Commercial Advertisement Loudness Mitigation (CALM) Act Summary of Best Practices

Introduction

The purpose of this document is to assist in establishing and maintaining consistent loudness across programs and commercials throughout the broadcast day for all audio services. There are FCC Regulations that apply, but this document is intended to be the practical guidance and a quick reference to the key issues for managing audio program loudness at various points in the broadcast chain. It is not intended to supplant ATSC A/85[1], but to remind those responsible for the control of audio loudness of important aspects of measuring and monitoring loudness as outlined in ATSC A/85. It is the responsibility of the reader to become familiar with A/85 in order to most effectively manage audio loudness and understand the methods of loudness measurement and correction.

1. Loudness monitoring using ITU-R BS.1770 versus PPM or VU metering

Stations must use BS.1770 meters as described in A/85 at every location where loudness needs to be measured, including production, ingest, and transmission areas.[2]

The most significant change for those involved in the management of audio loudness is the new paradigm of utilizing a time averaged loudness measurement. As described in A/85, ITU-R BS.1770 defines the loudness algorithms used to measure the perceived loudness of program material. Although many are familiar with using PPM and VU meters, these meters provide poor correlation to what a listener perceives as loudness. These meters were primarily intended to protect downstream equipment from overload and clipping. BS.1770 provides a frequency weighted, sliding window, time averaged measurement intended to model human loudness perception and is <u>not</u> intended as an instantaneous measurement such as provided by a PPM or VU meter. BS.1770 also provides a true peak reading to monitor and prevent downstream overload. BS.1770 meters report the measurement of loudness in terms of units of LKFS, which is a decibel scale.

Loudness must be measured for all forms of a program's audio delivery to listeners, e.g., 5.1-channel surround, stereo downmix, and monaural sum.[3] The loudness of ancillary audio services such as video description or alternative language versions must also be measured.

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[1] ATSC Recommended Practice A/85 "Recommended Practice: Techniques for Establishing and Controlling Audio Loudness for Digital Television" http://www.atsc.org/cms/standards/a_85-2011a.pdf.
[2] *Italics* are used to highlight recommendations.
[3] Certain production mixing techniques can result in significant loudness differences between these listening modes. See ATSC A/85 for further details.

2. Measuring the loudness of commercials, promos, or programs

A/85 provides guidance on measuring the loudness of short form and long form content. Short form content includes, among others, commercials, political ads, PSAs and promos.

For short-form content, A/85 recommends that the average loudness of the full mix be measured over the entire length of the item.

For long-form content, A/85 recommends identifying and measuring the anchor element during audio mixing and ingest. The anchor element is usually dialog, which the listener would tend to focus on when setting the volume control. The loudness of the anchor element would be reported as the loudness value of the program for a properly mixed program.

Large loudness changes from the segment average should be avoided near program boundaries when possible. Short-form content within acceptable limits may have the perception of being loud, when contrasted with quiet content entering or exiting programs.

This potential issue should be addressed with program acceptance specifications, as well as in best practices when dealing with locally produced programs.

Note: For a summary of a technical study about reaction to changes in loudness see Annex E in A/85. It showed that subjects turned the volume down when there was a mean increase in loudness of 5.6 dB.

3. The AC-3 metadata parameter, dialnorm

In the AC-3 audio encoder, there is a metadata setting called dialog level or dialnorm. Dialnorm can be set to a value ranging from 1 to 31. The measured average loudness of the audio must match the magnitude of the dialnorm parameter setting in the AC-3 audio encoder.

The simplest method for dealing with the dialnorm parameter (and the method least likely to cause additional loudness problems) is to set all audio at a fixed target loudness and with a single encoder setting (so-called fixed dialnorm). A/85 recommends a target loudness of -24 LKFS for stations wishing to use a fixed dialnorm value. (Note stations can choose to operate at a different fixed target.) To operate at the -24 fixed loudness, the dialnorm parameter must be set to 24 in the AC-3 encoder and the audio input managed to match the average loudness of -24 LKFS.

For stations that do not adopt a fixed target loudness (which is not recommended) the dialnorm value must always match the actual average audio loudness of each program and each commercial. As each program (or short form item) changes in average loudness over its total length, the corresponding dialnorm setting in the AC-3 encoder *must* be changed to match. Failure to do so will aggravate audio loudness problems.

Most major networks have chosen to operate with a fixed target loudness of -24 LKFS, as recommended by A/85. If the station adopts a fixed loudness of -24 LKFS, dialnorm can be fixed at 24 without change for all the content that is delivered at -24 LKFS. For

stations that choose to operate without a fixed target loudness (and therefore choose an agile dialnorm setting), workflow is considerably more complex. In this case, audio loudness still needs to be determined and dialnorm metadata must also be managed to match loudness of all content. Refer to A/85 for guidance before attempting an agile dialnorm operation.

4. Guidance on loudness certification, program/commercial delivery specifications and loudness correction

Where possible, the station should request a certification of compliance with A/85 from their network or program syndicator. This certification is an assurance that the loudness of embedded commercials is the same as the program. As mentioned previously, most networks have adopted a fixed loudness target of -24 LKFS, which is a good reason for the station to adopt the same fixed target loudness of -24 LKFS, as recommended by A/85. It is recommended that the station provide a program and commercial delivery specification to their program and commercial suppliers specifying a target loudness that matches what the station adopts if it is using fixed target loudness for its operation.

If the average loudness of any short form content item is measured with a difference of more than +/- 2dB from the specified target loudness value of the station, the average loudness of this content should be adjusted to match the target value by the difference, in units of dB.

If the station measures a difference of more than +/- 2dB from the target loudness for long form programming, it is recommended that the program provider re-issue the content or be consulted prior to correction by the station, if time-to-air permits.

5. Loudness control via inline automatic controllers

While the main effort of the station should be to manage the content so as to avoid loudness complaints through use of proper measurement, mixing and adjustment; it is recognized that perfection is not possible. Stations wishing to install inline audio loudness processing at the end of the audio chain preceding the AC-3 encoder as safety measure are advised that this type of loudness processing is not a replacement for good loudness monitoring techniques, measurement and adjustment. Such processors may not be audibly transparent and cannot be expected to yield results with the accuracy of other loudness control techniques. Stations are strongly advised to insure the controller uses the BS.1770 measurement algorithm, and the compression settings are set as 'light' as possible.
As different equipment can react differently, it is strongly advised that the settings applicable for your operations be determined with guidance from the manufacturer.

6. Loudness control via file delivery methods

A large portion of station long and short form content is now delivered as a file.

It is recommended that files be checked after receipt using a commercially available product such as a file-based transcoder incorporating the ITU-R BS.1770 measurement algorithm. Care should be exercised when using one of these products as most are limited to measurement and adjustment of the duration of the content's full program mix only, and therefore, per A/85, limited to use on short-form content. Once measured, should any loudness offset from the entered target value be identified, these products make a one-time loudness shift to all elements of the content to match the desired target. There is no alteration to dynamic range and quality of the content. Excellent loudness matching of short-form content loudness can be expected with this technique.

Note: Using one of these products for long form content should be avoided. Automated checking of the entire file after delivery might not result in a close match to an anchor element value, especially when using the 'gated' measurement mode on long form content. Isolation of the anchor element, ideally used for long form creation and loudness measurement, may not be available in these commercial products.

When an apparent variance is found in long form content, it is recommended that the content be rejected and reissued.