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Recommendations for Spot Check Loudness Measurements

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1.0 INFORMATIVE REFERENCES

The following reference document contains information that may be helpful in applying this Recommended Practice.

1.1 Standards from other Organizations

[1] A/85:2013, Techniques for Establishing and Maintaining Audio Loudness for Digital Television, Advanced Television Systems Committee, 12 March 2013.

[2] SCTE 35 2017, Digital Program Insertion Cueing Message for Cable

2.0 COMPLIANCE NOTATION

“SHOULD”	This word or the adjective “RECOMMENDED” means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
“SHOULD NOT”	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
“MAY”	This word or the adjective “OPTIONAL” means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

3.0 INTRODUCTION

As part of managing the relative audio loudness of content, this document provides recommendations for measuring content carried in a single programming channel of a program network for 24-hours with an audio loudness meter consistent with the measurement techniques discussed in A/85 [1] as well as recording the measured loudness and loudness metadata value¹.

The document also recommends some approaches for interpretation of the measurement data and for actions to be taken.

¹ Throughout this document, in all references to loudness metadata, for content encoded without metadata, the fixed target loudness for the channel should be used.

4.0 MEASUREMENT BASIS

Loudness measurements for spot checks should be made using the principles of ATSC RP A/85 and the ITU-R Rec. BS.1770 algorithm, as further specified below.

The spot check should be conducted after the signal has passed through the operator's processing equipment. The monitoring point should therefore be after any equipment in the distribution path that is designed to alter the loudness of the audio stream. For this procedure, access is required to the audio content as encoded for distribution to the consumer and also to any accompanying loudness metadata (**dialnorm** if AC-3).

Input to the loudness measurement device should be either:

1. A compressed audio (AC-3 or other codec) bitstream as encoded for distribution to the consumer;
2. A transport stream for the cable service, which includes the compressed audio (AC-3 or other codec) bitstream; or,
3. Taken from the un-decoded compressed audio (AC-3 or other codec) output of a cable set-top box.

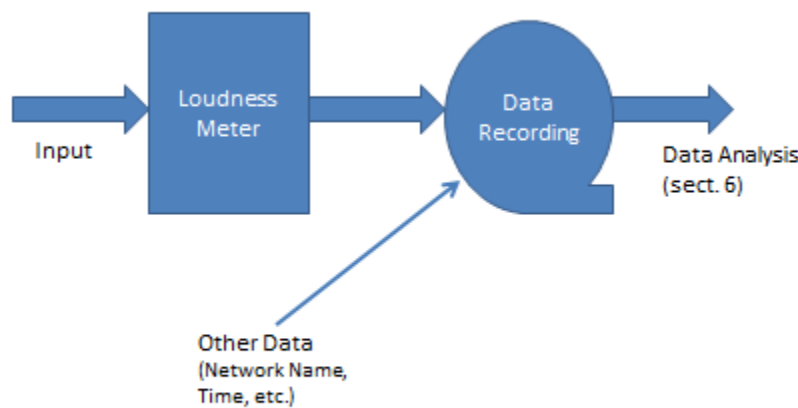


Figure 1: High-level measurement equipment configuration

Figure 1 shows a high-level block diagram for the recommended setup of measurement equipment used in this procedure.

5.0 TEST PROCEDURE

1. Follow the manufacturers' recommendations prior to the commencement of testing.
2. Record the make, model number and software version of each unit of test equipment used for the test.
3. Record identifying information on the content source and the date and time measurements commence.
 - a. If content is recorded for later measurement, log the date and time recordings commence. At time of later measurement, log the offset between recording time and measurement time.
4. Set the loudness measurement integration time to 1 second, 400 ms or 100 ms if available equipment supports any of these modes. If not then set to the most preferred sliding window average integration time available according to Table 1 ².
5. Log the measured loudness, the loudness metadata value (**dialnorm** if AC-3), and the date and time of day of each logging period according to Table 1.
6. Continue the log for 24 continuous hours. If content is not available for 24 continuous hours, continue logging measurements as content is available until 24 hours of content measurements are recorded. The minimum number of valid entries should equal 86,400.

Order of Preference	Integration Time	Logging Period	# of Log Entries
1	100 ms	100 ms	864,000
	400 ms	400 ms	216,000
	1 s	1 s	86,400
2	3 s	1 s	86,400
3	10 s	1 s	86,400

Table 1: Measurement Modes

² The longer the integration time used for measurements, the greater the imprecision and uncertainty that may be introduced in subsequent analysis of the data.

6.0 DATA ANALYSIS

In general, the operator is able to monitor and log loudness measurements of 24 hours of continuous programming but may not know which portions are commercials and which portions are long form programming. Consequently, the operator should analyze the logged results to determine if there are any periods of content which potentially are non-compliant with A/85 [1], then determine whether those periods occurred during a commercials. The steps are as follows:

1. Compare each recorded measured loudness value for the 24-hour period with the transmitted dialnorm recorded for that measurement.
2. Process the data to determine if a collection of measurements, taken together indicate there was a significant period (i.e., comparable to lengths of the commercials in the source) where the loudness exceeded the loudness metadata value (**dialnorm** for AC-3). The processing method is expected to vary by entity and to evolve with experience, hence none is recommended. Techniques may include averaging, voting, volatility analysis, sample processing, or others.
3. If a period of measured loudness exceeds the dialnorm value for a significant period by more than the criteria³ defined by the operator, note this as a potential discrepancy by a commercial and note the magnitude, time and duration of the apparent excess loudness. Such discrepancies may be legitimate over short periods for all content and may occur over longer periods for some forms of long form programming, but are an indication of a potential loudness discrepancy of a commercial.
4. Identify whether the potential discrepancy occurred during a commercial (see Section 7).

³ The criterion determined by the measuring entity should take into account the Comfort Zone and measurement tolerance, with a goal of minimizing both “false positives” and “false negatives.” The Comfort Zone (See A/85 [1], Annex E), the range of loudness variance beyond which the viewer is likely to adjust the volume, is a tolerance that has been found to be in the range of 5 to 6 dB. Measurement tolerance at the programming source and at the spot check might each contribute 2 dB of uncertainty. False positives might be due to assertions of excessive loudness that do not fall within commercials, or a pessimistic accumulation of tolerances. On the other hand, an optimistic accumulation of tolerances might result in ignoring a commercial with excessive loudness, a “false negative.”

7.0 IDENTIFICATION AND LOCATION OF COMMERCIALS

Operators should adopt a method for determining whether periods of discrepancy between measured loudness and the loudness metadata value (**dialnorm** for AC-3) occurred during short form programming (commercials/promotions). Some methods for determining whether the discrepancy occurred during a commercial or promotional spot might be:

- Request a program log from the programmer, and compare the times of the discrepancy with the program log
- Create a program log by using SCTE 35 messages (recognizing that not all commercials are signaled with SCTE 35 messages), and compare the times of the discrepancy with the program log
- Record thumbnail video at the same time that the loudness measurements are being made, and then manually review the video frames that were captured at the times of loudness discrepancy
- Use Automatic Content Recognition to determine the content of the program at the time of loudness discrepancy

8.0 ACTION TO BE TAKEN

Operators should develop a criterion for the duration and magnitude of discrepancy between loudness and the loudness metadata value (**dialnorm** for AC-3), or other criterion, that triggers a formal contact with the program network in case such notification is warranted by any non-compliance with A/85 [1] for commercials or promotional content governed by spot check regulations.

In some circumstances, it may be necessary to carry out further tests over the duration of the specific commercial to determine whether or not the commercial complied with A/85 [1].

In general, discrepancies above an operator-defined criterion should be addressed via a technical discussion with the program network.