

EBU

OPERATING EUROVISION AND EURORADIO

R 128 s3

LOUDNESS IN RADIO



SUPPLEMENT 3 TO R 128

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Loudness in Radio

After the introduction and successful adoption of recommendation EBU R 128 [1], the uptake in Radio has been slower. There is a need to give specific guidance for an audio levelling solution in Radio based on **loudness**.

The **key concept** is the clear differentiation between the *production* and the *distribution* realm.

The EBU considering:

- a) *that the majority of European TV broadcasters produces its programmes according to EBU R 128 with a Target Level of **-23.0 LUFS**;*
- b) *that many European Radio broadcasters have been delaying the adoption of loudness normalisation due to often shared processes and responsibilities between the programme and technical department. Furthermore, the distribution landscape is more heterogenous with different levelling schemes for legacy and current solutions (FM, DAB, Streaming etc.);*
- c) *that there is no unanimous use of MPX (multiplex) power limiting according to ITU-R BS.412 [2] for FM distribution, resulting in vastly different loudness levels of Radio stations across Europe;*
- d) *that many Radio broadcasters still rely considerably on this FM distribution path;*
- e) *that Online Streaming has become an important distribution path for Radio broadcasters;*
- f) *and that the exchange of content between Radio, TV and Online distribution is increasingly daily practice for many broadcasters, exposing different levelling schemes;*

recommends for production:

- g) *that Radio broadcasters should clearly distinguish between **production** and **distribution** of content and apply levelling strategies accordingly;*
- h) *that programmes shall be produced or prepared according to EBU R 128 and EBU Tech 3343 [3], that is with an average loudness level of **-23.0 LUFS**¹. The True Peak Level of a programme shall not exceed **-1 dBTP**. For tolerances refer to [1];*
- i) *that, consequently, internal and external *programme exchange* shall be performed with these key values in place (**-23.0 LUFS** and **-1 dBTP**);*
- j) *that legacy programmes should be loudness normalised to **-23.0 LUFS** prior to play-out, either through creating a new file or through the use of Loudness Metadata;*

The EBU further recommends for distribution:

- k) *that by default, Radio stations should aim to broadcast their programmes according to EBU Tech 3344 [4], that is at a *Distribution Loudness Level* of **-23.0 LUFS**;*
- l) *that for legacy analogue distribution paths (for example, the FM system), the alignment of the studio level to the carrier deviation may subsequently be adapted to approximately reach the same perceived loudness level as before;*
- m) *that, alternatively, the Distribution Loudness Level may be adapted without changing the legacy alignment;*

¹ Broadcasters should urge manufacturers of audio editing equipment and Content Management Systems to implement the necessary loudness tools, such as automatic clip-based loudness normalisation.

- n) that, generally, a Distribution Loudness Level deviating from -23.0 LUFS should be chosen within the range of -20.0 to -16.0 LUFS;
- o) that for digital distribution paths signal conditioning *independent of FM processing* should be used in order to avoid the disadvantages of MPX power and peak limiting and to use the full headroom according to EBU Tech 3344;
- p) that broadcasters should perform *Radio Streaming* in accordance with EBU R 128 s2 [5];
- q) that once especially mobile devices provide sufficient headroom and gain to enable satisfactory playback levels even in noisy environments², broadcasters with a higher Distribution Loudness Level should return to using -23.0 LUFS;
- r) that the True Peak Level in distribution shall not exceed the values specified in EBU Tech 3344;
- s) and that any further audio processes, systems and operations concerning the production and distribution of Radio programmes should be made in compliance with EBU Tech 3401 [8].

To illustrate the benefits of **loudness normalisation**, two different levelling schemes of a Radio station using the *FM distribution* path are illustrated below. In **Figure 1**, note how applying loudness normalisation in *production* reduces the degree of compression and peak limiting applied. The Distribution Loudness Level is also -23.0 LUFS, the alignment to nominal FM carrier deviation is adapted (R 128 1). In **Figure 2**, the same sequence of programmes is all over the place regarding loudness levels which is tamed through severe compression and limiting. The Distribution Loudness Level and the alignment stay unchanged (Legacy 2). Both cases result in the same loudness level on the receiver side. In **Figure 3** the two outcomes are compared side by side. Note the difference in the dynamic properties: R 128 1 shows a more open sound and a perfectly consistent loudness level.

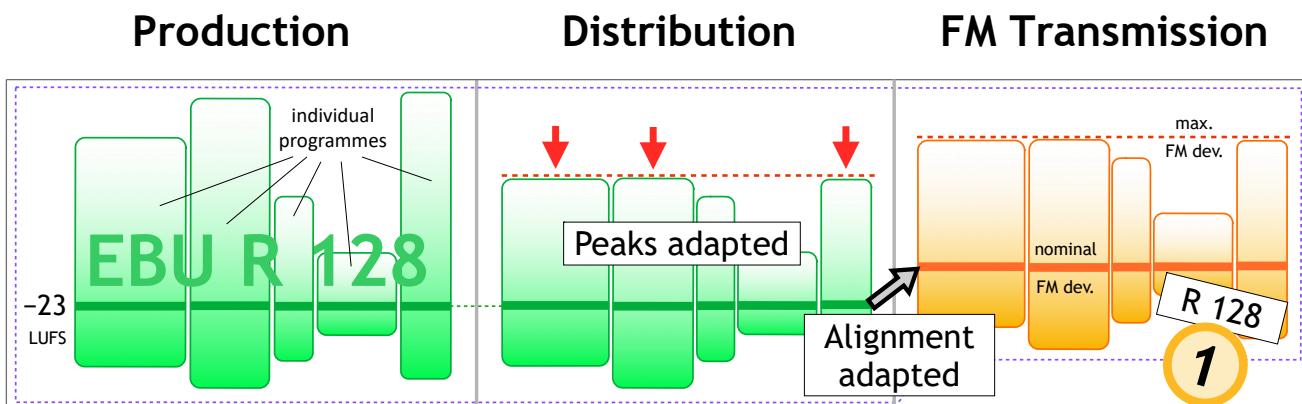


Figure 1: Levelling Scheme for a Radio station using R 128 compliant loudness normalisation at -23 LUFS in production and distribution with adapted alignment for FM (R 128 1). Mild peak limiting and/or dynamics processing is performed where needed (see the red arrows).

² With the publication of the revisions of CENELEC EN 50332-3 [6] and IEC 62368-1 [7] this situation is effectively in place and streaming need not be treated differently than broadcast.

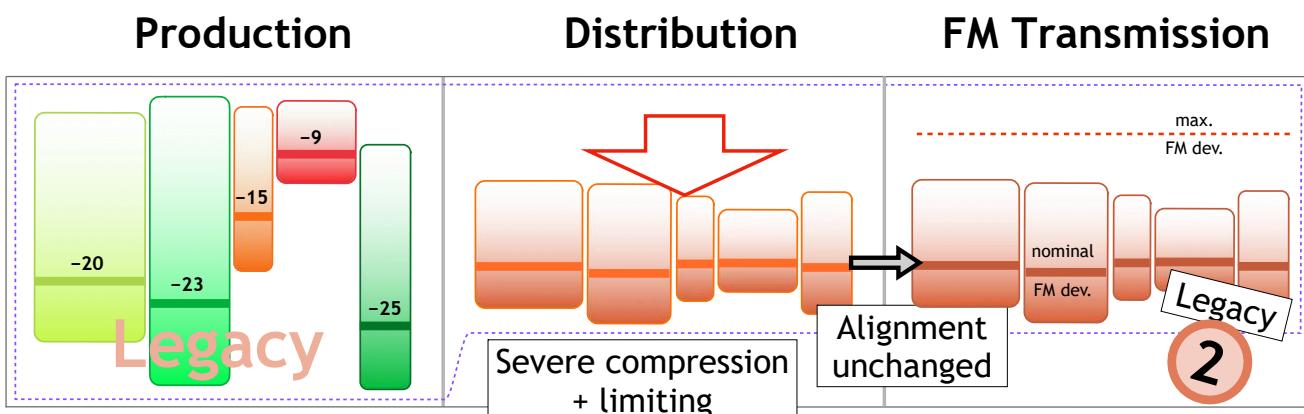


Figure 2: Levelling Scheme for a Radio station using no normalisation in production with legacy processing and alignment for FM. The resulting average loudness is the same as in Fig.1. Severe peak limiting and compression lead to a less dynamic, more squashed sound (Legacy 2).

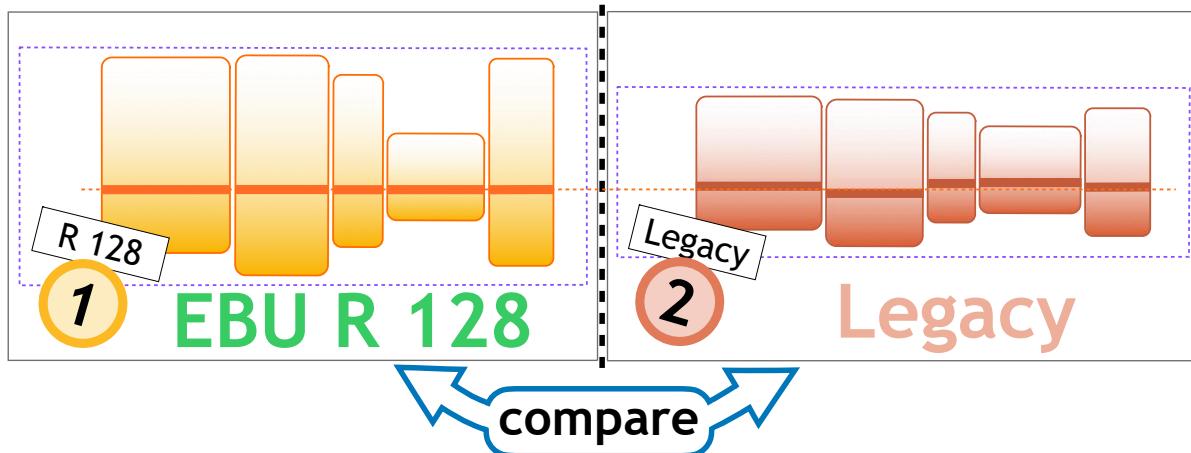


Figure 3: Comparison between the results of an FM Levelling Scheme according to EBU R 128 and of a legacy method (R 128 1 vs. Legacy 2). The same loudness level is achieved, but R-128-compliant loudness normalisation reduces transmission processor aggressiveness and enables a more dynamic, open sound

References

- [1] EBU R 128 ‘Loudness normalisation and permitted maximum level of audio signals’ <https://tech.ebu.ch/publications/r128>
- [2] ITU-R BS.412 ‘Planning standards for terrestrial FM sound broadcasting at VHF’ <https://www.itu.int/rec/R-REC-BS.412/en>
- [3] EBU Tech 3343 ‘Guidelines for Production of Programmes in accordance with EBU R 128’ <https://tech.ebu.ch/publications/tech3343>

- [4] EBU Tech 3344 ‘*Guidelines for Distribution and Reproduction of programmes in accordance with EBU R 128*’ <https://tech.ebu.ch/publications/tech3344>
- [5] EBU R 128 s2 ‘*Loudness in Streaming*'; supplement 2 to EBU R 128 <https://tech.ebu.ch/publications/r128s2>
- [6] 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*’
- [7] IEC 62368-1 ‘*Audio/video, information and communication technology equipment - Part 1: Safety requirements*’
- [8] EBU Tech 3401 ‘*Guidelines for Radio production and distribution in accordance with EBU R 128*’ <https://tech.ebu.ch/publications/tech3401>