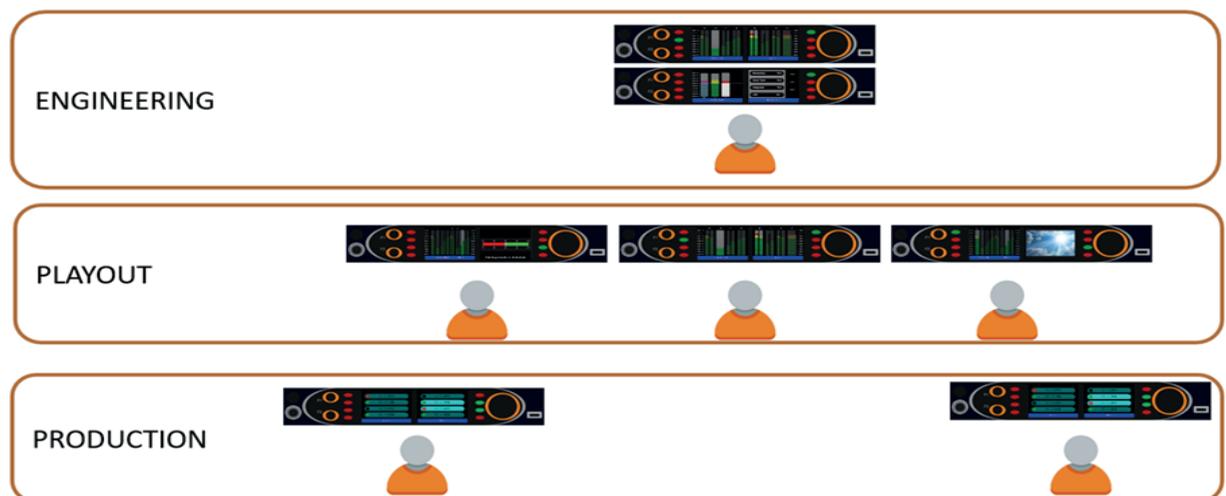# Measuring and Maintaining
Loudness Compliance

Loudness is the single biggest topic of viewer complaints, affecting everything from traditional broadcast through to OTT and podcasts.

Whether it's the difference between the loudest and quietest parts within a single programme, between multiple programmes that contribute to channel output or the differences experienced when switching between channels, viewers should expect a consistent and uniform audio experience without having to reach for the remote.

Loudness measurement specifications from the ITU (ITU-R Recommendation BS.1770) along with recommendations from the EBU (EBU R128) and ATSC (A/85) have been created to help address this challenge and provide consistency throughout the broadcast chain and ultimately to the viewer at home.

APPLICATION

Post Production

Short and long form content is increasingly subject to exacting broadcast delivery standards which stipulate target Loudness and True Peak values. Engineers need to ensure that these criteria are met and a loudness log can be created which can be used to validate the completed project.

In a typical post-production environment, audio sources may be transported as SDI, AES or MADI. In this environment the SAM-Q-SDI provides Momentary, Short-Term and Integrated Loudness measurements which are displayed using Loudness level meters and a numerical readout. This same Loudness data can also be monitored over an Ethernet network and logged for later reference, enabling the finished project to be checked for compliance and a record kept.

Maintaining Audio Fidelity using Loudness metering
One of the many benefits of the move away from peak metering to Loudness measurement has been a renewed emphasis on the skill of the sound engineer. To mix a live 5.1 programme or to create a surroundsoundtrack in post -production requires talent as well as artistic interpretation. It is therefore important that the integrity of the mix including crucial factors such as Downmix compatibility and dynamic range are maintained throughout the delivery process.

By supplementing the skills of the sound engineer with appropriate loudness metering at critical points throughout the chain, it is possible to dispense with ALC (Automatic Loudness Control) processors which often prove detrimental to the listeners' experience, and allow the consumer to experience the audio mix as intended.

Playout, Master Control and Transmission

Customer complaints about excessive loudness level may occur when commercials or programmes cause the viewer to continually adjust the volume on their television. Whether the culprit is a commercial which is perceived to be louder than everything else, a programme containing explosive effects or the transition between different programmes, it is important that the output of the TV channel is being monitored at Playout, Master Control or Transmission. As the last point in the broadcast chain before a programme is ultimately distributed and delivered to the home, it is now becoming increasingly important for the control room to be equipped with the necessary tools to ensure all content meets the relevant loudness specification in order to guarantee the quality of service viewers expect.

Far from being a traditional rackmount audio monitor, the SAM-Q can simultaneously analyse mono, stereo or surround audio formats whilst also providing Short-Term, Momentary and Integrated loudness data over an Ethernet network. The logging of such data can be reviewed in the event of customer complaints and helping to identify any remedial action required to improve an maintain quality of service. When serving engineering positions in a Playout, Master Control or Transmission Suite, the SAM-Q is an ideal accompaniment to exiting video and audio signal analysis tools and combined loudness logging can be used to maintain consistent channel performance.

A Phase Meter allows one audio source to be selected, monitored and checked for audio phase. The SAM-Q-SDI comes with a Phase Meter Mode as standard, which displays 16 Audio Level Meters + 1 Phase Meter.

Live Production

Although it can be impossible to anticipate the highs and lows within a live show or sporting event it is important that the Sound Engineer mixing the programme maintains target level across the duration of the production.

Equipped with the SAM-Q-SDI, audio engineers can periodically observe Loudness and True Peak readings, using loudness bar-graph and numerical displays. With its 8 independent loudness probes, the SAM-Q-SDI can measure and display the performance of a 5.1 audio mix and a 2.0 downmix simultaneously.

Whilst many mixing consoles are equipped with high resolution Audio channel meters, not all are capable of measuring loudness values or share those values over an Ethernet network for logging and display.

The SAM-Q-SDI is an ideal solution to loudness measurement and logging within a live broadcast production environment because it not only provides the sound engineer with a visual check of loudness performance but it also enables the loudness performance to be viewed remotely over an Ethernet network.

During and after production rehearsals for a TV Show or event, the loudness history can be reviewed and if appropriate any potential areas of concern identified, allowing the sound engineer to anticipate and adjust the audio mix accordingly, helping to ensure that target loudness values are being adhered to without compromising the production.

ENGINEERING EXCELLENCE

The SAM-Q-SDI includes a number of useful features designed specifically to help Systems Integrators and Broadcast Engineers during installation and maintenance.

Status Display

The SAM-Q-SDI reports signal status information, including SDI video format, MADI status and number of channels as well as AES and Ethernet status.
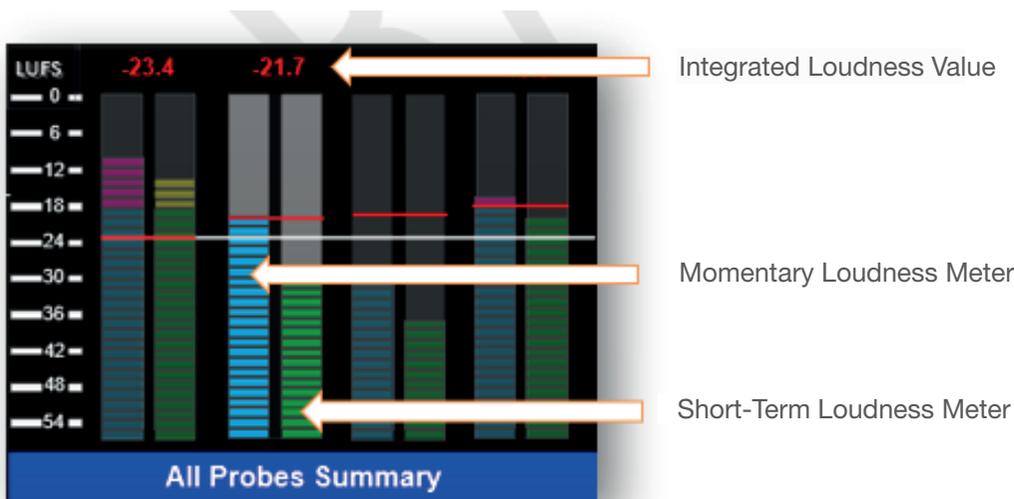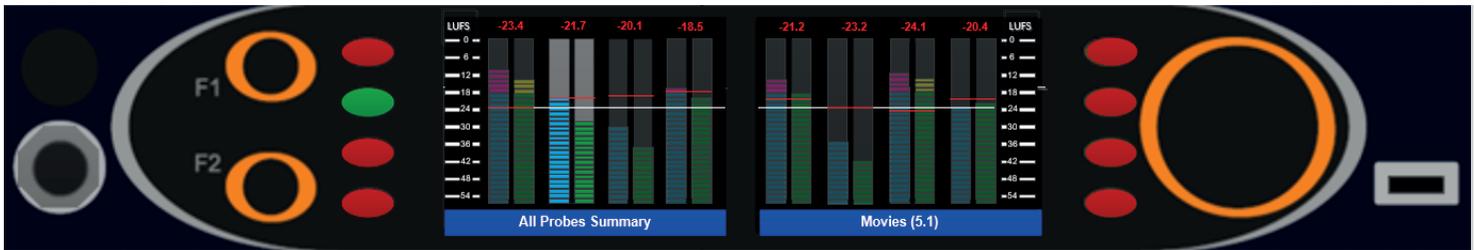
Phase Correlation

The SAM-Q features a phase correlation meter, allowing audio phase issues to be identified with ease. Audio phase can be deliberately reversed by the users allowing an audible phase check to be made also.

Loudness Displayed as you need it

The SAM-Q-SDI includes three dedicated displays, each of which have been designed to address a different loudness requirement.

Loudness Summary Mode

Loudness Summary Mode displays Short-Term, Momentary and Integrated loudness level meters from each of the 8 independent loudness probes simultaneously.

Integrated Loudness Value

Momentary Loudness Meter
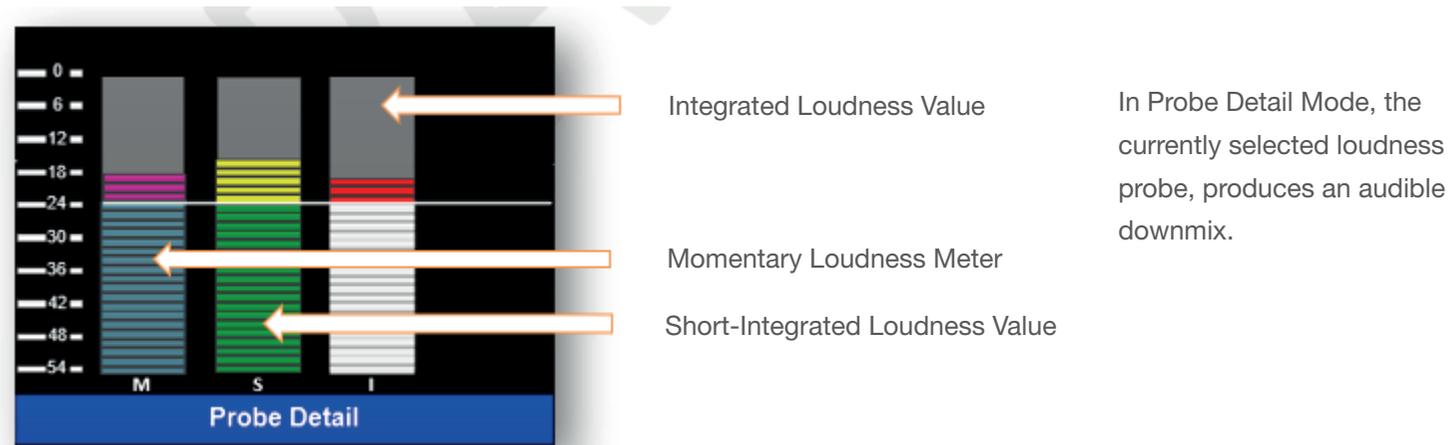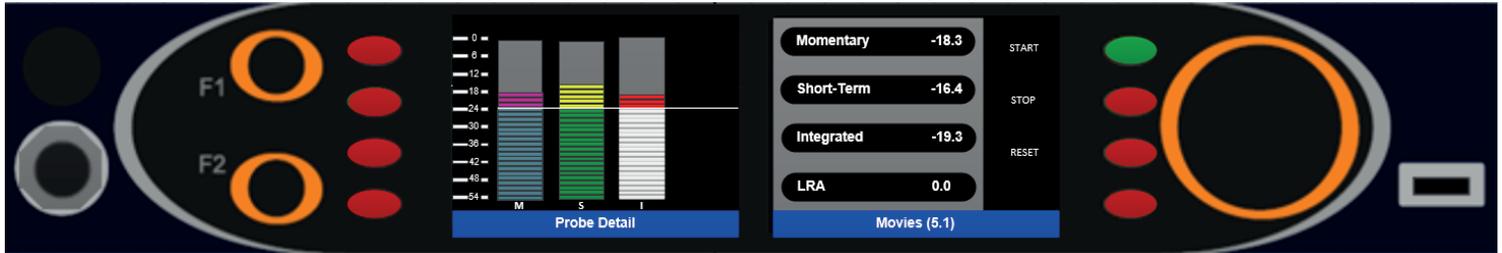
Short-Term Loudness Meter

The Loudness Target level can be adjusted and is displayed as a horizontal white line.

In Loudness Summary Mode, any probe can be selected for monitoring, producing an audible downmix.
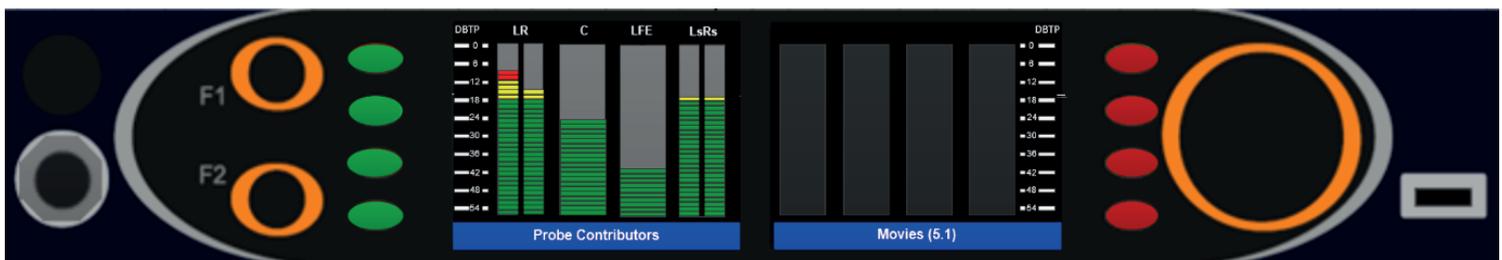
Probe Detail Mode

Probe Detail Mode displays the Short-Term, Momentary and Integrated Loudness values of any loudness probe as audio loudness meters and also as dedicated numerical displays.

Start, Stop and Reset buttons allow Integrated loudness measurements to be made for each commercial, programme or show.

Integrated Loudness Value

Momentary Loudness Meter

Short-Integrated Loudness Value

In Probe Detail Mode, the currently selected loudness probe, produces an audible downmix.

Probe Contributors Mode

Probe Contributors mode, displays all contributing audio channels being measured by the currently selected loudness probe using 'True Peak' audio level meters.
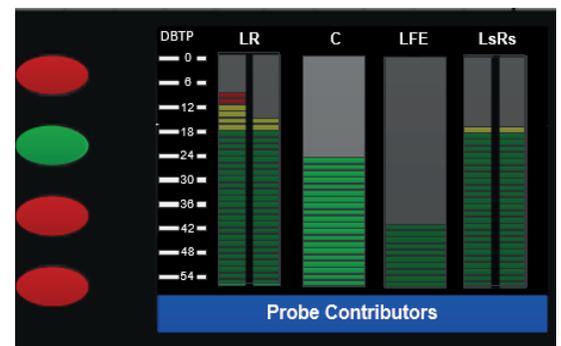

Loudeness Measurement for 2022-6 and 2110 Networks

With the adoption of IP infrastructures and standards such as ST-2022-6 an ST-2110, the PAM-IP provides loudness measurement, including a dedicated loudness histogram display.

Integrated loudness measurements can be Reset in accordance with each programme, commercial or show.

With the PAM-IP Dante/AES67 option, audio sent over Dante networks can also be measured for loudness.

Dolby sources can also be measured for loudness.

Whilst a downmic is made audible to the user, individual contributing channels can be selected or isolated as necessary (i.e. the Centre channel from a 5.1 program).

Set of Loudness specs

ATSC A/85

The US led ATSC A/85 was specifed by The Advanced Television Systems Committee in 2009 and applies solely to US broadcast digital television. A/85 introduced the ITU-R BS.1770 Loudnessalgorithm as a replacement for A-weighted measurements and proposed the use of a True-peak level

standard.

Ref: www.atsc.org

CALM ACT

In response to consumer complaints about loud commercials the CALM Act was enacted into law on Dec. 15, 2010, requiring the FCC to adopt the relevant portions of ATSC A/85. The FCC adopted new rules in Dec. 2011 requiring TV broadcasters, cable operators and other multichannel video programming distributors to be compliant by Dec.13, 2012.

EBU R128

In August 2010, the EBU published its Loudness Recommendation EBU R128. It tells how broadcasters can measure and normalise audio using Loudness meters instead of Peak Meters (PPMs) only, as has been common practice.

EBU R128 is the result of two years of intense work by the audio experts in the EBU PLOUD Group, led by Florian Camerer (ORF). The new Recommendation is accompanied by a Loudness Metering speci_cation (EBU Tech 3341), a Loudness Range descriptor (EBU Tech 3342), Loudness test material (various different sequences) Production Guidelines (EBU Tech 3343) and Distribution Guidelines (EBU Tech 3344). An EBU Technical Review Article describing the fundamental change in audio in broadcasting is also available from the EBU website: On the way to Loudness Nirvana.

-23 LUFS

EBU R128 recommends normalizing audio at -23 LUFS +/- 1 LU, measured with a relative gate at -10 LU. The metering approach can be used with virtually all material. To make sure meters from different manufacturers provide the same reading, EBU Tech 3341 speci_es the 'EBU Mode', which includes a Momentary (400 ms), Short term (3s) and Integrated (from start to stop) meter.

Ref. www.tech.ebu.ch/loudness