Technical Standards for delivery of audio for TV programmes to Norwegian broadcasters

1 Sound Quality

Sound must be recorded with appropriately placed microphones, giving minimum background noise and without peak distortion.

The audio must be free of spurious signals such as clicks, noise, hum and any analogue distortion.

The audio must be reasonably continuous and smoothly mixed and edited.

Audio levels must be appropriate to the scene portrayed and dynamic range must not be excessive. They must be suitable for the whole range of domestic listening situations.

Stereo audio must be appropriately balanced and free from phase differences which cause audible cancellation in mono.

The audio must not show dynamic and/or frequency response artefacts as a result of the action of noise reduction or low bit rate coding systems.

2 Technical Requirements – Audio

All programmes must be mixed to comply with the EBU Recommendation on Loudness Measurement EBU R128 (including supplements). Programmes which have been mixed to the old standard will only be accepted by prior agreement with the Broadcaster.

To avoid doubt during the QC process, file metadata or tape paperwork should note whether the programme has been mixed to EBU R128 or to the old standard.

The old standard for measuring programme audio levels used Quasi Peak Programme Meters (Nordic Scale, IEC 60268-10 Type 1) where -18 dBFS corresponds to 0 dBu. Typical peak levels on speech were +3 dBu, maximum programme peak level + 6 dBu.

2.1 Terms, Requirements and Guidelines

2.1.1 Terms and Requirements

R128 introduces new terms for the measurements of audio. The terms used in this document, how they are measured and the delivery requirements are listed below.

All programmes must be compliant with the *Programme Loudness* and *Maximum True Peak* requirements below. Other parameters are currently given for guidance only.

Term	Description	Measurement	Reference
LU	Loudness Unit	1LU = 1dB change in loudness	EBU Tech 3343
LUFS	Loudness Unit relative to Full Scale	LUFS	EBU Tech 3343
LRA	Loudness Range	LU	EBU Tech 3342

Delivery Requirements

Term	Description	Measurement	Requirement
Programme Loudness	The loudness measured over the duration of the programme.	LUFS	**-23.0 LUFS** **Note:** A tolerance of **±1.0LU** is accepted for live delivery
Maximum True Peak	The maximum value of the audio signal waveform.	dBTP (True Peak)	-3dBTP recommended. Programmes are deemed to have failed QC if level exceeds **-1dBTP**
Loudness Range (for guidance only)	This describes the perceptual dynamic range measured over the duration of the programme	LU	Programmes should *aim* for an LRA of no more than **18LU**

Although the target loudness is -23 LUFS, in exceptional circumstances other target levels may be permitted by agreement with the broadcaster. Other target levels must be agreed with the broadcaster *before* the final mix.

Delivery Requirements, Short-Form Content (advertisements, promos etc.)

Term	Description	Measurement	Requirement
Programme Loudness	The loudness measured over the duration of the programme.	LUFS	**-23.0 LUFS**
Maximum True Peak	The maximum value of the audio signal waveform.	dBTP (True Peak)	-3dBTP recommended. Programmes are deemed to have failed QC if level exceeds **-1dBTP**
Maximum Permitted Short-term Loudness Level	The maximum short term loudness of the programme	LUFS	**-18.0 LUFS** (+5.0 LU on the relative scale) (see note below)
Loudness Range (for guidance only)	This describes the perceptual dynamic range measured over the duration of the programme	LU	(not applicable)

Note: Short-Form Content is defined as a programme of short duration, typically shorter than 30s (but up to approximately 2 minutes duration). In addition to advertisements (commercials) and promotional items, interstitials, stingers, bumpers and similar very short items belong to this category.

2.1.2 Guidelines for True Peak audio levels

The following table is ***only for guidance*** on the true peak levels of different types of audio. At all times dialogue should be distinct and clear.

Material	Recommended Maximum Peaks
Uncompressed Music	**-3 dBTP**
Compressed Music (depending on degree of compression)	**-10 dBTP**
Heavy M & E (gunshots, warfare, aircraft, loud traffic, etc.)	**-3 dBTP**
Background M & E (office/street noise, light mood music etc.)	**-18 dBTP**

2.2 Metering Requirements

Meters must comply with the specifications in EBU Tech 3341. Programmes must be measured using the EBU Integrated (I) mode and the measurement must be applied to the whole programme.

2.3 Stereo Audio Requirements

Stereo tracks must carry sound in the A/B (Left/Right) form.

If mono originated sound is used, it must be recorded as dual mono, so that it may be handled exactly as stereo. It must meet all the stereo standards regarding levels, balance and phase

2.3.1 Stereo line-up tones

Each stereo audio pair must have either EBU stereo **or** GLITS line-up tone (not a mix of both). Tone must be 1kHz, sinusoidal, free of distortion and phase coherent between channels). Audio files of GLITS and EBU stereo tones may be downloaded from the DPP web site (see 2.6). Digital Audio Reference level is defined as 18dB below the maximum coding value (-18dBFS).

2.3.2 Stereo phase

Stereo programme audio must be capable of mixing down to mono without causing any noticeable phase cancellation.

2.4 Surround Sound Requirements

Surround sound is transmitted in the 5.1 format, and should normally be delivered as discrete tracks, except by agreement with the broadcaster.

Programmes delivering surround sound must also carry a stereo mix meeting all requirements for stereo delivery. This should generally be an automated down-mix of the surround channels, using the same down-mix parameters as are held in the surround metadata.

In order for both the surround mix and stereo down-mix to comply with EBU R128 the down-mix should be normalised before layback (for file or tape delivered programmes).

Stereo and surround audio tracks must be synchronous.

2.4.1 Surround line-up tones

Each group of surround tracks must carry BLITS tone. Tones must be sinusoidal; free of distortion and phase coherent between channels. Stereo tracks derived by down-mixing from the 5.1 audio should carry a down-mix of the BLITS tones, using the same down-mix parameters as those specified in the accompanying metadata. Any other stereo tracks delivered with the programme must carry stereo tone as per section 3.3.1.

An audio file of BLITS tone may be downloaded from the DPP web site (see 2.6).

2.4.2 AES Sample timing

This section refers to timing requirements for AES audio pairs embedded in HD SDI signals. Very small timing differences between audio tracks in a surround programme will not be heard unless the stereo down-mix is monitored acoustically. An error of as little as one or two samples between the Left, Right and Centre channels can cause phasing and comb filtering for those listening in stereo.

Timing differences between audio tracks in each AES pair in an SDI group and between each group containing a single audio programme must be no more than 0.2 samples (i.e. the timing between each track of the six audio tracks of a surround signal.)

Note: This error has not been noticed on devices that treat audio as multi mono channel audio (e.g. NLEs).

2.5 Sound to Vision Synchronisation

The relative timing of sound to vision should not exhibit any perceptible error. Sound must not lead or lag the vision by more than 5ms.

2.5.1 Audio / Video sync markers

To assist in maintaining A/V sync through the post-production process, a ‘sync plop’ may be used. If the delivered programme leader contains one it must meet the following conditions:

- The sync plop must be between timecode 09:59:57:06 and 09:59:57:08
- The audio plop must be 1kHz tone on all tracks at -24dBFS (-18dBFS is acceptable for stereo programmes)
- The duration of the vision flash must be 2 frames to allow it to pass through standards conversion successfully
- The audio plop must be synchronous across all audio PCM audio tracks and with the video flash (within +/- 5 ms)

If an end sync plop is used it must be no closer than 10 seconds to the end of the programme and comply with the relevant points above.

2.6 Line-up tone downloads

A zip file of acceptable line up tones can be downloaded from the DPP website:
http://www.digitalproductionpartnership.co.uk/downloads/standards/
It contains:
Surround Programmes - BLITS -18dBfs
Stereo Programmes - EBU 1kHz, GLITS 1kHz, GLITS 2kHz