



Recommendation ITU-R BS.1548-7
(10/2019)

**User requirements for audio coding
systems for digital broadcasting**

BS Series
Broadcasting service (sound)



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SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
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SNG	Satellite news gathering
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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 BS.1548-7

User requirements for audio coding systems for digital broadcasting

(Question ITU-R 19-1/6)

(2001-2002-2006-2012-2013-2017-01/2019-10/2019)

Scope

This Recommendation specifies the requirements relevant to the use of audio source coding systems in sound broadcasting, including television. The Recommendation covers the application of contribution and distribution, and emission.

Keywords

Audio, audio coding, broadcast, digital, broadcasting, sound, television, codec

The ITU Radiocommunication Assembly,

considering

- a) that the multichannel sound system, with or without accompanying picture, is the subject of Recommendation ITU-R BS.775;
- b) that the loudspeaker layouts and channel configurations for the advanced sound system are the subject of Recommendation ITU-R BS.2051;
- c) that audio coding for digital broadcasting is the subject of Recommendation ITU-R BS.1196;
- d) that the coding systems recommended in Recommendation ITU-R BS.1196 offer monophonic, two-channel stereophonic and multichannel coding modes;
- e) that the basic audio and stereo image quality required for sound systems for television and sound broadcasting is to be the highest possible, generally indistinguishable from the source material;
- f) that required audio quality for some emission applications is to be equivalent to or better than good reception of FM analogue broadcasting services;
- g) that Recommendation ITU-R BS.1283 provides a guide to ITU-R Recommendations for subjective assessment of sound quality;
- h) that interoperability and network operation involving programme connections such as contribution and distribution links should be carefully considered;
- i) that interoperability with existing consumer multichannel audio equipment, such as matrix surround decoders and discrete multichannel decoders, should be carefully considered;
- j) that, when introducing a multichannel sound system in an existing broadcasting service, compatibility with existing receivers to maintain the service must be considered;
- k) that more generally, in view of the many applications of such systems, all technical, quality and operational requirements should be clearly specified;
- l) that the performance of audio coding systems is widely dependent on the configuration under which the system is operated (bit rate, use of pre-matrixing, use of composite coding, etc.);
- m) that several broadcast services already use or have specified the use of the systems recommended in Recommendation ITU-R BS.1196;

- n) that, consequently, the broadcasters have a need of information necessary to set up all the available coding parameters of the recommended systems;
- o) that the introduction of incompatible systems with similar performance characteristics is highly undesirable;
- p) that those broadcasters which have not yet started services should be able to choose the system which is best suited to their application and which is the most cost-effective,

recommends

- 1 that the audio coding systems for digital television and sound broadcasting for contribution and distribution applications should fulfil the requirements listed in Annex 1;
- 2 that the audio coding systems for digital television and sound broadcasting for emission applications should fulfil the requirements listed in Annex 2;
- 3 that the categories of audio quality listed in Annex 3 should govern the audio quality and applications in *recommends* 1 and 2.

NOTE 1 – Information about systems that have been shown to meet the quality and other requirements for contribution and distribution applications is included in Attachment 1 to Annex 1.

NOTE 2 – Information about systems that have been shown to meet the quality and other requirements for emission applications is included in Attachment 1 to Annex 2.

Annex 1

Requirements for contribution and distribution

The audio coding systems for digital television and sound broadcasting for both contribution and distribution applications should fulfil the requirements listed below.

1 Service requirements

1.1 Channel configurations

For audio services, at least one of the following channel configurations should be supported according to the requirements of applications.

1.1.1 Channel configurations as per Recommendation ITU-R BS.775

TABLE 1

No. of channels	Channel configuration	Channel assignment
1 channel	1/0	Mono
2 channels	2/0	Left, right
3 channels	3/0 2/1	Left, right, centre Left, right/surround
4 channels	3/1 2/2	Left, right, centre/surround Left, right/surround left, surround right
5 channels	3/2	Left, right, centre/surround left, surround right

NOTE: For channel configuration “a/b”, “a” and “b” indicate the numbers of front and rear channels, respectively.

For contribution, in addition, it could be necessary to convey programmes produced in formats other than those listed above, e.g. 3/4, thus the coding system should allow for accommodation of additional high quality channels.

1.1.2 Channel configurations of channel-based advanced sound systems as per Recommendation ITU-R BS.2051

TABLE 2

Label of sound system	No. of channels	Channel configuration	No. of LFE channels	Channel assignment
System C	8	2+5+0 (2/0+3/2+0)	1	Left top front, right top front + left, right, centre / left surround, right surround. LFE
System D	10	4+5+0 (2/2+3/2+0)	1	Left top front, right top front / left top rear, right top rear + left, right, centre / left surround, right surround. LFE
System E	11	4+5+1 (2/2+3/2+1/0)	1	Left top front, right top front / left top rear, right top rear + left, right, centre / left surround, right surround + centre bottom front. LFE
System F	12	3+7+0 (2/1+3/2/2+0)	2	Left height, right height / centre height + left, right, centre / left side, right side / left back, right back. Left LFE, right LFE
System G	14	4+9+0 (2/2+5/2/2+0)	1	Left top front, right top front / left top back, right top back + left, right, centre, left screen, right screen / left side surround, right side surround / left rear surround, right rear surround. LFE
System H	24	9+10+3 (3/3/3+5/2/3+3/0)	2	Top front left, top front right, top front centre / top side left, top side right, top centre / top back left, top back right, top back centre + front left, front right, front left centre, front right centre, front centre / side left, side right / back left, back right, back centre + bottom front left, bottom front right, bottom front centre. LFE-1, LFE-2

TABLE 2 (end)

Label of sound system	No. of channels	Channel configuration	No. of LFE channels	Channel assignment
System I	8	0+7+0 (0+3/2/2+0)	1	Left, right, centre / left side surround, right side surround / left rear surround, right rear surround. LFE
System J	12	4+7+0 (2/2+3/2/2+0)	1	Left top front, right top front / left top back, right top back + left, right, centre / left side surround, right side surround / left rear surround, right rear surround. LFE

NOTE: For channel configuration “a/b/c+a/b/c+a/b/c”, the first, second and third “a/b/c” parts indicate the numbers of audio channels in the top, middle and bottom layers, respectively. “a”, “b” and “c” indicate the numbers of front, side and rear channels, respectively. When the number of side channels is 0, “a/b/c” can be written as “a/c”. When the number of audio channels in the layer is 0, “a/b/c” can be written as “0”.

For contribution, it could be necessary to convey programmes produced in other formats than those listed above; thus, the coding system should allow the accommodation of additional high-quality channels.

1.2 Flexible allocation of channels

A bit stream should provide identification data for signalling and controlling of sound configurations. It must be possible in the transmission system to switch dynamically among the channel configurations listed in § 1.1.

1.3 Ancillary data

The audio coding system should provide for the possibility of transmission of ancillary data. The ancillary data can convey various types of information, including dynamic range control, loudness control, user data, and any metadata required by the emission encoder that will encode the final audio for delivery to the consumer.

2 Performance requirements

2.1 Audio quality

2.1.1 Basic audio quality

The quality of sound reproduced after a reference contribution/distribution cascade (five contribution codecs and three distribution codecs working consecutively) should be subjectively indistinguishable from the source for most types of audio programme material. Using the triple stimuli double blind with hidden reference test, described in Recommendation ITU-R BS.1116 – Methods for the subjective assessment of small impairments in audio systems including multichannel sound systems, this requires mean scores generally higher than 4.5 in the impairment 5-grade scale, for listeners at the reference listening position. The worst rated item should not be graded lower than 4.

NOTE 1 – The confidence interval (error bar) associated with the single mean score for a codec and item shows the range above and below the stated mean score in which the true score may fall, with some degree of certainty, usually 95%. The true score for a codec and item may be as poor as the lower limit of the confidence interval about the stated score. In order to make a meaningful evaluation of the expected performance of cascaded codecs, the confidence interval associated with the reported mean scores for the individual codecs must be approximately equal to or less than the difference between the scores being compared.