1 EBU R 128 is at the core of a true audio revolution: audio levelling based on loudness, not peaks

Audio signal normalisation based on peaks has led to more and more dynamic compression and a phenomenon called the 'Loudness War'. The problem arose because of misuse of the traditional metering method (Quasi Peak Programme Meter – QPPM) and the extended headroom due to digital delivery. Loudness normalisation ends the 'Loudness War' and brings audio peace to the audience.

2 ITU-R BS.1770-2 defines the basic measurement, EBU R 128 builds on it and extends it

BS.1770-2 is an international standard that describes a method to measure loudness, an inherently subjective impression. It introduces 'K-weighting', a simple weighting curve that leads to a good match between subjective impression and objective measurement. EBU R 128 takes BS.1770-2 and extends it with the descriptor Loudness Range and the Target Level: -23 LUFS (Loudness Units referenced to Full Scale). A tolerance of ± 1 LU is generally acceptable.

3 Gating of the measurement is used to achieve better loudness matching of programmes that contain longer periods of silence

Longer periods of silence in programmes lead to a lower measured loudness level. After subsequent loudness normalisation such programmes would end up too loud. In BS.1770-2 a relative gate of 10 LU (Loudness Units; 1 LU is equivalent to 1dB) below the ungated loudness level is used to eliminate these low level periods from the measurement. Thus, better loudness matching is achieved.

4 A separate document about ‘Loudness Metering’ (EBU Tech Doc 3341) defines the framework for a loudness meter compliant with ‘EBU Mode’

There are three time constants which differ in the integration time: Momentary (400ms), Short-term (3s) and Integrated (from start to stop; the whole programme/item). These three meters are abbreviated M, S and I. The result of a loudness measurement is a Loudness Level, abbreviated \( L_{k} \), the value is expressed in ‘LUFS’ (Loudness Units referenced to Full Scale). ‘M’ and ‘S’ are commonly used in stereophony for ‘Mid’ and ‘Side’. To distinguish the integration times ‘Momentary’ and ‘Short-term’, the versions ‘ML\( L_{k} \)’ and ‘SL\( L_{k} \)’ (as well as ‘IL\( L_{k} \)’) may be used.
5 All major audio meter manufacturers participated in the EBU group PLOUD. They co-developed ‘EBU Mode’.

Equipment implementing ‘EBU Mode’ has been introduced very quickly after publishing the EBU Recommendation. The joint work of manufacturers of audio metering equipment as well as experienced sound engineers ensures that loudness meters will be compliant with ‘EBU mode’. The work within PLOUD is a prime example of such a collaboration between users and vendors.

6 The descriptor ‘Loudness Range’ (LRA) is a tool to assess if a programme fits the tolerance of the transmission chain and target audience and if dynamic compression is needed.

‘Loudness Range’ estimates the distribution of loudness of a programme with statistical tools. A broadcaster can establish a maximum LRA value for specific genres and transmission platforms. LRA can also be used to check for dynamic transparency of a signal chain. A detailed description of LRA is given in EBU Tech Doc 3342.

7 Loudness normalisation is applicable to the whole signal chain.

The concept of EBU R 128 is applicable to all areas of audio production, from acquisition, live broadcasting and post-production to ingest, file-based workflows, playout (master control), transmission, archiving and distribution (re-broadcasting). The publications provided by the EBU group PLOUD cover all these areas.

8 The transition to loudness normalisation need not be a brutal switch...

Current mixing techniques (with a Peak Meter) can still be used with subsequent adjustment of the result. Loudness Metering is nevertheless encouraged. Analysis of past productions and mixing techniques with a loudness meter gives a good indication of compatibility and the necessary changes. Audio engineers will quickly realize the extended dynamic possibilities. EBU Tech Doc 3343 gives practical guidelines for the new way of working with audio levels.

9 EBU R 128 lies also at the heart of the Distribution Guidelines

EBU Tech Doc 3344 represents a major step towards equal loudness for all possible sources of audio signals arriving at the consumer’s home. This also includes specifications for set-top boxes and AV Receivers.

10 Metadata is important too

If content normalised to the Target Level has loudness metadata associated with it, it should be set to indicate -23 LUFS. If normalisation cannot be achieved then the metadata should indicate the actual loudness level of the content.

For more information, visit: tech.ebu.ch/loudness
Loudness is the sound level people ‘hear’
Loudness refers to the perceived strength of a piece of audio (music, speech, sound effects ...). The loudness depends on the level, frequency, content and the duration of the audio, amongst other things.

Viewers and listeners complain about loudness jumps
Viewers watching television programmes often get annoyed when the audio loudness jumps at every commercial break or when they change channels. Television advertisements are unfortunately infamous for their high compression and loud presentation.

Current peak audio meters do not reflect loudness
Audio metering in broadcasting today is based typically on peak programme meters (PPMs). Improving audio metering by replacing the PPM with the loudness meter is a step closer to the best measurement tool: the human ear.

Dynamic range has decreased dramatically because of the “loudness war”
Peak metering has encouraged powerful dynamic range processing to make one broadcast element louder than the competition. The competition responds by becoming louder and dynamic range is reduced as everything comes to sit just below the point of distortion. This processing leads to listener fatigue in the audience and reduces audio quality overall. By introducing loudness normalisation, we believe we can counteract this problem.

Audio dynamics is a creative tool – honestly!
Dynamic range compression should only be used for artistic reasons (e.g. conquering too much level variation in a voice or giving ‘punch’ to a musical instrument). Using compression just to ‘be the loudest’ takes the life out of the programme. By moving to loudness metering and normalisation, audio production can look forward to using dynamics as a creative tool once again.
6 Peace can be brought to the loudness war by changing the reference
Loudness wars between broadcasters or programmes should be abolished. The audience doesn't like them. 
Competition should be on content and sound quality.

7 Loudness normalisation provides the solution
Everyone recognises the problem and accepts that the current situation must change. The solution is to change the metering 
paradigm and mix to a common loudness level.

8 EBU PLOUD lends a hand
The EBU PLOUD Group (with over 240 participants including creative and technical experts) has published its Recommendation 
- R128 – on target loudness, and a specification for loudness meters. It also has created practical guidelines for use by everyone 
involved with broadcast audio. R128 is based entirely on open standards and aims to harmonise the way we produce and measure 
audio internationally.

9 Improving an existing standard: ITU-R BS.1770-1
The ITU-R BS.1770-1 recommendation provides the basis for the EBU’s Recommendation R128. The EBU’s development was 
needed to accommodate the needs of programme makers, with particular regard to the complete mix (rather than just the dialogue) 
and the loudness range of the programme. The meter manufacturers in the PLOUD Group have agreed to implement an ‘EBU 
mode’ of the ITU recommendation to make sure their meters’ readings will be aligned.

10 A transparent path from Production To Delivery
R128 establishes a predictable and well-defined loudness level for news, sports, advertisements, drama, music, promotions, film 
etc. throughout the broadcast chain and thereby helps professionals to create robust specifications for ingest, production, play-out 
and distribution to a multitude of platforms.

The PLOUD Group is part of the EBU Expert Community on Audio (ECA).
For more information, visit: http://tech.ebu.ch/loudness