Recommendation ITU-R BS.1909
(01/2012)

Performance requirements for an advanced multichannel stereophonic sound system for use with or without accompanying picture

BS Series
Broadcasting service (sound)
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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.1909

Performance requirements for an advanced multichannel stereophonic sound system for use with or without accompanying picture

(Questions ITU-R 15/6 and ITU-R 135/6)

(2012)

Scope

This Recommendation specifies the requirements for an advanced multichannel sound system with or without accompanying picture. Such a system, or a system derived from it, may find application as the sound components of expanded-LSDI and UHDTV programmes.

The ITU Radiocommunication Assembly,

considering

a) that Recommendation ITU-R BS.1734 – Basic performance requirements for the sound components of large-screen digital imagery applications for presentation in a theatrical environment, specifies the requirements relevant to the presentation of the sound components of the large screen digital imagery (LSDI) applications intended for presentation in a theatrical environment, which are mostly based on Recommendation ITU-R BS.775 that specifies the 5.1 channel sound system;

b) that Recommendation ITU-R BS.1688 – Baseband sound system and audio source-coding at delivery interfaces of large screen digital imagery applications, recommends that, for such LSDI applications, the reference digital baseband sound system at the interfaces should be based on the hierarchical reference sound system specified in Recommendation ITU-R BS.775 – Multichannel stereophonic sound system with and without accompanying picture, namely a hierarchy ranging from monophonic, 2-channel stereophonic and up to 5.1 channels of sound;

c) that Recommendation ITU-R BT.1769 – Parameter values for an expanded hierarchy of LSDI image formats for production and international programme exchange, specifies an expanded hierarchy of LSDI image formats for production and international programme exchange, in which the two image formats of 3 840 × 2 160 and 7 680 × 4 320 are specified;

d) that ITU-R has been studying UHDTV, which is a television application that is intended to provide viewers with an enhanced visual experience primarily by offering a wide field of view that covers virtually all of the human visual field with appropriate screen sizes relevant to usage at home and in public places;

e) that Recommendation ITU-R BS.646 – Source encoding for digital sound signals in broadcasting studios, specifies the sampling frequency and sample resolution for the digital encoding of sound;

f) that Recommendation ITU-R BT.1359 – Relative timing of sound and vision for broadcasting, recommends the timing tolerance between sound and vision signals in broadcasting systems;

g) that the wide field of view video of expanded-LSDI and UHDTV programmes requires spatially enhanced sound beyond the 5.1 channel sound;

h) that the advancements in video formats should be met with a sufficiently advanced sound formats for broadcasting sound system, for use both with and without accompanying picture,
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recommends

1 that an advanced multichannel sound system for use with or without accompanying picture should meet the performance requirements contained in Annex 1;

2 that such an advanced multichannel sound system, or a system derived from it with an appropriate number of channels, should be considered for use as the sound component of expanded LSDI and UHDTV programmes;

3 that the appropriate number of channels in programme production should be a choice at the discretion of the programme producer;

4 that the appropriate sound presentation arrangements in the home, such as the number of loudspeakers and the set-up position, should be a choice at the discretion of each member of the public.

Annex 1

Performance requirements

1 Sound quality requirements

1.1 The sound image should be reproduced in all directions around the listener, including the elevation direction, within reasonable limits of stability.

1.2 The sensation of a three-dimensional spatial impression that augments a sense of reality, which is related to ambience and envelopment, should be significantly enhanced over established sound formats in Recommendation ITU-R BS.775.

1.3 For applications with accompanying picture, the directional stability of the frontal sound image should be maintained over the entire area of high-resolution large-screen digital imagery. The coincidence of position between sound images and video images should also be maintained over a wide image and listening area.

1.4 Excellent sound quality should be maintained over a wide viewing/listening area. See Appendix 1.

1.5 For the coding parameters of sound signals, see Recommendation ITU-R BS.646.

1.6 For the relative timing of sound and vision, see Recommendation ITU-R BT.1359. Implementers should note that in large venues where sound and vision timing varies relative to seating location, other adjustments may need to be taken into account.

NOTE 1 – The sound quality is related to timbre, transparency, sound image, and spatial impression. The attributes of sound image and spatial impression include directional stability of the frontal sound image, the sensation of a three-dimensional spatial impression, and the prescribed three-dimensional image locations around the listener, including depth perception. The sound quality has to be defined dependent on the target environments of Appendix 2.

2 Functional requirements

2.1 Backward compatibility with the 5.1 channel sound system and conventional two-channel sound system should be ensured to an acceptable degree.
2.2 Appropriate rendering of the sound format should be ensured for loudspeaker configurations suitable for the range of typical listening environments, to provide an optimum sound field and maintain excellent sound quality at least within a limited area, or alternatively for headphone reproduction. See Appendix 2.

3 Operational requirement
3.1 Live recording, mixing and transmission should be possible, if required.

Appendix 1

Example of an expanded-LSDI system that gives viewers/listeners audiovisual experiences with a high sensation of reality

Figure 1 shows the horizontal viewing angle of an expanded-LSDI system that gives visual experiences with a high sensation of reality (see Recommendation ITU-R BT.1769).
Figure 2 shows an assumed seating area that gives audiovisual experiences with a high sensation of reality in a theatrical environment.

**FIGURE 2**

Assumed seating area that gives audiovisual experiences with a high sensation of reality

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**Appendix 2**

**Typical viewing/listening environments and assumed sound reproduction configurations**

The following are typical viewing/listening environments and assumed sound reproduction configurations for an advanced multichannel stereophonic sound system with and without accompanying picture.

1. **Public environments:** A loudspeaker reproduction system is likely to be used in conjunction with a large screen display, but may also be used without accompanying picture. The sound system will be required to produce acceptable quality and directional stability over an extended listening area:
   - theatre/outdoor presentation environments;
   - large theatre/outdoor presentation environments.

2. **Home environments:** A loudspeaker reproduction system will be used in conjunction with a high-resolution display or without accompanying picture. The sound presentation arrangements in a home, such as the number of loudspeakers and the set-up position, are considerably varied. A headphone reproduction system may also be used for individual listening:
   - large-to-average size room environment including home theatre environment;
   - small size room environment;
3. Mobile environments: A sound reproduction system will be used in conjunction with a small high-resolution display or without accompanying picture. The sound presentation arrangements in a mobile environment are likely to vary considerably. In some cases, a headphone reproduction system may be used:
   – personal environment;
   – in-car environment.