

EBU

OPERATING EUROVISION AND EURORADIO

R 128

LOUDNESS NORMALISATION AND PERMITTED MAXIMUM LEVEL OF AUDIO SIGNALS

Status: EBU Recommendation



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Loudness normalisation and permitted maximum level of audio signals

<i>EBU Committee</i>	<i>First Issued</i>	<i>Revised</i>	<i>Re-issued</i>
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The EBU has studied the needs of audio signal levels in production, distribution and transmission of broadcast programmes. It is of the opinion that an audio-levelling paradigm based on loudness measurement is needed.

The EBU recommends the measurement of the average loudness of a programme ('Programme Loudness') for the normalisation of audio signals. The measurement of the 'Maximum True Peak Level' of an audio signal is recommended to comply with the technical limits of the complete signal chain. The measures 'Loudness Range', 'Maximum Momentary Loudness' and 'Maximum Short-term Loudness' can be used to further characterise an audio signal as well as to fulfil the aesthetic needs of each programme/station depending on the genre(s), the target audience and the distribution platform.

The EBU, considering;

- a) *that peak normalisation of audio signals has led to considerable loudness differences between programmes and between broadcast channels;*
- b) *that the resulting loudness inconsistencies between programmes and between channels are the cause of the most viewer/listener complaints;*
- c) *that, when used to read peaks in the usual way, the QPPM (Quasi-Peak Programme Meter) specified in EBU Tech 3205-E [1] does not reflect the loudness of an audio signal, and that the QPPM is not designed to indicate a long-term average;*
- d) *that with the proliferation of digital production, distribution and transmission systems, the permitted maximum level of an audio signal specified in ITU-R BS.645 [2] is no longer appropriate;*
- e) *that an international standard for measuring audio programme loudness has been defined in ITU-R BS.1770 [3], introducing the measures LU (Loudness Unit) and LUFS (Loudness Units, referenced to Full Scale)¹;*
- f) *that a gated measurement of Programme Loudness (which hence measures foreground loudness) is advantageous to improve the loudness matching of programmes with a wide loudness range;*

¹ 'LUFS' is equivalent to 'LKFS' (which is used in ITU-R BS.1770). The EBU uses 'LUFS' which is compliant with international naming conventions.

recommends (see Note):

- g) that the measures **Programme Loudness**, **Loudness Range** and **Maximum True Peak Level** shall be used to characterise an audio signal;
- h) that the **Programme Loudness Level** shall be normalised to a **Target Level of -23.0 LUFS**. The permitted deviation from the Target Level shall generally not exceed ± 0.5 LU¹. Where attaining the Target Level with this tolerance is not achievable practically (for example, live programmes), a wider tolerance of ± 1.0 LU is permitted. This exception shall be clearly indicated to ensure that such a deviation from the Target Level does not become standard practice;
- i) that in special circumstances the **Programme Loudness Level** may be lower than **-23.0 LUFS** on purpose. This exception shall be clearly indicated to ensure that such a lower programme loudness level is not unintentionally compensated;
- j) that the audio signal shall generally be measured in its **entirety**, without emphasis on specific foreground elements such as voice, music or sound effects;
- k) that the measurement shall be made with a loudness meter compliant with ITU-R BS.1770 and EBU Tech 3341 [4];
- l) that this measurement shall include a **gating** method as specified in ITU-R BS.1770 (and summarised in EBU Tech 3341);
- m) that the **Maximum Permitted True Peak Level** of a programme during production (linear audio) shall be **-1 dBTP** (dB True Peak), measured with a meter compliant with both ITU-R BS.1770 and EBU Tech 3341;

The EBU further recommends

- n) that the measure Loudness Range (measured in compliance with EBU Tech 3342 [5]) can be used to evaluate the loudness variation of a programme², its potential subsequent dynamic treatment and the dynamic integrity of a distribution path;
- o) that **Maximum Momentary Loudness** and **Maximum Short-term Loudness** (measured in compliance with EBU Tech Doc 3341) can be used to determine if a programme exceeds the upper loudness tolerance limit of the target audience;
- p) that **Loudness Metadata** shall correctly indicate the actual Programme Loudness. Additional metadata may be used to ensure a playback loudness level deviating from Target Level (for example, for programmes according to item i));
- q) that audio processes, systems and operations concerning production of programmes should be made in compliance with EBU Tech3343 [6];
- r) that audio processes, systems and operations concerning distribution and reproduction of programmes should be made in compliance with EBU Tech 3344 [7].

¹ The ± 0.5 LU tolerance exists to allow for minor variations of meter calibrations and errors.

² For programmes shorter than 1 minute, the use of the measure Loudness Range is not recommended due to too few data points (Loudness Range is based on the Short-term-Loudness values (3-seconds-window)).

Definitions:

Programme:	An individual, self-contained audio-visual or audio-only item to be presented in Radio, Television or other electronic media. An advertisement (commercial), trailer, promotional item ('promo'), interstitial or similar item shall be considered to be a programme in this context;
Programme Loudness:	The integrated loudness over the duration of a programme - Programme Loudness Level is the value (in LUFS) of Programme Loudness;
Loudness Range (LRA):	The distribution of loudness within a programme;
Maximum True Peak Level:	The maximum value of the audio signal waveform of a programme in the continuous time domain.

Note

As the switch to loudness normalisation is a substantial change in audio signal levelling, aligning and production procedures as described in the EBU Techs 3343 & 3344 will have an economical and organisational impact. Therefore a **transition phase** may be necessary before this recommendation can be fully implemented; Broadcasters should in any case aim to make the transition as quickly as is practically possible.

References

- [1] EBU Tech 3205-E The EBU standard peak-programme meter for the control of international transmissions
- [2] ITU-R BS.645 Test signals and metering to be used on international sound programme connections
- [3] ITU-R BS.1770 Algorithms to measure audio programme loudness and true-peak audio level
- [4] EBU Tech 3341 Loudness Metering: 'EBU Mode' metering to supplement loudness normalisation in accordance with EBU R 128
- [5] EBU Tech 3342 Loudness Range: A measure to supplement loudness normalisation in accordance with EBU R 128
- [6] EBU Tech 3343 Guidelines for Production of Programmes in accordance with EBU R 128
- [7] EBU Tech 3344 Guidelines for Distribution and Reproduction of Programmes in accordance with EBU R 128