

ATSC A/85 RP on Audio Loudness

Effect on Program and Commercial Production

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Why Loudness??

- Human perception of audio level is complex and is influenced not just by the sound pressure level but the spectral frequency as well as the cadence (duty cycle) of the program.
- However there are absolutes in terms of minimum sound levels and maximum sound levels
- Loudness is the quality of a sound program that represent the overall perception of level, that incorporates all the characteristics of the sound program
- Loudness is subjective and thus is not simple to quantify.
- Loudness is dependent on many factors including the sonic environment.

Objective Measure of Loudness

- There have been many attempts to measure loudness:
 - CBS Labs Loudness Meter
 - LeqA
 - LKFS (BS 1770)
- ITU Rec BS 1770 has adopted a method, dubbed LKFS, which has been shown by subjective testing to come closest to the subjective evaluation by humans of loudness.
- We reference LKFS from 0dB FS. It is a frequency weighted power average of the audio program, averaged over the whole program. In multi-channel programs, the power sum of all channels is usually specified.

So why now?

- Viewers of digital television have noted that the audio volume between programs and commercials (and from channel to channel) are not consistent and that **COMMERCIALS ARE TOO LOUD!!!**
- The ATSC started a specialist group about 3 yrs ago to investigate and recommend how to mitigate this problem.
- Last year the US Congress passed the CALM act, that authorized the FCC to write rules to govern loudness of TV programs and commercials. They specifically called out the work of the ATSC.
- The ATSC published their Recommended Practice (A/85) on “Techniques for Establishing and Maintaining Audio Loudness for Digital Television”, Nov 2009.

How will this impact production?

- Establishes a common method to measure loudness (BS 1770/LKFS).
- Provides guidelines to mixers in terms of how to meet a 'target' loudness level overall, without dictating or limiting the creative sound mixing process.
- Suggest proper mixing environment and reference monitor levels.

Small Mix Room

- A/85 Recommend Practices describes (5) types of sound mixing environments:
 - Type I,II. Room sizes from 1500 ft³ to 20,000 ft³ or larger.
 - Type III. Typical edit room
 - Type IV. Rooms less than 1500 ft³
 - Type V. Headphones
- SPL levels for monitoring shall conform to:

>20,000 ft ³ :	85dB SPL
10,000 - 20,000 ft ³ :	82dB SPL
5,000-10,000 ft ³ :	80dB SPL
1,500-5,000 ft ³ :	78dB SPL
<1,500 ft ³ :	76dB SPL
Headphones:	74dB ref 440kHz and 2cc coupler

Important:
verify mix on small speakers,

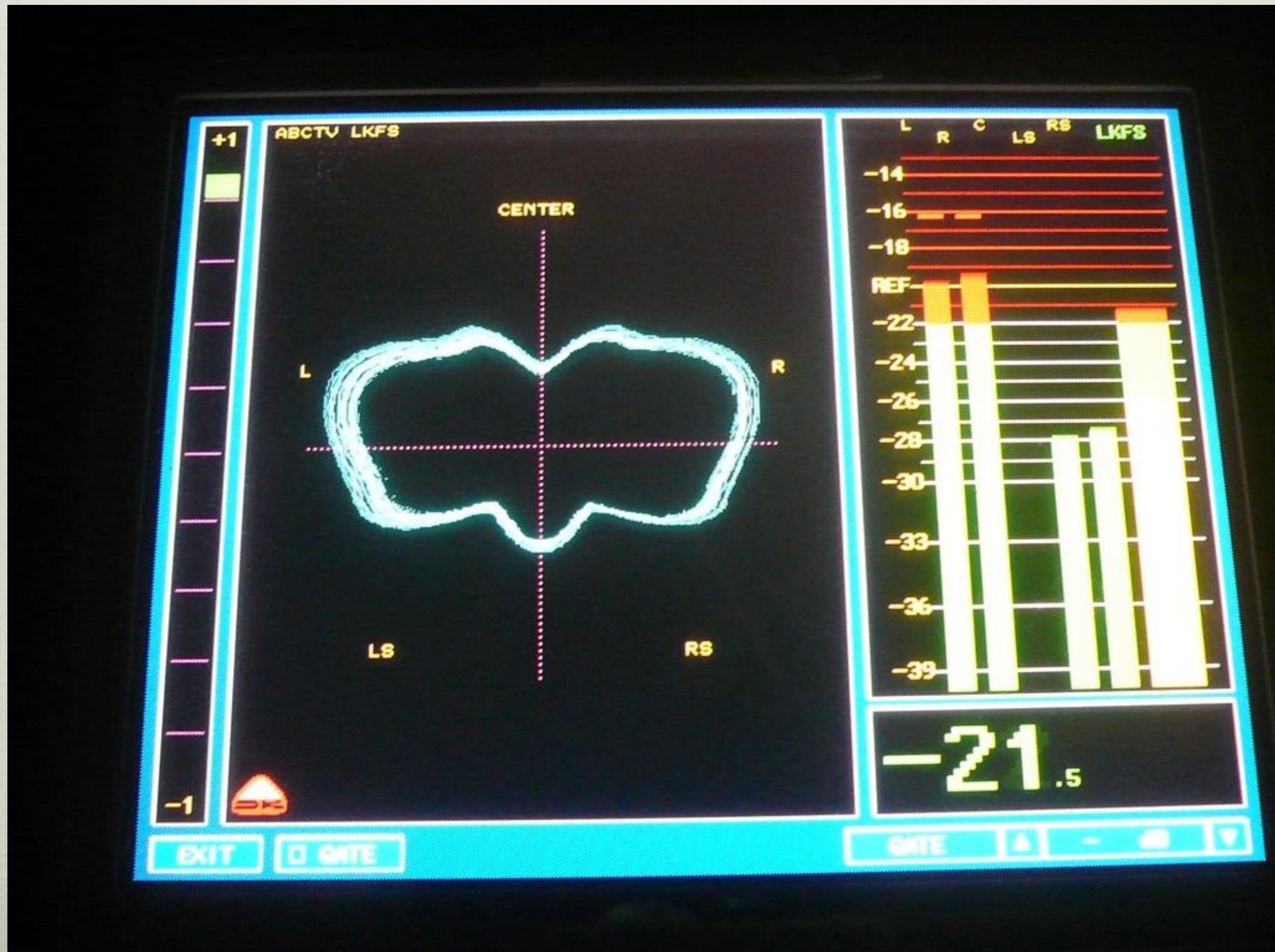
stereo and mono downmix

- While the 5.1 surround mix is important, is it vital to check the mix on a small stereo or mono speaker system, using appropriate downmix parameters.
- Also important to recognize that while the full 5.1 mix dynamics work in surround, strong surround channels can overload the center dialog track.

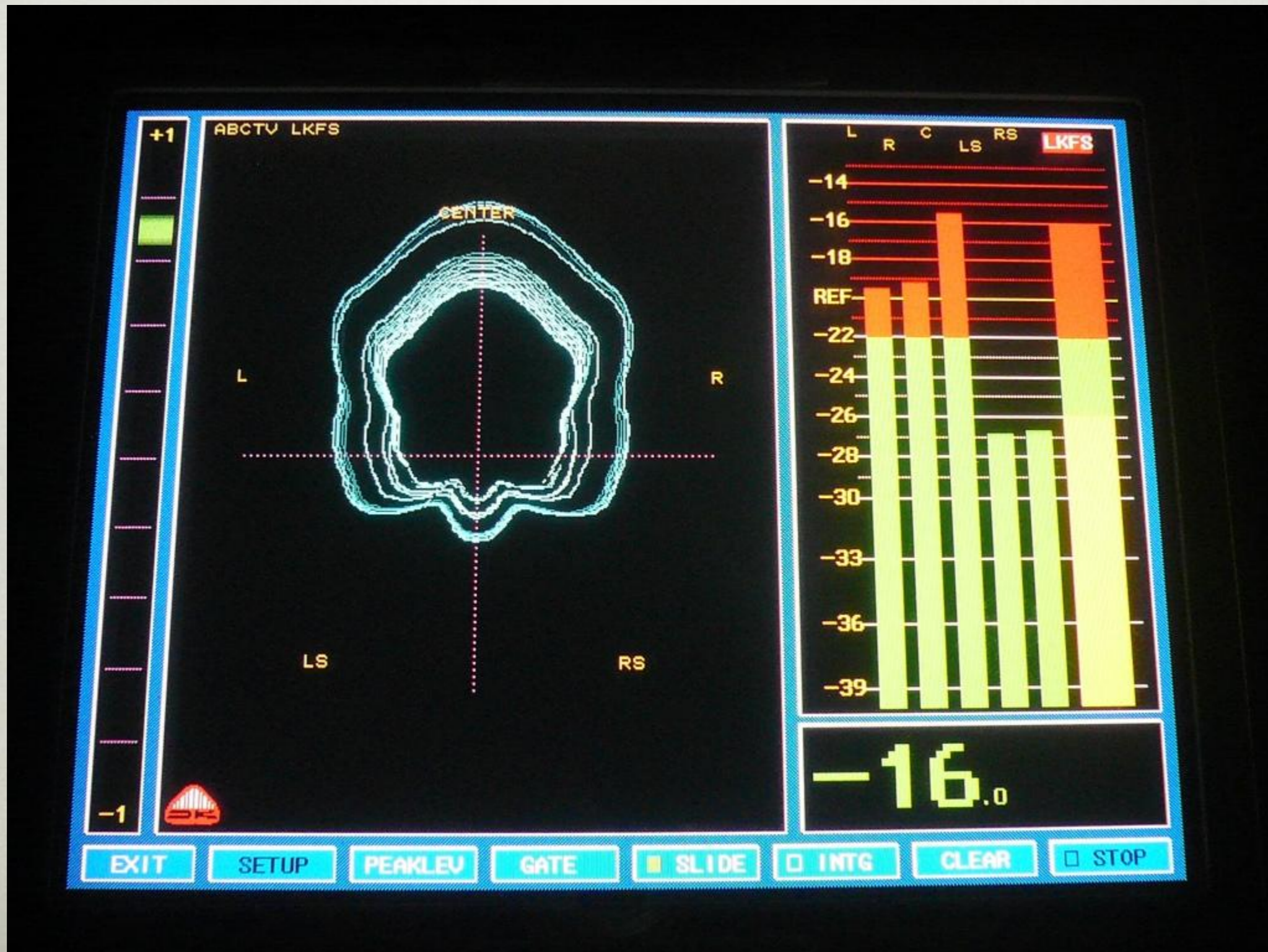
Strong Center Mix



Weak Center Mix



Dialog across all Front Channels



How to meet a Target Loudness Value?

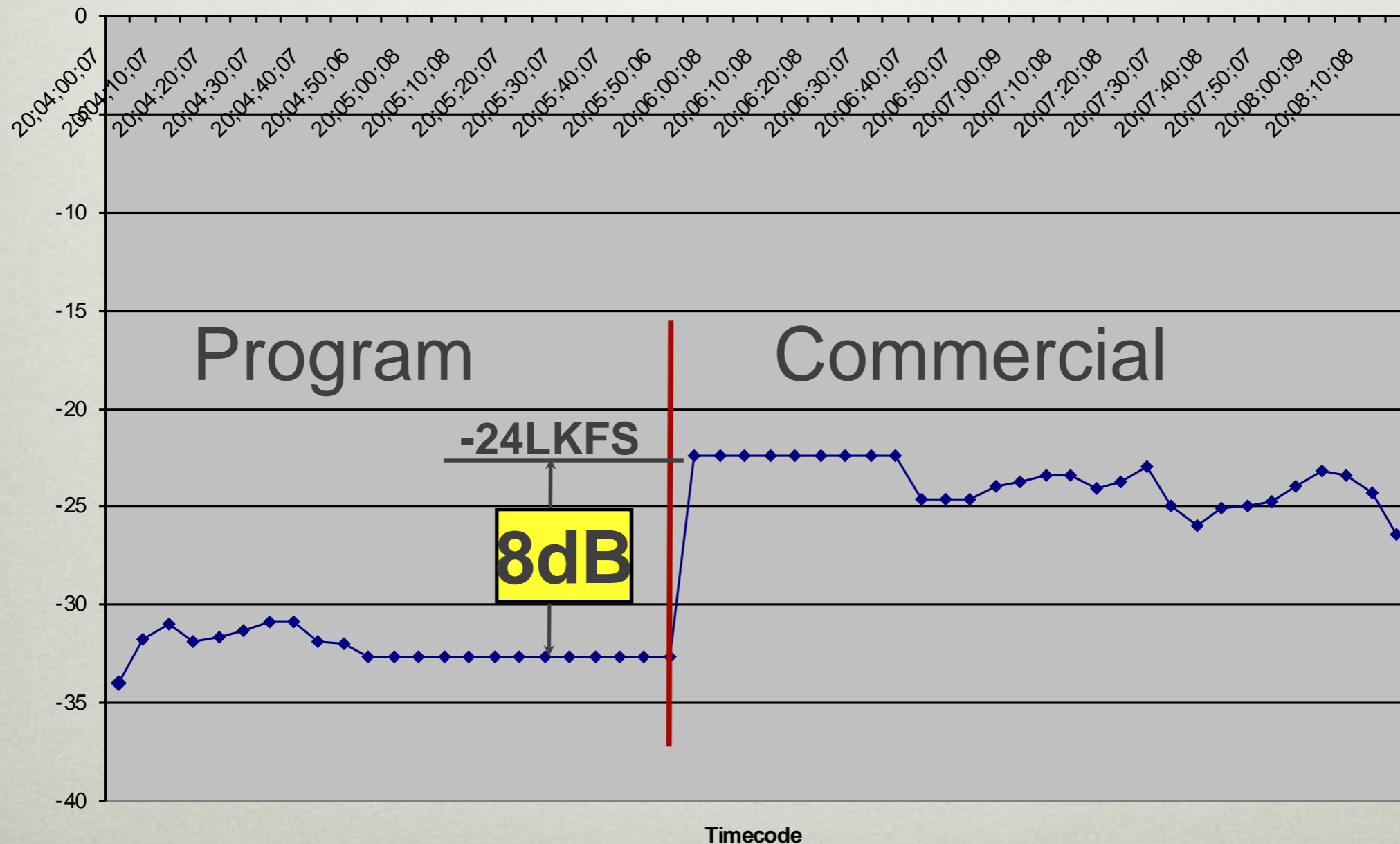
- A85 has the following guidance:
long form content:
Measure the long form content audio when typical dialog is present and record this value as the Dialog Level of the content.
short form content:
Measure the loudness of all audio channels and all elements of the soundtrack integrated over the duration of the short form content.
- Use a qualified BS 1770 meter with LKFS to measure the dialog level/overall loudness.
- Live audio mixing. Mixer should use a BS 1770 meter to set the 'anchor' element of the mix (typically dialog) to the target value and then mix the other elements to achieve an overall pleasing sonic balance. Care should be taken when the anchor element is not present to ignore the short term loudness measurement.

Boundary Problem

- The loudness measurement is made either on an anchor element or a sum over the whole program or act, with one number reported as the dial_norm value.
- However during some portions, the anchor/dialog level may drop below the target value. This is fine if part of the overall artistic intent.
- But if this occurs at the beginning or end of an act, adjacent to interstitial materials, then there maybe a large loudness discontinuity across the boundary from program to commercial, even if the commercial has been 'normalized' to the target dialog level

Example of Boundary Issue

TV program (1 min before 1st Comm)
1st Commercial: 20:05:32:14 - 20:08:17:17



Recommendations

- Use BS 1770 Loudness measurements to meet a target loudness level for mix.
- The 'Golden Rule': Make sure that the dialog level matches the target dial_norm value specified by the Network.
- Measure the anchor element or overall level, all channels (except LFE)
- Make sure that the mixing environment is suitable for TV and that the mixing monitor levels are set correctly
- Check the downmix!
- Make sure the Center channel is not overloaded by the surround channels
- Insure that the loudness of the program near the boundary of program/commercials is within the 'comfort zone' of loudness change.