

# **Recommendation ITU-R BT.1833-5**

**(05/2023)**

BT Series: Broadcasting service (television)

**Broadcasting of multimedia and data applications for mobile reception by handheld receivers**



## Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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### Series of ITU-R Recommendations

(Also available online at <https://www.itu.int/publ/R-REC/en>)

Series	Title
<b>BO</b>	Satellite delivery
<b>BR</b>	Recording for production, archival and play-out; film for television
<b>BS</b>	Broadcasting service (sound)
<b>BT</b>	<b>Broadcasting service (television)</b>
<b>F</b>	Fixed service
<b>M</b>	Mobile, radiodetermination, amateur and related satellite services
<b>P</b>	Radiowave propagation
<b>RA</b>	Radio astronomy
<b>RS</b>	Remote sensing systems
<b>S</b>	Fixed-satellite service
<b>SA</b>	Space applications and meteorology
<b>SF</b>	Frequency sharing and coordination between fixed-satellite and fixed service systems
<b>SM</b>	Spectrum management
<b>SNG</b>	Satellite news gathering
<b>TF</b>	Time signals and frequency standards emissions
<b>V</b>	Vocabulary and related subjects

*Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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RECOMMENDATION ITU-R BT.1833-5<sup>1</sup>**Broadcasting of multimedia and data applications for mobile reception  
by handheld receivers<sup>2</sup>**

(Question ITU-R 45/6)

(2007-2011-2012-2014-2022-2023)

**Scope**

This Recommendation provides an answer to the specific objectives of Question ITU-R 45/6 in order to guide administrations, as well as the broadcasting and radiocommunication industries, in the development of mobile broadcasting multimedia and data solutions. The scope of this Recommendation deals with the special aspects of end user requirements for handheld receivers.

The ITU Radiocommunication Assembly,

*considering*

- a)* that digital television and sound broadcasting systems have been implemented in many countries and will be introduced in many more in the coming years;
- b)* that multimedia and data broadcasting services have been introduced, or are planned to be introduced, using the inherent capability of digital broadcasting systems;
- c)* that mobile telecommunication systems with advanced information technologies are planned to be implemented in some countries, and will be implemented in other countries in the near future;
- d)* that the characteristics of mobile reception are quite different from the fixed reception cases;
- e)* that digital broadcasting services are expected to be offered in a variety of reception environments including those aimed at indoor, portable, handheld and vehicular receivers;
- f)* that the display sizes and receiver capabilities of handheld, portable and vehicular receivers are different from those of fixed receivers;
- g)* that a special case of mobile reception by handheld receivers requires specific technical characteristics;
- h)* the need for interoperability between the mobile telecommunication services and interactive digital broadcasting services;
- i)* the need for technical methods to ensure cyber security and conditional access solutions,

*noting*

- a)* that there are telecommunication systems not explicitly dedicated to broadcasting services, such as Multimedia Broadcast/Multicast Services (MBMS) that fulfil the requirements for interoperability between mobile telecommunication services and interactive digital broadcasting services;

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<sup>1</sup> This Recommendation should be brought to the attention of Radiocommunication Study Group 4.

<sup>2</sup> This Recommendation is a part of the family of Recommendations and Reports on Multimedia Broadcasting.

b) that there are multimedia systems combining satellite component (dedicated or not explicitly dedicated to broadcasting) and dedicated terrestrial broadcasting components integrated within national frequency plans that fulfil the requirements for wide coverage with good quality of service,

*recommends*

1 that administrations wishing to implement broadcasting of multimedia and data applications for mobile reception by handheld receivers should consider the end user requirements as stated in Annex 1 for the evaluation and assessment of the respective system characteristics of multimedia systems;

2 that administrations wishing to implement broadcasting of multimedia and data applications for mobile reception by handheld receivers should use the technologies described in the referenced Recommendations in Annex 1 for designing multimedia broadcasting systems;

3 that Multimedia Systems listed in Annex 1 may be applied for broadcasting of multimedia and data applications for mobile reception by handheld receivers.

## Annex 1

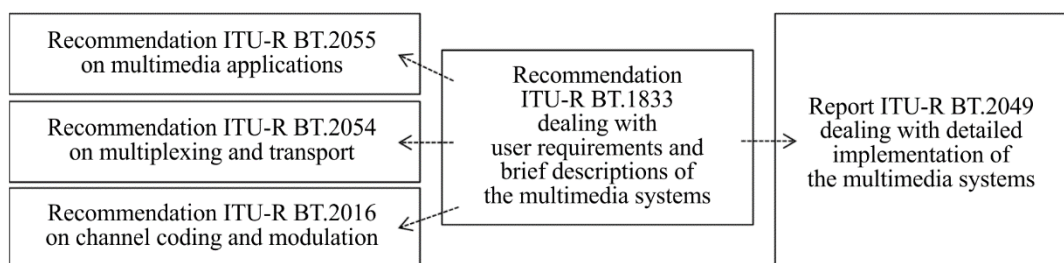
### 1 References

This Recommendation gives big-picture information on multimedia broadcasting systems for mobile reception. It describes the user requirements of multimedia broadcasting systems for mobile reception and overviews of each system.

There are three other Recommendations and one Report related with this Recommendation. The structure of a suite of Recommendations and Report is shown in Fig. 1.

FIGURE 1

Structure of ITU-R Recommendations and Report dealing with multimedia broadcasting systems for mobile reception



BT.1833-01

NOTE – An arrow means reference.

Recommendation ITU-R BT.2055 – Content elements in multimedia broadcasting systems for mobile reception, deals with technologies for the application and presentation layers in multimedia broadcasting systems for mobile reception. It describes signal formats, source coding of audio, video, and other signals that constitute content. It also describes the technologies used for content navigation and interactivity.

Recommendation ITU-R BT.2054 – Multiplexing and transport schemes in multimedia broadcasting systems for mobile reception, deals with technologies for the multiplexing and transport layers in multimedia broadcasting systems for mobile reception.

Recommendation ITU-R BT.2016 – Error-correction, data framing, modulation and emission methods for terrestrial multimedia broadcasting for mobile reception using handheld receivers in VHF/UHF bands, gives information on the channel coding and modulation layers in multimedia broadcasting systems for mobile reception.

Report ITU-R BT.2049 – Broadcasting of multimedia and data applications for mobile reception, gives detailed information on the implementation of multimedia broadcasting systems for mobile reception.

## **2 Introduction**

The end user experience and the related applications for handheld reception are different from those already available, for portable and vehicular reception. In addition, the physical limitations of handheld receivers imply specific system characteristics to meet the end user requirements.

Therefore, the scope of this Recommendation on broadcast multimedia and data applications for mobile reception is in particular dealing with the special aspects of the operation of handheld devices.

### **2.1 Handheld receivers**

Handheld receivers are battery operated devices which have significant physical limitations inherent in their dimensions (small antenna, screen sizes, etc.), screen resolution, computing power, battery capacity, etc.

### **2.2 Portable receivers**

Portable receivers are devices which are less power-constrained and therefore might offer higher computing power. As an example, this might result in the offering of higher picture resolution applications than possible with handheld receivers.

### **2.3 Vehicular receivers**

Vehicular receivers do not have the same physical and power-related limitations as handheld receivers have. However, the speed at which vehicular receivers may operate, on average, may be much higher. Vehicular receivers might be connected to vehicular mounted external antennas.

## **3 Abbreviations**

AT-DMB	Advanced terrestrial digital multimedia broadcasting
ATSC	Advanced Television Systems Committee
BCAST	OMA mobile broadcast services
DAB	Digital audio broadcasting
DVB-H	Digital video broadcasting – handheld
DVB-SH	Digital video broadcasting – Satellite services to handheld devices
DVB-T	Digital video broadcasting – terrestrial
DVB-T2	Digital video broadcasting – second generation terrestrial

ETSI	European Telecommunications Standards Institute
ETSI EN	ETSI European Norm
ETSI TS	ETSI Technical Specification
IP	Internet Protocol
IPDC	Internet Protocol Data Cast
ISDB-T	Terrestrial integrated services digital broadcasting
MBMS	Multimedia broadcast/multicast services
OMA	Open mobile alliance
QVGA	Quarter video graphics array
T-DAB	Terrestrial digital audio broadcasting
T-DMB	Terrestrial-digital multimedia broadcasting

#### 4 User requirements

Some user requirements for mobile reception differ from those for fixed reception. For mobile reception of broadcast multimedia and data by handheld receivers, specific requirements arise because of the differences in the usage of the receiving devices. The following requirements should be considered when implementing broadcast multimedia and data applications for mobile reception to handheld devices:

- delivery of high-quality multimedia content<sup>3</sup> including video, audio and/or data services;
- flexible configuration of a large variety of services (audio/video, ancillary and auxiliary data);
- access to content and services may be controlled via conditional access/service access protocols and other content protection mechanisms;
- seamless service access to content and services across networks;
- support for fast discovery and selection of content and services characterized for example, by channel acquisition time, service switching time<sup>4</sup>, scheduled content delivery mechanisms, etc.;
- support for efficient mechanisms to minimize power consumption and physical size of the handheld receivers;
- support for stable and reliable service coverage for handheld receivers in various reception environments;
- support for interactivity, e.g. interactive content and applications, and/or interaction channel capabilities on handheld receivers;
- support for efficient and reliable delivery (transport) mechanisms of services; and
- technical aspects enabling interoperability of the services between broadcast and telecommunication networks, e.g. content format, audio/video codecs and encapsulation methods.

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<sup>3</sup> The term “content” in this Recommendation means programme material and related information of any variety.

<sup>4</sup> The service switching time is the time between the user selection of a new real-time streaming service and the initial display of this delivered service to the end user.

Table 1 lists system characteristics of multimedia broadcasting systems for mobile reception in response to the user requirements above.

In Table 1, the following systems are described:

- multimedia System “A” is based on Terrestrial Digital Multimedia Broadcasting (T-DMB, Recommendation ITU-R BS.1114 System A, ETSI TS 102 427 and 102 428) and Advanced Terrestrial Digital Multimedia Broadcasting (AT-DMB, TTA.KO-07.0070/R1, TTA.KO-07.0071);
- multimedia System “B” is based on ATSC Mobile DTV Standard (A/153) that is an enhancement of the ATSC system (Recommendation ITU-R BT.1306 System A);
- multimedia System “C” is based on Integrated Services Digital Broadcasting-Terrestrial (ISDB-T one segment);
- multimedia System “E” is based on digital System E of Recommendation ITU-R BO.1130 for satellite component and Recommendation ITU-R BS.1547 for terrestrial component;
- multimedia System “F” is based on Integrated Services Digital Broadcasting-Terrestrial (ISDB-T) multimedia broadcasting for mobile reception;
- multimedia System “H” is based on Digital Video Broadcasting-Handheld (DVB-H, ETSI EN 302 304 and TR 102 377);
- multimedia System “I” is based on Digital Video Broadcasting Satellite to Handheld devices (DVB-SH ETSI EN 302 583 and TS 102 584);
- multimedia System “T2” is based on Digital Video Broadcasting Terrestrial (DVB T2-Lite) profile (DVB-T2, ETSI EN 302 755 v.1.3.1);
- multimedia System “L”<sup>5</sup> is based on ETSI TS 103 720, which is entitled “5G Broadcast System for linear TV and radio services; LTE-based 5G terrestrial broadcast system”;
- multimedia System “S” is based on the ATSC 3.0 Standard suite, which encompasses a set of individual Standards documents of which A/300:2021 (“ATSC 3.0 System”) describes the complete range of ATSC 3.0 technologies;
- multimedia System “N” is based on 5G New Radio (5G NR) Multicast Broadcast Service System (QB-1018-2022).

Detailed implementation and/or the service deployment of each system are described in Report ITU-R BT.2049.

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<sup>5</sup> This system was developed by 3GPP including the proposal “5G, Release 15 and beyond – LTE+NR SRIT” which is included as Annex 1 of Recommendation ITU-R M.2150-1 – Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2020 (IMT-2020), and has been standardised by ETSI as TS 103 720 – 5G Broadcast System for linear TV and radio services; LTE-based 5G terrestrial broadcast system.

TABLE 1

**System characteristics of multimedia broadcasting for mobile reception by handheld receivers**

<b>System</b>	<b>System characteristics description</b>
Multimedia System "A"	<p>This system, also known as terrestrial digital multimedia broadcasting (T-DMB) system, is an enhancement of T-DAB system to provide multimedia services including video, audio, and interactive data services for handheld receivers in a mobile environment. Multimedia System "A" uses T-DAB networks and is completely backward compatible with T-DAB system for audio services.</p> <p>AT-DMB system is an enhancement of T-DMB system to increase channel capacity of T-DMB and is completely backward compatible with T-DMB system.</p>
Multimedia System "B"	<p>This system, also known as ATSC Mobile DTV, is an enhancement of the first-generation ATSC system intended to provide multimedia services including video, audio, and interactive data service delivery to small (power efficient) receivers, for fixed, handheld and vehicular environments. Multimedia System "B" uses IP-based mechanisms with control of time synchronized delivery via buffer modelling for an end-to-end broadcast system including enablement of a return path to facilitate delivery of any type of digital content and service.</p>
Multimedia System "C"	<p>The stream signal of this system can be multiplexed with the signal for the stationary reception that coexists within a single stream.</p> <p>A rich content format such as script programme support provides good interactivity on a small device.</p>
Multimedia System "E"	<p>Target receivers are typically handheld type with a 3.5 inch wide display for QVGA video and data broadcasting in addition to high quality audio. Satellite section covers nationwide and gap-fillers augment shadow areas from the satellite path. Suitable broadcasting system is digital System E of Recommendation ITU-R BO.1130.</p>
Multimedia System "F"	<p>This system is designed for real-time and non-real-time broadcasting of video, sound, and multimedia content for mobile and handheld receivers based on the common technology of multimedia System C (ISDB-T).</p> <p>High quality video, audio, and multimedia data services can be configured flexibly. In addition, support of a script interpreter for rich content format provides flexibility for the content and service.</p>
Multimedia System "H"	<p>An end-to-end broadcast system for delivery of any type of digital content and services using IP-based mechanisms, such as those included in the IP Datacast (IPDC) or OMA BCAST specifications. It is based on DVB-H, which is an enhancement, optimized for handheld terminals, of the DVB-T digital broadcast standard, with which it shares the physical radio environment.</p>



TABLE 1 (*end*)

System	System characteristics description
Multimedia System “I”	An end-to-end broadcast system for delivery of any type of digital content and services using IP-based mechanisms, such as those included in the IP Datacast (IPDC) or OMA BCAST specifications. It is based on DVB-SH and provides a way to distribute these contents and services over combined or integrated satellite and terrestrial networks to a variety of mobile and fixed terminals having compact antennas and very limited directivity.
Multimedia System “T2”	An end-to-end broadcast system for delivery of multimedia broadcasting signal to handheld devices based on physical layer pipes (PLP) concept with T2 time slicing technology. This system is designed to optimize and sufficiently improve efficiency of multimedia broadcasting system in trade-off between system parameters such as <i>C/N</i> performance, bit-rate, receiver complexity, etc. enables the simulcasting of two different versions of the same service, with different bit-rates and levels of protection, which would allow better reception in fringe areas.
Multimedia System “L”	An end-to-end broadcast system for delivery of multimedia broadcasting signal to handheld devices. It supports Free-to-Air (FTA) and Receive-Only Mode (ROM) services over 3GPP, network dedicated to linear television and radio broadcast, Single Frequency Network (SFN) deployments with Inter-Site Distance (ISD) significantly larger than a typical ISD associated with typical cellular deployments, mobility scenarios including speeds of up to 250 km/h to enable receivers in cars with external omni-directional antennas, common streaming distribution formats such as Dynamic Streaming over HTTP (DASH), Common Media Application Format (CMAF), and HTTP Live Streaming (HLS), IP-based services such as IPTV or ABR multicast, and different file delivery services such as scheduled delivery or file carousels.
Multimedia System “S”	An end-to-end broadcast system (ATSC 3.0) for delivery of any type of digital content, data, and services, using physical layer pipes (PLPs), and supporting IP, MPEG-2 TS, and other transport mechanisms. The ATSC 3.0 suite of standards is a non-backward-compatible evolution from the first-generation ATSC system, and provides much greater capability than previous generations of terrestrial broadcasting, with substantial improvements in performance, functionality, and efficiency. The ATSC 3.0 system is designed to improve the efficiency of multimedia broadcasting, allowing an optimized balance of system parameters such as <i>C/N</i> performance, bit-rate, receiver complexity, and the like. Each ATSC 3.0 Standard is designed for maximum efficiency and flexibility in its operation and is extensible to accommodate future enhancements.
Multimedia System “N”	An end-to-end broadcast system for delivery of multimedia broadcasting signal to handheld devices, based on the 5G New Radio Multicast Broadcast Service System. It supports Free-to-Air (FTA) and Receive-Only Mode (ROM) services, network dedicated to linear television and radio broadcast, dynamic and seamless switching between unicast services and broadcast/multicast services, flexible servicing abilities, bi-directional interaction, accurate push of broadcast and multicast services based on location, adapted to standard 5G general terminals, coordinated mixed network structure based on 5G cellular base stations and existing TV towers.