# EBU

OPERATING EUROVISION AND EURORADIO

# R 128 s4

# LOUDNESS NORMALISATION OF CINEMATIC CONTENT

SUPPLEMENT 4 TO R 128

Geneva
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## Document History

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This document gives guidance how to potentially adapt and normalise highly dynamic content with speech as a main component (original Cinematic Content like movies, drama productions or TV series) for broadcasting and streaming. It is explicitly **not** intended as production advice for feature films.

# Loudness Normalisation
# of Cinematic Content

After the introduction of recommendation **R 128** [1], the EBU has studied the practical adoption and its consequences. **Cinematic Content** (for example, feature films, drama productions or TV series) is often challenging to be *broadcast* or *streamed* unaltered (see Fig.1 case **a**). This long-form content is typically characterised by a large **Loudness-to-Dialogue Ratio** (LDR) (the difference between **Programme Loudness** (PL) and **Dialogue Loudness**[1] (DL)) as well as large loudness variations. Such programmes can be compatible with playback, for example, in cinemas, but for broadcasting and streaming those characteristics can sometimes be excessive. This supplement to R 128 gives guidance on how to quantify and potentially adapt the dynamics of such programmes. Furthermore, guidance is given on the subsequent **loudness normalisation**.

## *The EBU, considering:*

a) *that measuring audio programme loudness is defined in ITU-R BS.1770 [2], and that loudness normalisation by European broadcasters is performed according to EBU R 128;*

b) *that the main criterion for qualifying Cinematic Content as challenging is a large **Loudness-to-Dialogue Ratio** (LDR), sometimes reaching 15 LU or more;*

c) *that normalisation of Cinematic Content based on an "anchor signal" (typically speech) can lead to a more balanced loudness impression especially for programmes with advertisement breaks (see [3]);*

d) *that for measuring Dialogue Loudness the speech part of the programme needs to be separated. In case an isolated speech track (dialogue stem or pre-mix) is not available, the Dialogue Loudness Level can be spot checked or automatically measured (for example, using a speech detection algorithm);*

e) *and that broadcasters may perform signal adaptations internally, may demand compliance with delivery specs for external content providers or may use a combination of both approaches;*

## recommends:

f) that the following measures should be used to specify Cinematic Content: **Programme Loudness**, **Dialogue Loudness**, **Loudness-to-Dialogue Ratio** and **Maximum True Peak Level**;

g) that Programme Loudness and Maximum True Peak Level shall be measured with a loudness meter compliant with ITU-R BS.1770 and EBU Tech 3341 [4]. Dialogue Loudness should also be measured with a loudness meter compliant with ITU-R BS.1770;

h) that a broadcaster should specify the dialogue separation and measurement method in order to obtain consistent results;

i) that, if manual checking of speech parts is performed, the track mainly containing speech should be used. For a surround sound programme (for example, 5.1), this is typically the Centre channel; for a stereo programme, the complete mix is the basis;

j) that the **Loudness-to-Dialogue Ratio** of Cinematic Content should not exceed **5 LU**. Dynamic adaptation of the programme should mainly target this parameter (see Fig.1 case **b**);

k) that, if the **Loudness-to-Dialogue Ratio** of Cinematic Content is within 5 LU, no dynamic adaptation needs to be performed, thus keeping the quality of the original mix. Particularly, increasing Dialogue Loudness to match Programme Loudness (LDR = 0) should be avoided;

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[1] Dialogue Loudness is also called "Speech Loudness" or "Speech-gated Loudness".

l)   that the **True Peak Level** of a programme shall not exceed **−1 dBTP** (dB True Peak) for linear audio (for tolerances, see EBU R 128);

m)  that, after dynamic adaptation according to item j), by default **Programme Loudness** of Cinematic Content should be normalised to a Target Level of **−23.0 LUFS** (see Fig.1 case **c**) (for tolerances, see EBU R 128);

n)   and that, particularly for providers with advertisement breaks during broadcasting or streaming of Cinematic Content, **Dialogue Loudness** may be normalised *up to* the Target Level of **−23.0 LUFS** ("anchor-based normalisation", described in EBU Tech 3343 [5]; see Fig.1 case **d**). This normalisation scheme typically leads to a Programme Loudness Level higher than −23.0 LUFS (with LDR ≤ 5 LU, it can maximally reach −18.0 LUFS), with less headroom than normalisation to Programme Loudness. Dynamic treatment may have to be adapted accordingly;

**The EBU further recommends:**

o)   that for systems without loudness metadata, anchor-based normalisation can be achieved by applying a static gain to the whole programme so that Dialogue Loudness is at the desired Target Level (up to −23.0 LUFS). Subsequent peak limiting may be applicable;

p)   that for metadata systems with one loudness parameter, anchor-based normalisation can be achieved by setting this parameter to the Dialogue Loudness value;

q)   and that for metadata systems where both parameters are available (for example, the Audio Definition Model [6]), Loudness Metadata should indicate Programme Loudness and Dialogue Loudness. When both parameters are actually present, providers define whether anchor-based normalisation to DL should be used.
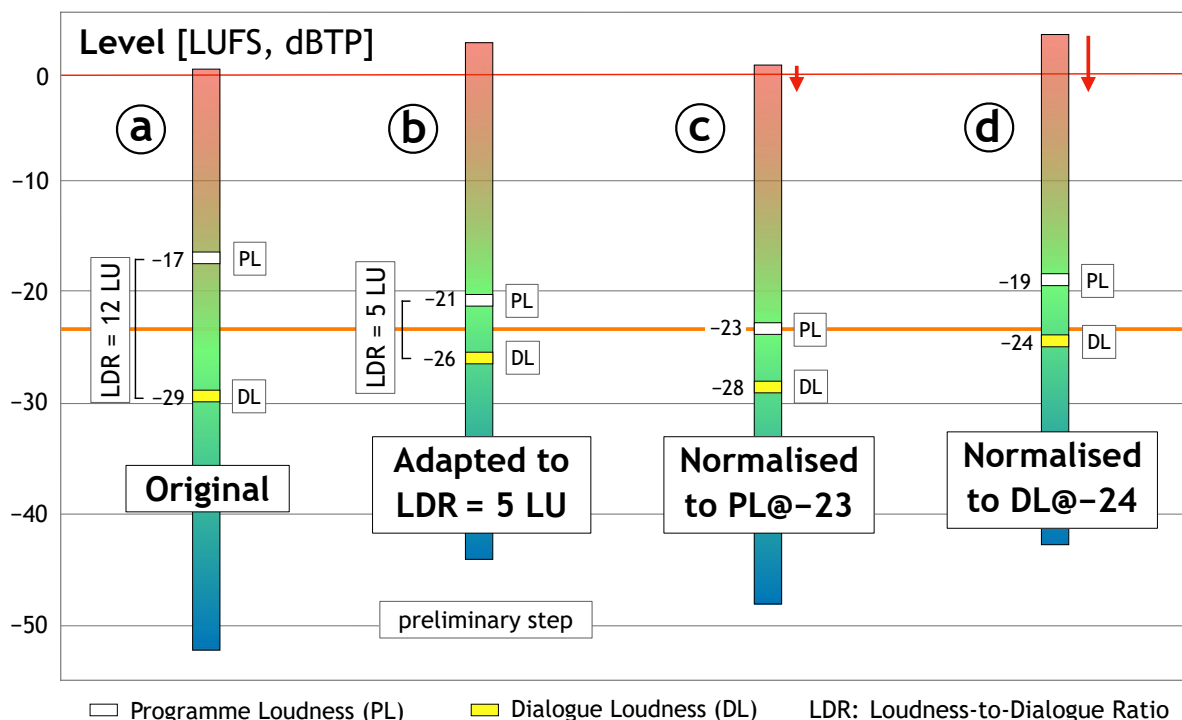


**Figure 1:** Illustration of the two normalisation schemes (PL vs. DL), after adaptation of the Loudness-to-Dialogue Ratio (see details below)

Case **a**:   Original movie mix; in this <u>example</u>, PL = −17 LUFS, DL = −29 LUFS (thus, LDR = 12 LU). If this programme is normalised with PL to −23 LUFS (6 dB attenuation), DL would be at −35 LUFS, 12 LU *lower* than the Target Level! If anchor normalisation to −23 LUFS using DL is performed (+6 dB gain), PL would be at −11 LUFS, 12 LU *higher* than the Target Level (with 12 dB True-peak limiting necessary)! Both solutions are not satisfactory;

Case **b**:    Example of dynamic adaptation of the whole programme to bring the Loudness-to-Dialogue Ratio (LDR) to 5 LU: after adaptation the value of DL is −26 LUFS and PL is −21 LUFS. This is a preliminary step which can result in higher peaks than in the original signal, depending on the adaptation process;

Case **c**:    The adapted programme is normalised to **PL = −23 LUFS** (−2 dB gain) which is the *default normalisation* scheme according to EBU R 128. The level of DL at transmission is −28 LUFS. Headroom is slightly increased, but True-Peak Limiting may still be necessary depending on the degree of LDR-adaptation (case b) and on the distribution path;

Case **d**:    The adapted programme is *in this example* normalised to **DL = −24 LUFS** (+2 dB gain) which is *anchor-based normalisation*. The level of PL at transmission is −19 LUFS. Dialogue Loudness close to or at the Target Level can provide a better balance to the level of speech, especially in the presence of advertisement breaks. Headroom is slightly decreased, so True-peak limiting will typically be necessary for most distribution paths. −24 LUFS is a value for DL anticipating the **range** of possible levels. DL can be normalised to −23 LUFS if wanted, but it does not need to be. It can, for example, be normalised to −25 LUFS, if a broadcaster wants to ensure that the resulting PL never exceeds −20 LUFS.

## *Note:*

Broadcasters are encouraged to study **§ 9.4** of the **EBU Production Guidelines** (Tech 3343) for background information, further details and practical advice. They should also consult EBU R 128 s2 [7] for detailed guidance to Loudness in Streaming, bearing in mind that, especially in Europe, streaming to portable devices no longer needs to be treated differently than broadcasting [8], [9].

## *Definitions:*

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| **Programme:** | An individual, self-contained audio-visual or audio-only item to be presented in Radio, Television or other electronic media |
| **Cinematic Content:** | A long-form programme with a large variation of loudness levels, for example, feature films, drama productions, TV series etc.; Typically, such programmes exhibit a large Loudness-to-Dialogue Ratio (LDR, see below), sometimes reaching 15 LU or more. Live programmes with similar properties, movie trailers and programmes for playback in cinemas are explicitly not considered in this document. |
| **Programme Loudness (PL):** | The integrated loudness over the duration of a programme; Programme Loudness Level is the value (in LUFS) of Programme Loudness and is measured with a loudness meter compliant with ITU-R BS.1770. |
| **Dialogue Loudness (DL):** | The average loudness of the speech component of a programme |
| **Loudness-to-Dialogue Ratio (LDR):** | The difference between Programme and Dialogue Loudness (LDR = PL − DL) |

## *References*

[1]    **EBU R 128**        *'Loudness normalisation and permitted maximum level of audio signals'*

[2]    **ITU-R BS.1770**      *'Algorithms to measure audio programme loudness and true peak audio level'*

[3]    **ATSC A/85**        *'Techniques for Establishing and Maintaining Audio Loudness for Digital Television'*; see § 5.2

[4]    **EBU Tech 3341**     *'Loudness Metering: 'EBU Mode' Metering to supplement Loudness Normalisation in accordance with EBU R 128'*

[5]    **EBU Tech 3343**     *'Guidelines for Production of Programmes in accordance with EBU R 128'*; see § 9.4

[6]    **ITU-R BS.2076**     *'Audio definition model'*

[7]    **EBU R 128 s2**      *'Loudness in Streaming'*; supplement 2 to EBU R 128

[8]    **CENELEC EN 50332-3**     *'Sound system equipment: headphones and earphones associated with personal music players - maximum sound pressure level measurement methodology - Part 3: measurement method for sound dose management'*

[9]    **IEC 62368-1**      *'Audio/video, information and communication technology equipment - Part 1: Safety requirements'*