EBU – Recommendation R 128

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)[1];

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;

[1] '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 **±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'