

# Loudness normalisation and permitted maximum level of audio signals



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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 is needed based on loudness measurement.

In addition to the average loudness of a programme (*'Programme Loudness'*) the EBU recommends that the descriptors *'Loudness Range'* and *'Maximum True Peak Level'* be used for the normalisation of audio signals, and to comply with the technical limits of the complete signal chain as well as the aesthetic needs of each programme/station depending on the genre(s) and the target audience.

### **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 Doc 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 Unit, referenced to Full Scale)<sup>1</sup>;*
- f) *that a gated measurement of Programme Loudness (hence measuring 'Foreground Loudness') is advantageous to improve the loudness matching of programmes with a wide loudness range;*
- g) *and that the descriptor 'Loudness Range' can be used to assess the need for loudness-range reduction to fit programmes to the tolerance window of the target audience;*

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<sup>1</sup> 'LUFS' is equivalent to 'LKFS' (which is used in ITU-R BS.1770-1). An input document has been submitted to the ITU requesting it to change its nomenclature to 'LUFS' (which is compliant with international naming conventions).

**recommends** (see Note):

- h) that the descriptors **Programme Loudness**, **Loudness Range** and **Maximum True Peak Level** shall be used to characterise an audio signal;
- i) that the **Programme Loudness Level** shall be normalised to a **Target Level** of **-23 LUFS**. The permitted deviation from the Target Level shall generally not exceed  $\pm 1$  LU for programmes where an exact normalisation to Target Level is not achievable practically (for example, live programmes);
- j) that the audio signal shall generally be measured in its entirety, without emphasis on specific elements such as voice, music or sound effects;
- k) that the measurement shall be made with a loudness meter compliant with both ITU-R BS.1770 and EBU Tech Doc 3341 [4];
- l) that this measurement shall include a **gating** method with a relative threshold of **8 LU** below the ungated LUFS loudness level as specified in EBU Tech Doc 3341;
- m) that **Loudness Range** shall be measured with a meter compliant with EBU Tech Doc 3342 [5];
- n) that the **Maximum Permitted True Peak Level** of a programme during production shall be **-1 dBTP** (dB True Peak), measured with a meter compliant with both ITU-R BS.1770 and EBU Tech Doc 3341.

**The EBU further recommends**

- o) that loudness metadata shall be set to indicate **-23 LUFS** for each programme that has been loudness normalised to the Target Level of **-23 LUFS**;
- p) that loudness metadata shall always correctly indicate the actual programme loudness, even if for any reason a programme may not be loudness normalised to **-23 LUFS**;
- q) that audio processes, systems and operations concerning production and implementation should be made in compliance with EBU Tech Doc 3343 [6];
- r) that audio processes, systems and operations concerning distribution should be made in compliance with EBU Tech Doc 3344 [7].

**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):	This describes 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**

At the publication time of this recommendation, measurement instruments compliant with ITU-R BS.1770 [3] and EBU Tech Doc 3341 [4] have only recently become available. As the switch to loudness normalisation is a substantial change in audio signal levelling, aligning procedures as described in the EBU Tech Docs 3343 [6] and 3344 [7] will have an economical and organisational impact. Therefore a **transition phase** may be necessary by some broadcasters 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 Doc 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 Doc 3341 'Loudness Metering: 'EBU Mode' metering to supplement loudness normalisation in accordance with EBU R 128'
- [5] EBU Tech Doc 3342 'Loudness Range: A descriptor to supplement loudness normalisation in accordance with EBU R 128'
- [6] EBU Tech Doc 3343 'Practical Guidelines for Production and Implementation in accordance with EBU R 128'
- [7] EBU Tech Doc 3344 'Practical Guidelines for Distribution of Programmes in accordance with EBU R 128'