

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Audio reproduction method for normalized loudness level

Méthode de reproduction audio pour niveau d'isotonie normalisé

IEC 62760:2016

<https://standards.iteh.ai/catalog/standards/sist/229c3900-5cc3-4483-97a6-6fefa20a4767/iec-62760-2016>



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The text of this standard is based on the following documents:

FDIS	Report on voting
100/2591/FDIS	100/2635/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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INTRODUCTION

The loudness level of audio reproduction varies according to the level of the input source and whether it is mono, stereo or multichannel. Without a suitable form of automatic control, users are forced to adjust the volume level of equipment to obtain an appropriate loudness level when the user selects another audio source or audio mode such as mono, stereo or downmix. There are some specific adjustment methods applied to consumer equipment but these methods are not standardized. For broadcast audio, broadcasting studios apply loudness level measurements and settle a reference level for their audio content depending on ITU-R BS.1770 and ITU-R BS.1864, the first standardisation work for loudness level in broadcasting. The audio loudness levels of other services are also expected to be standardized.

Broadcast audio with regulated loudness levels can be reproduced correctly with appropriately-configured reproduction systems and equipment. This International Standard specifies the method for reproduction with channel mode level setting and other level settings, and provides improved quality of listening for users. This method is also applicable for various audio content other than broadcasting audio. This International Standard is applicable to electrical signal levels and excludes acoustic audio levels from loudspeakers.

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AUDIO REPRODUCTION METHOD FOR NORMALIZED LOUDNESS LEVEL

1 Scope

This International Standard specifies the audio reproduction method for normalized loudness level of audio sources for consumer equipment and systems.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62574, *Audio, video and multimedia systems – General channel assignment of multichannel audio*

ITU-R BS.1770-3:08/2012, *Algorithms to measure audio programme loudness and true-peak audio level*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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For the purposes of this document, the following terms and definitions apply.

3.1.1

loudness

subjective notion describing the magnitude of the perception of the sound by the human sense of hearing

Note 1 to entry: The magnitude of the auditory sensation mainly depends on sound pressure, it differs with frequency and sustain time of sound (see ISO 226:2003).

Note 2 to entry: The loudness is based on a sound that is pure tone of 40 dB sound pressure level and 1 kHz frequency, whose level is defined as 1 sone. Its symbol is N .

3.1.2

loudness level

level of a sound equal to the sound pressure level of 1 kHz sine wave

Note 1 to entry: The loudness level is sensed by humans as equal to the subjective sound level. The reference is 1 kHz sine wave and 40 dB sound pressure level, its loudness level is 40 phon.

Note 2 to entry: The symbol for loudness level is L_N and its unit is phon.

3.1.3

gated loudness

numerical value of loudness measured according to ITU-R BS.1770-3

Note 1 to entry: Gated loudness is measured in LKFS.

3.1.4

LKFS

loudness, K-weighted, relative to nominal full scale

Note 1 to entry: LKFS is a unit whose value is defined in ITU-R Recommendation BS.1770-3.

Note 2 to entry: This note applies to the French language only.

3.1.5

monophonic

sound processing by a single channel

Note 1 to entry: Monophonic is a mode of recording audio with one microphone or an equivalent method, transferring through one channel, then reproducing with one loudspeaker.

3.1.6

dual mono

consisting of two mono signal channels

Note 1 to entry: Dual mono is a mode of recording audio with two independent monophonic sounds, transferring through two channels, then reproducing one of two signals.

3.1.7

stereophonic

sound processing by two or more related channels

Note 1 to entry: Stereophonic is a mode of recording audio with two or more microphones or an equivalent method, transferring through two or more channels, then reproducing with two or more loudspeakers.

3.1.8

5.1 channel

stereophonic with 5 full range channels and 1 channel of low frequency effect

3.1.9

22.2 channel

stereophonic with 22 full range channels and 2 channels of low frequency effect

3.2 Abbreviations

mono	monophonic
stereo	stereophonic

4 Loudness normalisation

4.1 General

A system model is defined as specified below. It is applied to the back end of source devices or the front end of amplifiers.

4.2 System model

Figure 1 describes the system model of reproduction. This model is applied to the appropriate part of audio devices. For instance, a TV set may apply this model in its final stage of audio reproduction, an audio amplifier may apply this model in its first stage of audio reproduction.

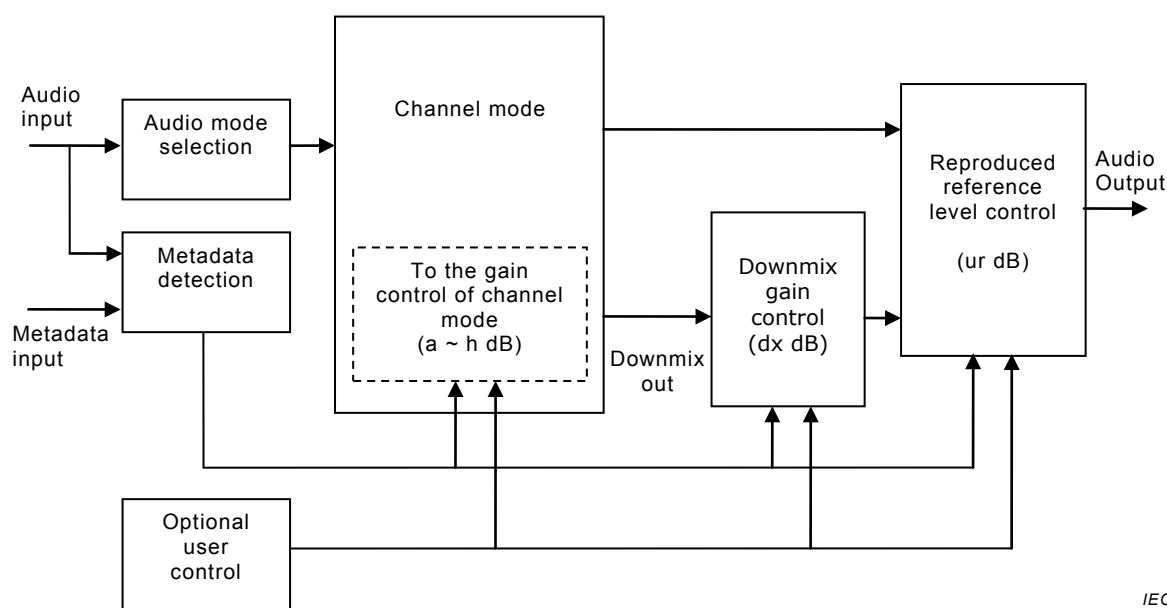


Figure 1 – System model

In this model, the channel mode applies the appropriate reproduction-level control described in Clause 5. The downmix gain control is a compensation of reproduction level of downmix. The reproduced reference level control is a final level control, it controls reproduction level to the target reproduced reference level.

Metadata of loudness or other gain control information is input to the metadata detection. They may be accompanied with audio data or separately input through other path. The detected metadata shall be input to each gain control unit to control its function and gain setting.

4.3 Control method

4.3.1 Principal control

The reproduction level of each channel mode is controlled as specified in Clauses 5 and 6.

The downmixed reproduction level is controlled by the downmix gain control. It is controlled depending on the downmix mode by the manufacturer's setting.

The reproduced reference level control controls the both downmix reproduction level and non-downmix reproduction to the same reproduced reference level. The reproduced reference level is settled by the manufacturer.

The metadata may be accompanied with audio data, or provided through other path such as Internet or data distribution. These metadata shall be used to control reproduction levels of the channel mode, downmix gain control and reproduced reference level control.

4.3.2 Optional control

For historical and practical reasons and situations in each country, it may be required to set a specific reproduction level of channel modes and downmixes. The optional user control may be applied to conform to these specific settings. The optional user control may be used by the end user and the manufacturer.

The reproduction level of each channel mode is controlled as specified in Clause 6. Some channel mode reproduction levels are not equal to the input level to the channel mode. Reproduction levels of downmixes are not equal to the input level of the downmix gain control.

Channel mode controls the reproduction level depending on the manufacturer's mode settings or the optional user control, and it can also be controlled with the metadata.

The downmixed reproduction level is controlled by the downmix gain control to be equal to the input level of the downmix gain control. It is controlled depending on the downmix mode by the manufacturer setting or by the optional user control, and it can also be controlled with the metadata.

The metadata may be accompanied with audio data, or may be provided through another path such as Internet or data distribution.

The reproduced reference level control controls the downmix reproduction level and non-downmix reproduction to be the target reproduced reference level, the target reproduced reference level is settled by the manufacturer or by the user setting the optional user control, and it can also be controlled with the metadata.

5 Channel mode

5.1 General

Channel mode defines the reproduction method and level of each channel in conjunction with the input source for each channel. Channels may range from monophonic to many channels stereophonic, and input sources may range from monophonic to many channels stereophonic.

5.2 Input source

The combination of channels and input sources is shown in Figure 2. These show sets of possible input sources for each channel mode. These input sources are identified as S1 to S5. S5 is a case of more than 5.1 channels that applies the general channel assignment defined by IEC 62574.

S1, with content A, is 1 channel input source to M1 or M2.

S2, with content AL and AR, is 2 channel input source of the stereophonic or the same input source to L and R.

S3, with content A and B, is 2 channel input source of the two independent input sources to L and R., e.g. bilingual application.

S4, with content AL, AR, AC, ALFE, ALS and ARS, is 5.1 channel input source of the 5.1 channel stereophonic input source to L to RS.

S5, with content AFL, AFR, and ABtFR, is 22.2 channel input source of the 22.2 channel stereophonic input source to FLc to BtFR.

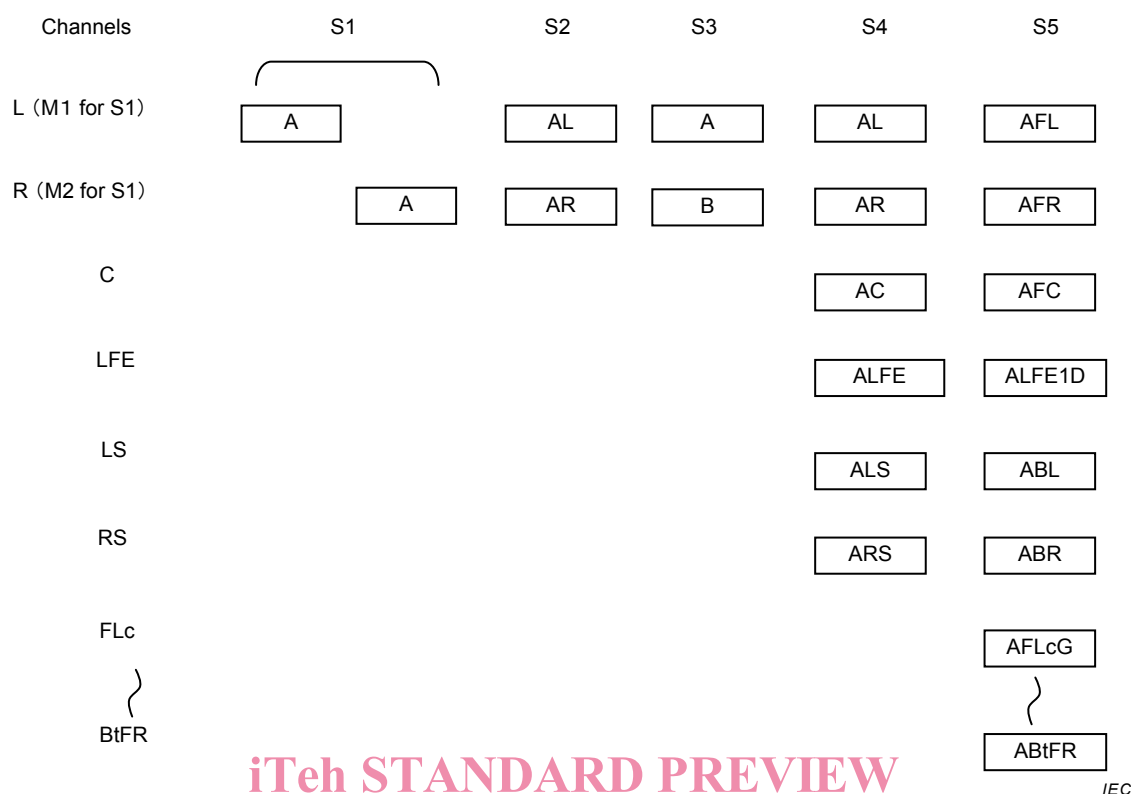


Figure 2 – Input sources

5.3 1 channel mode

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In the 1 channel mode, one channel reproduces one or two input sources. Figure 3 shows various cases for 1 channel mode of reproduction.

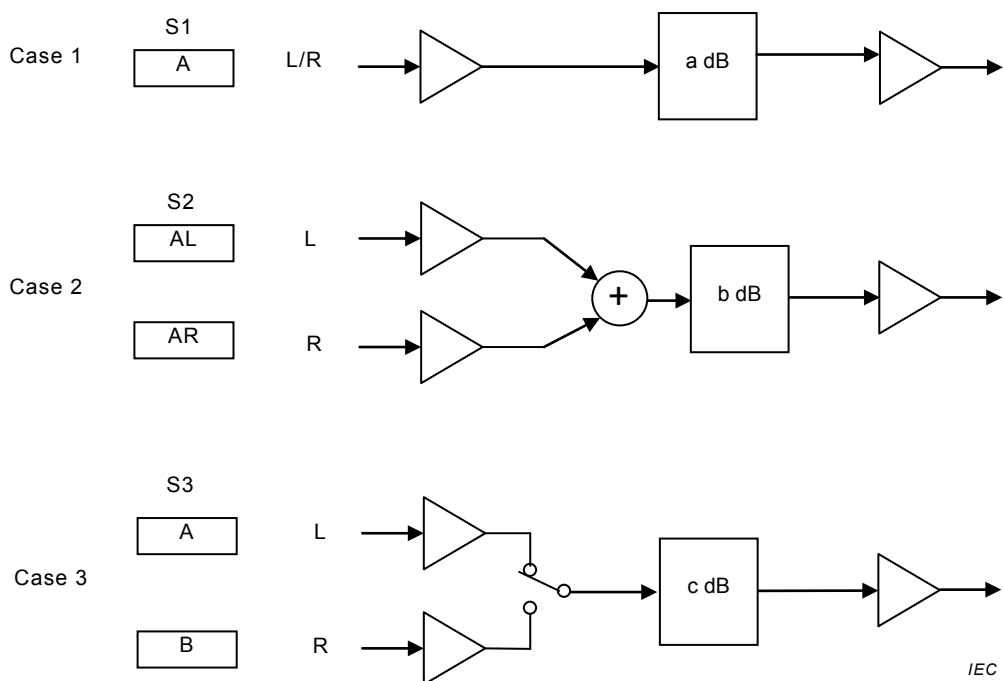


Figure 3 – 1 channel mode of reproduction

In cases where the output sound is reproduced by two or more loudspeakers, the level should be controlled to maintain the same level of reproduction as one loudspeaker.

In each case, the level attenuator should be set as follows:

Case 1, $a = 0$ dB

Case 2, $b = -3$ dB

Case 3, $c = 0$ dB

Case 2 should consider headroom when each input reference is over -24 LKFS.

5.4 2 channel mode

In the 2 channel mode, stereophonic or monophonic content and channel mode of reproduction is defined, as shown below. Figure 4 shows various cases for 2 channel mode of reproduction.

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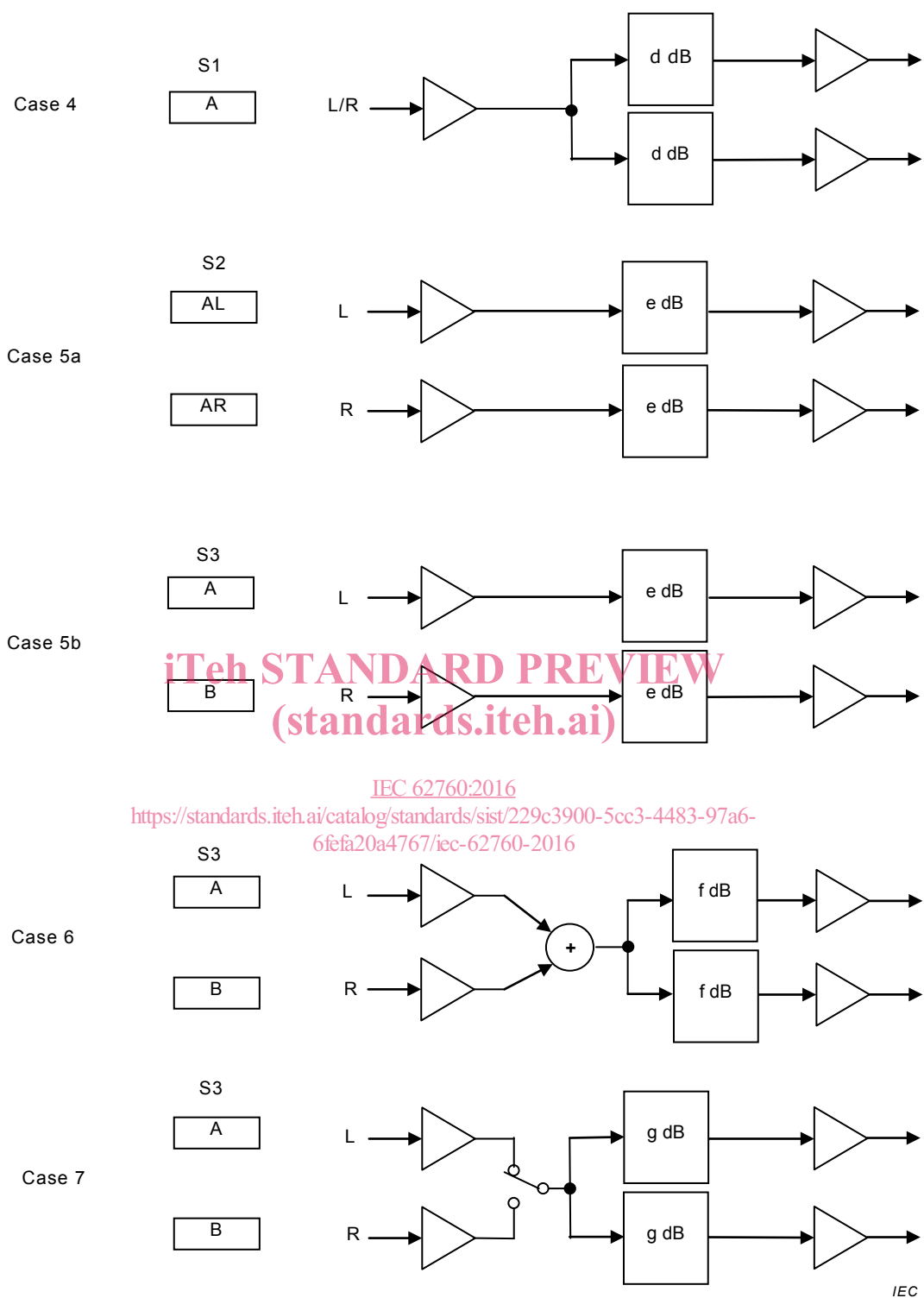


Figure 4 – 2 channel mode of reproduction

In each case, the level attenuator should be set as follows:

Case 4, $d = -3$ dB

Case 5a, $e = 0$ dB

Case 5b, $e = 0$ dB

Case 6, $f = -5$ dB

Case 7, $g = -3$ dB

NOTE 1 Case 5b level is defined considering a hearing level of content A and B from two loudspeakers.

NOTE 2 Case 6 mostly reproduces content A and B with a correlation coefficient from 1 to 0, see Annex E.

5.5 5.1 multichannel stereophonic

5.1 channels content and channel modes of reproduction are defined, as shown below. Figure 5 shows channel mode of reproduction.

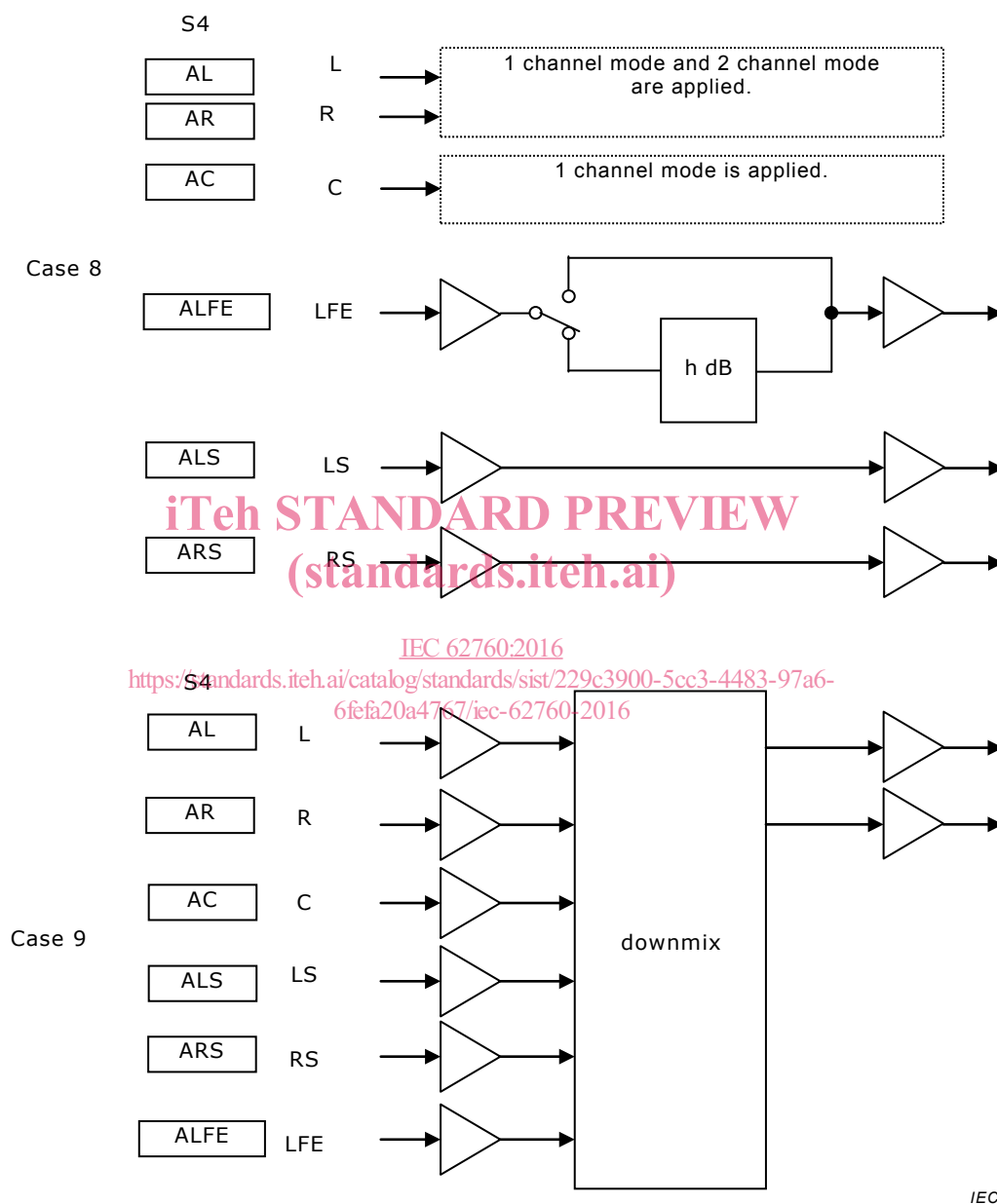


Figure 5 – 5.1 channel mode of reproduction

In Case 8, the level attenuator should be set as follows:

Case 8, $h = +10$ dB

5.6 More than 5.1 channels

22.2 channels content and channel mode of reproduction is defined as shown below. Figure 6 shows channel mode of reproduction.