Broadcast Loudness Issues:  
The Comprehensive Dolby Approach  

Loudness-level inconsistencies rank among the most pervasive problems in the broadcast industry. Differences in loudness within programs, between programs on the same channel, and between channels seriously annoy viewers and are a leading cause of consumer complaints.

These consumer complaints have made loudness level control an important issue for broadcasters to correct. In the US and many other countries, recommendations or regulations have been created that require these inconsistencies to be addressed.¹

*Dolby can help you end those complaints and ensure compatibility with legal and other regulatory requirements. We have unique and effective solutions that address the whole range of loudness problems.*
Loudness Inconsistencies: Multiple Causes

Loudness problems can arise when content is created or at nearly any point in the broadcast delivery chain. Programs originate from various sources, and not all content creators know about or use the professional tools available for properly setting loudness levels. Quantifying and managing loudness across many sources often challenges broadcasters and operators throughout the chain.

Further complicating the problem is the fact that loudness differences have proven difficult to measure with conventional methods and equipment. Traditional VU or PPM indicators are not designed to measure loudness, and broadcasters and operators frequently interpret their readings differently. Often there is limited correlation between how a signal measures and how its loudness is actually perceived by listeners.

The Consequences

Sudden increases or decreases in volume degrade the experience for viewers. Even minor differences can find them reaching for the remote and possibly changing more than the volume. With the growing number of available content sources—more choices of providers, more channels, video-on-demand services, interactive packaged media, and over-the-top services (video delivered over broadband Internet connections)—improving the listening experience becomes increasingly important in order to retain viewers. Correcting loudness problems is a vital part of this improvement.

Dolby’s Range of Solutions

Just as unwanted loudness variations have no single cause, no single solution will apply to all situations. Approaches to the problem fall into several general categories, including metadata, measurement, analysis and correction, and consumer-end leveling. All of these can be effective but none is the “magic bullet” that will provide an optimum solution to every situation. Dolby has been at the forefront of research into loudness problems and in developing innovative solutions to overcome them. Whatever the cause of a loudness problem, we have an effective solution. Further, our solutions can work together to ensure the best possible viewer experience.

Metadata

At the transmission end, our broadcast formats—Dolby Digital Plus, Dolby Digital, and the Dolby implementations of HE AAC—all include metadata that can be used to normalize loudness across programs and channels, and provide flexible control of a program’s dynamic range. Metadata gives broadcasters and operators a high level of control over final replay, assuring a high-quality listening experience. End users are provided with consistent loudness, and those with full-featured decoders can also choose listening modes that provide metadata-driven dynamic range adjustments requiring no additional (and costly) dynamics processing at the broadcast transmission point. Metadata can be set in transmission, using presets to suit the content genre and station style or, for maximum flexibility, can be optimized per program using manual or automated techniques.
**Measurement**

Whether you’re making content in line with a loudness delivery specification, or using the full flexibility of metadata to control loudness on replay, having tools for accurate measurement of program loudness is key. Dolby has developed a wide variety of tools to measure program loudness, both during production and once encoded into Dolby formats. Loudness measurement tools from Dolby and our partners support a range of international standards, including ITU-R BS.1770-1, ATSC A/85, and EBU R128.

**The Importance of Dialogue**

Research has demonstrated that viewers judge loudness by the level of the anchor element, typically dialogue, in the mix. Overall, they are looking to achieve consistency of dialogue level from program to program. In fact, ATSC Recommendation A/85 and some other international specifications specifically call for loudness to be measured and controlled based on a measurement of dialogue or other anchor element.

Fortunately, Dolby has created an automatic and repeatable technology for measurement of the dialogue level in broadcast programming. Dialogue Intelligence™ was first introduced in the groundbreaking Dolby LM100 Broadcast Loudness Meter, and is now available in tools both from Dolby and from partner manufacturers. The patented Dialogue Intelligence algorithm, coupled with the ITU-R BS.1770-1 algorithm, analyzes the input signal and only measures during the presence of speech, objectively quantifying what listeners subjectively hear and following the principles recommended by ATSC and other technical organizations.

**Dolby LM100 Broadcast Loudness Meter**

The Dolby LM100 Broadcast Loudness Meter accurately measures program loudness using optional Dialogue Intelligence and presents results in an easy-to-read numerical format. The LM100 also incorporates extensive logging functions to help track and pinpoint problems.

**Dolby Media Meter 2**

Our software tool, Dolby Media Meter 2, also employs Dialogue Intelligence, coupled with the ITU-R BS.1770-1 algorithm. The software is available for both Mac® and Windows® platforms and can be used as a stand-alone program or as a plug-in supporting either real-time or file-based measurement on audio workstations. It offers complete logging functions as well.

**Dolby Media Emulator**

The Dolby Media Emulator simplifies the creation of soundtracks to meet existing metadata delivery specifications or to author program-specific metadata. With integration into major audio workstations, it enables content creators to ensure that delivery specifications are met and to easily monitor how the audio will sound in different consumer replay environments. As part of the creation of Dolby metadata, the software can measure the loudness level of the audio and use this for the Dialogue Normalization parameter.

**Dolby DP568 Professional Reference Decoder**

The Dolby DP568 Professional Reference Decoder helps broadcasters ensure that viewers at home will enjoy the highest quality audio. It also provides broadcasters with monitoring capabilities for emulating set-top box behavior in the QC environment. The DP568 shares many of the loudness measurement and logging features of the Dolby LM100 and Dolby Media Meter.

Together, the Dolby loudness solutions provide practical and highly effective loudness control from content creation through the home listening experience. In combination, the Dolby solutions ensure that viewers can set their volume controls once—and then leave them alone.
Analysis and Correction

File-based workflows and their attendant automation bring new control issues, but also provide new opportunities for improving program quality.

Dolby DP600 Program Optimizer

The Dolby DP600 Program Optimizer is an innovative audio platform that provides a file-based workflow solution for loudness correction, audio conversion, and upmixing. The DP600 expands on Dolby's Dialogue Intelligence technology to normalize the loudness of audio programs while preserving their original dynamic range. The DP600 analyzes the loudness of file-based audio bitstreams coded in all Dolby broadcast formats, and validates and corrects the Dialogue Normalization metadata parameter without decoding and reencoding. The DP600 also works with content that isn't coded with Dolby technologies, providing intelligent, speech-based loudness normalization for PCM, MPEG-1 LII, and HE AAC.

Consumer-End Volume Leveling

No matter how effective the various approaches are, the simple fact is that some programs will still reach the consumer without any loudness control or correction. Content from sources such as gaming consoles, PCs, or portable media players is also unlikely to match the loudness levels of broadcast content. A volume-leveling solution built into consumer equipment can catch these programs and smooth out any volume differences.

Dolby Volume

Dolby Volume complements the Dolby metadata applications in providing an overall solution for controlling loudness over a wide range of consumer media formats, addressing loudness variations within program sources that lack proper metadata. Drawing on four decades of research in understanding how people perceive sound, Dolby Volume offers a completely new and uniquely effective approach to eliminating the sudden, bothersome changes in volume that often occur between channels, programs, or input sources.

While it cannot read the mind of the content creator, Dolby Volume provides completely natural sound, free of the artifacts introduced by many leveling processes. Dolby Volume also preserves audio detail even at very low levels.

For more details on applications and capabilities of specific products, visit www.dolby.com.

1 For example, in 2010 the US Congress passed a bill called the Commercial Advertisement Loudness Mitigation (CALM) Act that legally requires broadcasters to ensure that commercials and programs are replayed at the same loudness levels.