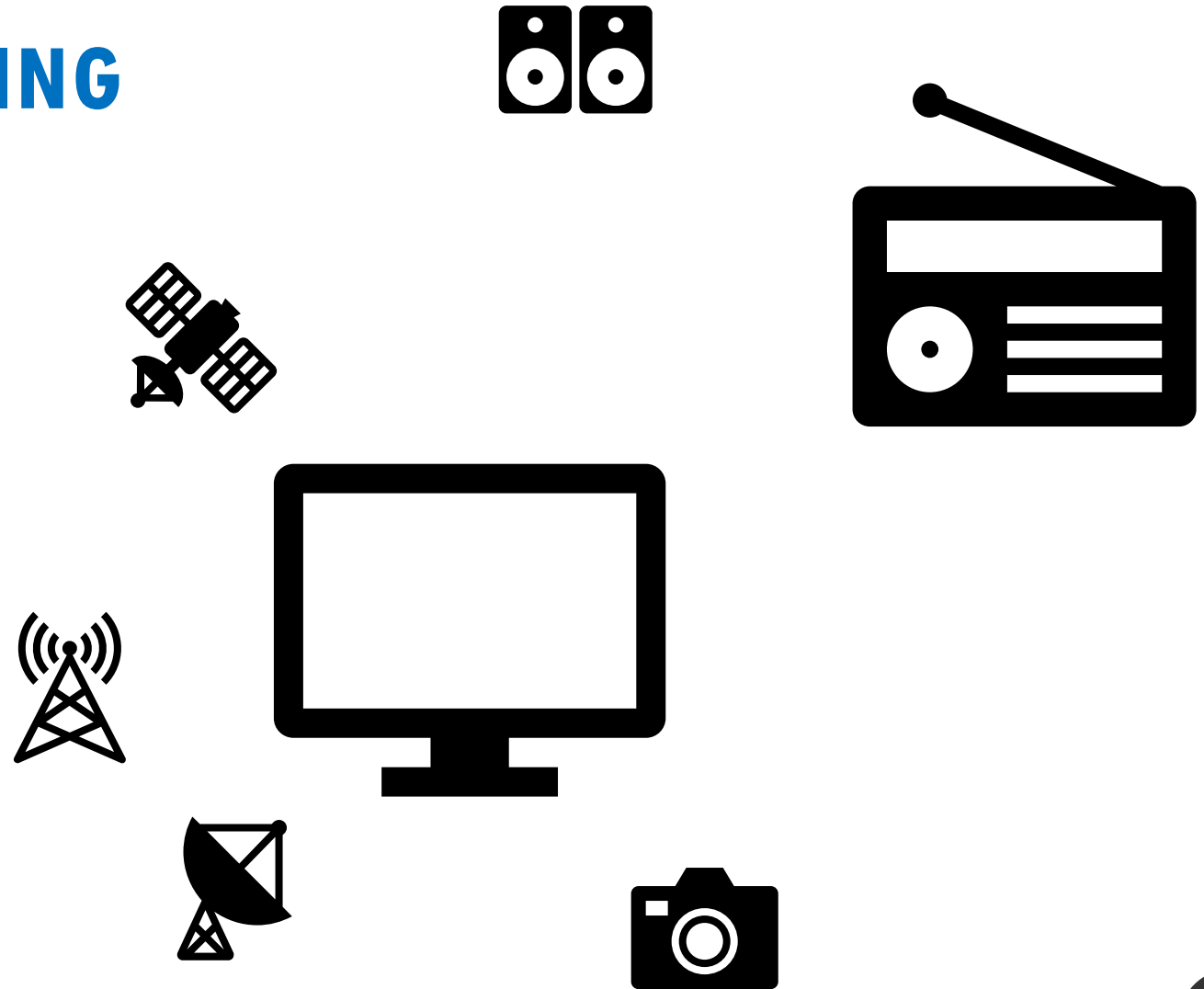# DIGITAL BROADCASTING

ON-GOING STUDIES WITHIN ITU-R SG 6 ON DIGITAL BROADCASTING

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DIGITAL BROADCASTING

Covers all broadcasting chain from the production of programs to their ultimate delivery to the audience.

THE STUDY SCOPE OF ITU-R SG6 ON DIGITAL BROADCASTING

Terrestrial broadcasting delivery

➢ Terrestrial broadcast delivery systems (channel coding and modulation)
➢ Network planning
➢ Spectrum utilization and sharing
➢ Antennas
➢ Reference transmitter and receiver
➢ Protection of the broadcasting service from interference

Broadcasting service assembly and access

➢ Signal interfaces
➢ File formats
➢ Metadata
➢ Source coding
➢ Multiplexing and transport
➢ Access control
➢ Multimedia and interactivity
➢ Requirements for delivery and distribution
➢ Integrated broadcast-broadband

Program production and quality assessment

➢ Acquisition of video and sound
➢ Signal representation
➢ Recording and archiving
➢ Quality evaluation methods for video and sound
➢ International program exchange

TERRESTRIAL BROADCASTING DELIVERY(1)

First generation of DTTB (Rec.ITU-R BT.1306)

➤Advanced Television Systems Committee (ATSC)

➤Digital Video Broadcasting (DVB-T)

➤Integrated Services Digital Broadcasting (ISDB-T)

➤Digital Television/Terrestrial Multimedia Broadcasting (DTMB)

Methods for objective quality coverage assessment of first-generation DTTB signals have been developed (Rec. BT.1735 and Rep. BT.2252).

TERRESTRIAL BROADCASTING DELIVERY(2)

Second generation DTTB (Rec. ITU-R BT.1877)

➢ATSC 3.0

➢DVB-T2

➢DTMB-A

REPORT ITU-R BT.2467-0 "Methods for the evaluation of the quality of service of second generation DTTB systems"

REPORT ITU-R BT.2468-0 "Guidance for selection of system parameters and implementation of second generation DTTB systems"

TERRESTRIAL BROADCASTING DELIVERY(3)

System for **digital sound broadcasting** in the broadcasting bands below 30MHz
(Rec. ITU-R BS.1514)

DIGITAL RADIO MONDIALE (DRM) SYSTEM

IN BAND ON CHANNEL DIGITAL SOUND BROADCASTING (IBOC DSB) SYSTEM

TERRESTRIAL BROADCASTING DELIVERY(4)

System for **digital sound broadcasting** in the broadcasting in bands 30-3 000 MHz (Rec. ITU-R BS.1114)

➤ Digital System A (DAB)

➤ Digital System F (ISDB-TSB)

➤ Digital System C (the IBOC system)

➤ Digital System G (DRM)

➤ Digital System H (the CDR system)

➤ Digital System I (the RAVIS system)

TERRESTRIAL BROADCASTING DELIVERY(5)

Multimedia broadcasting for mobile reception using handheld receivers in VHF/UHF bands (Recommendation ITU-R BT.2016)

➢ Multimedia system A (T-DMB and AT-DMB)

➢ Multimedia System F (ISDB-T multimedia broadcasting for mobile reception)

➢ Multimedia system I (DVB-SH)

➢ Multimedia System H (DVB-H)

➢ Multimedia system T2 (T2 Lite profile of DVB-T2 system)

REPORT ITU-R M.2373-1

Audio-visual capabilities and applications supported by terrestrial IMT systems

 Multimedia Broadcast Multicast Service MBMS

TERRESTRIAL BROADCASTING DELIVERY(6)

Ongoing studies on new topics

➢Advanced network planning and transmission methods for enhancements of DTTB for accommodation of new applications of HDTV,UHDTV,HDR-TV,HFR-TV,AIAV, AdvSS, VR/AR, Multiscreen and ultra-wide angle panoramic television and additional information.

➢Methods for introduction of new systems, technologies and applications in DTTB service

➢Co-existence calculations for digital terrestrial television broadcasting using Monte Carlo simulations

➢Preparation for agenda items of WRC-23, particularly for the agenda item 1.5

BROADCASTING SERVICE ASSEMBLY AND ACCESS(1)

➢**Digital Interfaces**

Rec. ITU-R BT.2077 defines serial digital interfaces for all UHDTV image formats and signaling of high-dynamic range (HDR) video parameters

Rec. ITU-R BT.2133:Transport of advanced immersive audio-visual (AIAV) content in IP-based broadcasting systems

➢**Audio Metadata and File Formats**

Rec. ITU-R BS.2076 on metadata for the Audio Definition Model (ADM)

Rec. ITU-R BS.2088 for the Broadcast Wave 64-bit (BW64) audio file format to carry large multichannel files and metadata

RECOMMENDATION ITU-R BS.2125 A serial representation of the Audio Definition Model

BROADCASTING SERVICE ASSEMBLY AND ACCESS(2)

➢**Integrated Broadcast-Broadband Systems**

▪ A Recommendation has been developed that includes HbbTV, Hybridcast, TOPSmedia, and Ginga (Rec.ITU-R BT. 2075)

➢**Global Platform for Broadcasting**

▪ To meet the need for a more holistic approach to broadcasting and content delivery (combined terrestrial, satellite, and internet platforms including IP networks and IMT for consumption on many types of terminals) (Rep. ITU-R BT.2400)

➢**Accessibility**

▪ Production, emission and exchange of closed captions for all worldwide language character sets (latin and non-latin) (Rep. ITU-R BT.2342)

▪ Technical realisation of signing in digital television(Rep. ITU-R BT.2448)

BROADCASTING SERVICE ASSEMBLY AND ACCESS(3)

Some ongoing studies on new topics:

Transmission method for non-PCM audio signals and data over digital audio interfaces for programme production and exchange

Practical implementation of broadcast emission systems using Audio codecs as specified in ITU-R BS.1196 and ITU-R BS.1548 for ITU advanced sound systems

Interactive Control Extension for the Audio Definition Model

Use of Interoperable Mastering Format for the supply of non-live content to a Global Platform for broadcasting

Technologies applicable to Internet Protocol (IP) interfaces for programme production

PROGRAM PRODUCTION AND QUALITY ASSESSMENT (1)
VIDEO SYSTEM PARAMETERS

Rec. ITU-R BT.601: Studio encoding parameters of digital television for standard 4:3 and wide screen 16:9 aspect ratios (SDTV)

Rec. ITU-R BT.709 Parameter values for the HDTV standards for production and international programme exchange

Rec. ITU-R BT.2020 Parameter values for ultra-high definition television systems for production and international programme exchange (UHDTV 4k and 8k)

Rec. ITU-R BT.2100 Image parameter values for high dynamic range television for use in production and international programme exchange(HDR-TV)

BT.2123 Video parameter values for advanced immersive audio-visual systems for production and international programme exchange in broadcasting (AIAV resolution of 30K × 15K defined)

PROGRAM PRODUCTION AND QUALITY ASSESSMENT (2)

➢ **Advanced Sound Systems**

- A Recommendation on advanced sound systems has been developed that goes beyond 5.1 channel "surround sound."(Rec. ITU-R BS.2051)

- A reference ADM Renderer (Rec. ITU-R BS.2127) has been developed for the advanced sound systems specified in Rec. ITU-R BS.2051 in conjunction with the audio-related metadata specified by the ADM in Rec. ITU-R BS.2076.

PROGRAM PRODUCTION AND QUALITY ASSESSMENT (3)

➢ Sound and image Quality Evaluation Methods

- The well-known seminal Recommendation ITU-R BT. 500 for assessing image quality
- Rec. BS.2132 Method for the subjective quality assessment of audible differences of sound systems using multiple stimuli without a given reference
- Rec. BS.2126 Methods for the subjective assessment of sound systems with accompanying picture
- Rec. BS.1770 Algorithms to measure audio programme loudness and true-peak audio level
- Rec. BT.2124 Objective metric for the assessment of the potential visibility of colour differences in television

PROGRAM PRODUCTION AND QUALITY ASSESSMENT (4)

➢Artificial Intelligence

▪ Report ITU-R BT.2447 discusses current applications and efforts underway that are relevant to the near-term broadcast program and production pathway.

▪ QUESTION ITU-R 144/6 Use of Artificial Intelligence (AI) for broadcasting

  decides that the following Questions should be studied

  ▪ 1   What are the applications, requirements, and impacts of AI technologies for programme production and how can the effectiveness be increased?
  ▪ 2   What are the applications, requirements, and impacts of AI technologies for quality evaluation and how can the effectiveness be increased?
  ▪ 3   What are the applications, requirements, and impacts of AI technologies for programme assembling and access and how can the effectiveness be increased?
  ▪ 4   What are the applications, requirements, and impacts of AI technologies for broadcast emission and how can the effectiveness be increased?

PROGRAM PRODUCTION AND QUALITY ASSESSMENT (5)

➢ **Some ongoing studies on new topics**

- An objective measurement algorithm for monitoring and managing the brightness of high dynamic range television

- Requirements and Applications for Mean Image Level meters for for monitoring and managing the brightness of HDR-TV

- Sound test materials for advanced sound systems

Thank you