Application Note

Measuring & Maintaining Loudness Compliance

TSL Products

Loudness Conformity for Broadcast

Loudness measurement has become the de-facto metering format for Television broadcasters striving to deliver a consistent listening experience to the viewing public and for maintaining the quality of the sound throughout the broadcast chain.

With regulations and recommendations setting new guidelines for what are acceptable broadcast sound levels, it is imperative that content producers and TV broadcasters have the tools at hand to ensure that their programmes and commercial output remain compliant and the audio mix created by the sound engineer or editor is delivered fully intact.

Simple metering devices like PAM PiCo provide reassurance throughout the production chain that loudness levels are consistent and the addition of Loudness Logging enables key operators to maintain a database of 'show by show' loudness history as a definitive record of compliance. With PAM PiCo, unnecessary processing of audio during transmission can be avoided, preserving dynamic range and maintaining audio signal fidelity.

PAM PiCo Audio & Loudness Meter

PAM PiCo

www.tslproducts.com

Challenges

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

Post-Production

StarFish enables editors to 'see' the sound energy within their 5.1 mix

In a typical post production setup the PAM PiCo is connected via USB port to the Edit PC with SDI, AES or Analogue hooked up to a suitable monitoring connection (such as a breakout box or sound mixer). PiCo delivers a constant display of channel activity via the hi-resolution bargraph displays and when used for 5.1 productions, the StarFish display is an invaluable tool capable of indicating inter-channel phase coherence and energy patterns.

The Loudness Logging application runs alongside the Edit software and is typically activated when the Editor needs to check the compliance of a finished project and store the resultant record to a database or perhaps send a .pdf log to his/her client or producer as proof of compliance.

A typical Edit or Post-Production setup

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 develop a surround soundtrack in post production using a target Loudness value of -23LUFS or -24LKFS requires a degree of talent combined with artistic interpretation. It is therefore important that the integrity of the mix including crucial elements such as Downmix compatibility and dynamic range are maintained throughout the delivery process. By supplementing the skills of the sound engineer with the application of appropriate metering at critical points along the chain, it is possible to dispense with ALC (Automatic Loudness Control) processors which are often detrimental to the listeners' experience and allow the viewer to hear the mix as it was intended to be heard.

Loudness Modes

The PAM PiCo comprises two modes of Loudness measurement operation.

Capture Start Pause

Measurement is activated manually using the Start/Pause/Reset buttons at the bottom of the meter. This mode is useful when checking levels 'on the fly', when monitoring a channel output or applications like Ingest, QC, MCR and Lines rooms.

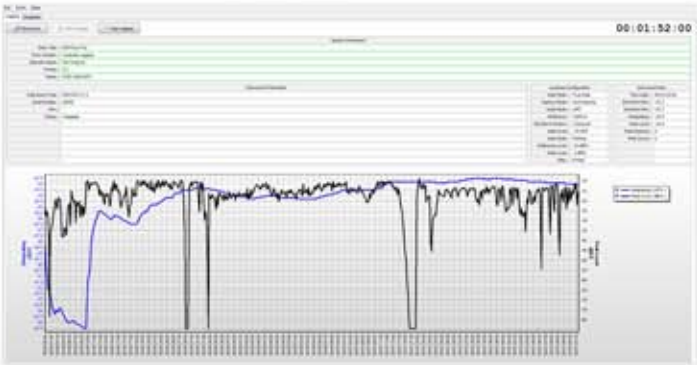
Capture Auto Start

Loudness measurement is triggered by the presence of incoming audio and is ideal for measuring the level of a completed project or work in progress during a Post production operation. When used in conjunction with Loudness Logging, Auto Start and the Logging Application are activated before the clip is played. Both the PiCo and the Logging software will commence measurement as soon as audio is present, once the clip is finished the resultant 'Integrated' Loudness figure, Histogram and other important criteria such as True Peak are recorded for the project giving a comprehensive record of compliance or as a means to identify problems to be rectified.

ATSC A/85

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

Ref: www.atsc.org



Loudness Logging enables key operators to maintain a database of Loudness history as a record of compliance and a visual aide during the production process

Measuring Loudness in a Playout or Transmission environment

Customer complaints about excessive loudness level may occur when advertisements or programmes cause the viewer to continually reach for the volume switch on their remote control. Whether the culprit is a commercial which is perceived to be louder than everything else, a TV show where a scene uses explosive effects or the transition between different programme genres causes offence, it is important that the output of the TV channel is monitored at Playout or Transmission. PAM PiCo is the ideal solution; an unobtrusive measurement device capable of analysing stereo or surround audio whilst maintaining a calculation of long-term loudness and simultaneously creating a log file which can be reviewed in the event of customer complaints so that 'infringements' can be identified and action taken.

The Playout or Transmission function in a broadcasting facility is the last point in the chain before a programme makes its way through whichever delivery mechanism to the home. As a result it is imperative that the control room is equipped with the necessary tools to ensure that the content meets final delivery criteria.

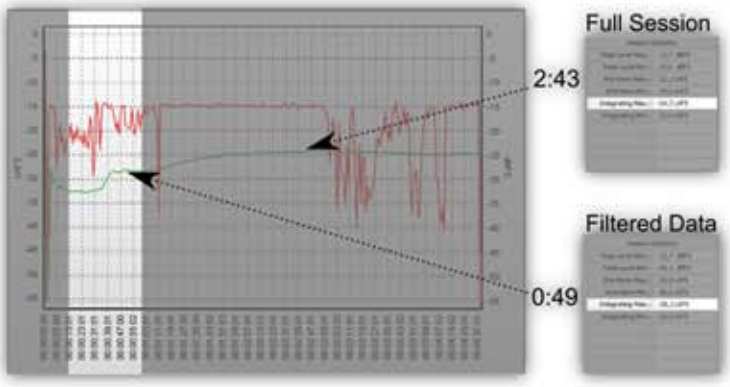
When used in a typical engineering position in a Playout or Transmission Suite the PAM PiCo is an ideal accompaniment to a video signal analysis tool and combined with the Logging Application can be used to maintain a consistent output loudness level as well as a means to identify when outgoing signals exceed defined loudness parameters.

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.

A typical Engineering position in Playout or Transmission

Isolate programmes or commercials within a long form histogram



Filtered data within the Logging Application

The data filter function of the Loudness Logging Application is used to isolate individual programmes or commercials within a long-form histogram. The operator enters the start/stop points of the content under analysis and the application calculates the loudness and peak readings for that area of waveform. A separate report can be created and stored within the logging database.

A good example of the use of the data filter would be to analyse a commercial which has been identified as excessively loud via a viewer complaint. By recalling the log file for that period of transmission the commercial break is identified, the filter applied and the loudness value for that advertisement calculated.

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.

Set of Loudness specs

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 specification (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.

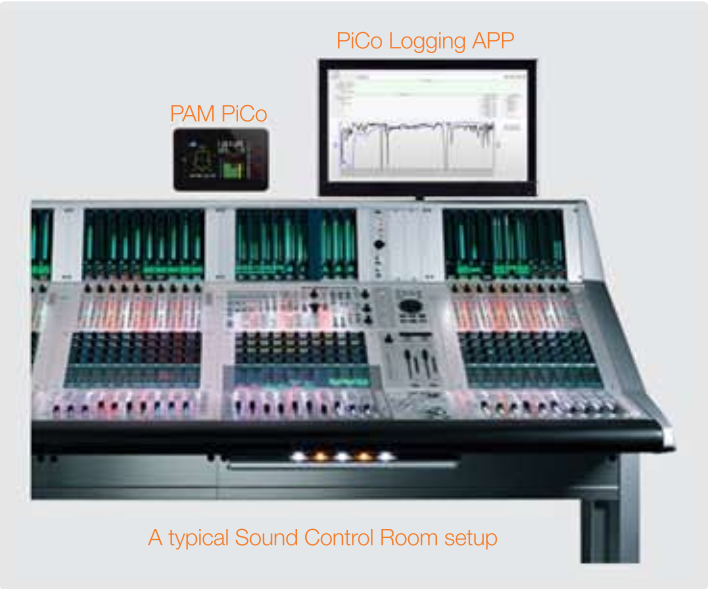
-23 LUFS

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 specifies 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

Live Production

Loudness levels in live TV Production may be subject to the same regulatory conditions imposed for commercials and server based playout. Although it can be impossible to anticipate the highs and lows within a live show or sports event it is important that the Sound Engineer mixing the programme tries to maintain target level across the duration of the production. The PAM PiCo can be mounted adjacent to the meter bridge of the mixing console enabling the audio engineer to periodically observe the Loudness and True Peak readings whilst benefitting from the range of bargraph and meter view options including moving coil emulation and the StarFish surround energy audio vector display.



A typical Sound Control Room setup

Many mixing consoles are equipped with high resolution channel meters but few are capable of measuring loudness values and none possess the facility to log loudness. PAM PiCo is an ideal solution to loudness measurement and logging within a live broadcast production environment because it can be installed unobtrusively and combined with the Logging Application enables the operator to maintain both a visual check of outgoing loudness and a graphical record of the audio peaks and loudness values.

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 so that the sound engineer can anticipate and adjust the mix accordingly to ensure that target loudness values adhered too without compromising the viewers' enjoyment of the production.

Using PAM PiCo as an Engineering Tool

PAM PiCo includes a number of useful features which may be used by Systems Integrators or Broadcast Engineers to help install and maintain their system infrastructure. From checking the integrity of SDI, AES and analogue cabling to verifying the technology linking workflow elements across the broadcast plant, PAM PiCo is a valuable addition to an Engineers Test and Measurement toolkit.

Signal Presence and Level

With up to 16 bargraphs visible at any one time and the ability to display SDI, AES and analogue level meters (depending on the model), PAM PiCo can be used as a highly specified, portable and affordable multi-format signal checker.

Eye Width

Range: 10% - 100%

All SDI capable PAM PiCo's feature the Eye Width Parameter as default feature. Inspired by cell phone reception indication, Eye Width expresses the immediate quality of the incoming SDI signal and allows you to constantly monitor this to avoid any drop outs and instabilities. It is also ideal for checking the integrity of SDI cabling infrastructure.

FFT Spectrum Analyser

The Fast Fourier Transform (FFT) spectrum analyser is primarily designed to display the audio spectrum of a given channel displayed by PiCo during production however a secondary role can be as a means to detect frequency response problems caused by infrastructure defects and equipment faults.

Phase Correlation

PAM PiCo features a number of functions designed to check signal phase correlation. Intended primarily as an aide to content producers such as mix engineers and editors, features such as the Vectorscope (Stereo content), StarFish or JellyFish (both 5.1) may be used to check for phase shift problems which may be caused by cabling errors or incorrectly configured or faulty equipment.

Video Confidence Check

Display incoming 3G SDI video at a glance, a feature unique to PAM PiCo Five.

TSL Products

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