Technical Document AESTD1005.1.16-09

Audio Guidelines for Over the Top Television and Video Streaming

Preliminary Loudness Guidelines: September 2016

Audio Engineering Society, Inc.
551 Fifth Avenue, Suite 1225
New York
NY 10179
USA
Tel: +1 212 661 8528. Email: hq@aes.org. Internet: http://www.aes.org

The Audio Engineering Society's Technical Council and its Technical Committees respond to the interests of the membership by providing technical information at an appropriate level via conferences, conventions, workshops, and publications. They work on developing tutorial information of practical use to the members and concentrate on tracking and reporting the very latest advances in technology and applications. This activity is under the direction of the AES Technical Council and its Committees.

The Technical Council and its first Technical Committees were founded by the Audio Engineering Society in 1979, and standing rules covering their activities were established in 1986, with the intention of defining and consolidating the technical leadership of the Society for the benefit of the membership. The Technical Council consists of the officers of the Technical Council, the chairs of the Technical Committees, the editor of the Journal, and as ex-officio members without vote, the other officers of the Society.

TECHNICAL COUNCIL
Francis Rumsey - Chair
Juergen Herre - Vice Chair
Robert Schulein - Vice Chair
Michael Kelly - Vice Chair

TECHNICAL COMMITTEES
Acoustics and Sound Reinforcement
Archiving, Restoration and Digital Libraries
Audio for Games
Audio Forensics
Audio for Telecommunications
Automotive Audio
Broadcast and Online Delivery
Coding of Audio Signals
Fiber Optics for Audio
Hearing and Hearing Loss Prevention
High-Resolution Audio
Loudspeakers and Headphones
Microphones and Applications
Network Audio Systems
Perception and Subjective Evaluation of Audio Signals
Recording Technology and Practices
Semantic Audio Analysis
Signal Processing
Sound for Digital Cinema and Television
Spatial Audio

www.aes.org/technical/

The goal of AES Technical Documents is not to state a policy or support for a technical method, device or principle, but to provide information that represents the collective knowledge of a group of experts.
Neither AES nor any of its Committees or members shall be responsible for any consequences resulting from the use of information contained in this publication.

Audio Guidelines for Over the Top Television and Video Streaming (AGOTTVS) Study Group

(AGOTTVS is a subcommittee of the Broadcast and Online Delivery Technical Committee of the AES)

Preliminary Loudness Guidelines: September 2016

Writing group
Chairman and Editor:
Jim Starzynski

Writers
Frank Baumgarte
David Bialik
Florian Camerer
Tim Carroll
Roger Charlesworth
Jim DeFilippis
Fabian Kuech
Thomas Lund
Scott Norcross
Sean Richardson
Jeff Riedmiller
Steven. A. Silva
Jim Starzynski
Jean-Michel Trivi
Adrian Wisbey

With Additional Contributions by
Eric Allamanche
Leslie Gaston-Bird
Manuel Briand
Werner de Bruijn
Andy Butler
Rob Byers
Deborah Cornish
Terry Douds
Chris Fetner
Kimio Hamasaki
Chris Homer
Bob Katz
John Kean
Alex Kosiorek
Fadi Malik
Andres A. Mayo
Matthieu Parmentier
Nils Peters
Skip Pizzi
Peter Pors
Will Wolcott
Yongjun Wu

Additional Study Group Members
Shujaat Ali
Robert Bleidt
Dave Casey
Greg Coppa
Werner DeBruijin
Frank Foti
Ed Greene
Clarence Hau
Schuyler Quackenbush
Patrick Waddell
Ben Waggoner
Robert Weigand
Dave Wilson

Introduction:

The AGOTTVS technical group was formed in early 2016 to study the many issues related to audio loudness variations. Our goal is to develop a comprehensive recommendation, providing effective guidelines for managing audio loudness of soundtracks of television and video content available to consumers Over-The-Top (OTT)[1] and by Online Video Distributors (OVD).[2, 3]

The group understands that a comprehensive recommendation requires a thorough process of user input, data collection, discussion and drafting. This work is underway and is forthcoming.

However, the group also recognizes the urgent need to publish "Preliminary Loudness Guidelines" that immediately address the fundamental concern of audio loudness in the developing segment of on-line television and video content delivery, from creation through distribution and to the consumer experience.

With the release of these "Preliminary Loudness Guidelines" the group also hopes to raise awareness of its forthcoming, comprehensive and ongoing work. Therefore, all interested parties are welcome to join this effort.

This group currently consists of volunteer members with expertise and/or interest in the creation, distribution and emission of professional audio. AGOTTVS membership is open to all stakeholders with a material interest in its work, regardless of AES membership status.

Professionals interested in joining AGOTTVS please contact: jim.starzynski@nbcuni.com or broadcast@aes.org

Jim Starzynski—Director and Principal Audio Engineer-NBCUniversal
Chairman- AES AGOTTVS, Vice-Chairman of the AES Broadcast and Online Delivery Technical Committee

David Bialik—Director of Stream Operations-CBS Local Media
Co-Chairman of the AES Broadcast and Online Delivery Technical Committee

---

[1] Over the Top Television (OTT). For the purpose of this document OTT is defined as: The means to deliver video content via Streaming, VOD, Pay TV, IPTV and download via IP mechanisms

[2] Online Video Distributor (OVD), defined as any entity that offers video content by means of the Internet or other Internet Protocol (IP)-based transmission path provided by a person or entity other than the OVD. FCC 15th Report on Video Competition, July 22, 2013.

[3] OTT and OVD do not include delivery of content via means of traditional distribution e.g., broadcast TV, Cable TV, Satellite TV, and Telco Supplied TV Etc.

Preliminary Loudness Guidelines for OTT and OVD Content
September 2016

To preserve the original sonic integrity of Over the Top (OTT) and Online Video Distributor (OVD) content, to reduce annoying loudness jumps when switching content, to prevent clipping and to provide an appropriate listening level across different devices, it is encouraged that content distributors practice the following:

1. For delivery of OTT and OVD content, where the distribution system supports loudness control metadata, loudness metadata should be encoded in the content bitstream reflecting the value of the measured loudness of the content.[1, 2, 3] Where there is no prior arrangement by the parties regarding loudness, the appropriate broadcast regional content delivery and exchange loudness value recommendation, typically –24 LKFS, –23 LUFS, should be followed.[3, 4, 5]

2. For delivery of OTT and OVD content without loudness metadata or where metadata support by the distribution system is not present or is uncertain:

- For delivery of content to devices capable of full dynamic range[7], the content should be prepared using the regional broadcast loudness standard for full range devices.[1, 2, 3]

- For delivery of content to devices with limited dynamic range[8] and for use cases with expected limited dynamic range, it may be necessary to pre-process content prior to encoding to accommodate devices with limited dynamic range and loudness management capabilities. In this case, average content loudness should never exceed –16 LKFS[1, 3, 6], –16 LUFS.[2, 3, 6]

- If the employed distribution format supports the carriage of loudness metadata, loudness metadata should be encoded in the content bitstream reflecting the value of the measured loudness of the content.[1, 2, 3]

3. It is strongly recommended that all deployed system implementations be examined to avoid unexpected behavior, especially when relying on metadata to control loudness and dynamic range of content.

4. If multiple versions of the same content are to be encoded by metadata and non-metadata supported systems:

- Versions for use with metadata should be the full dynamic range version of the content.
- Versions for use without metadata may be encoded with reduced dynamic range for compatibility with a variety of playback devices and use cases.

Note: Distributors should expect potential loudness variations when mixing metadata and non-metadata content in the same stream or sequence of streams.

[1] For services following ATSC A/85 (ITU-R BS.1770, measured per sections 5.2.3 for long-form content and 5.2.4 for short-form content).

[2] For services following EBU R128 (ITU-R BS.1770, measured as per items J, K and L for long-form content and items B, D, E, G, H for short-form content per EBU R128S1).

[3] For services following the practices of other regions such as ARIB TR-B32, OP/59, etc., follow those regional loudness guidelines.

[4] For services following ATSC A/85, the target loudness recommended is –24 LKFS as per Sections 5 and 6.

[5] For services following EBU R128, the target loudness recommended is –23 LUFS as per item H.

[6] Lund, Thomas, "Prevention of Hearing Loss from the Use of Personal Music Players", AES 58th International Conference, Aalborg, Denmark, June 28–30 2015; http://www.aes.org/e-lib/browse.cfm?elib=17796

Wolters, Martin; Mundt, Harald; Riedmiller, Jeffrey, "Loudness Normalization In The Age Of Portable Media Players", AES 128th Convention, London, UK, May 22-25 2010; http://www.aes.org/e-lib/browse.cfm?elib=15341

[7] E.g.: Audio/Video Receivers (AVRs), Set Top Boxes (STBs) and Game Consoles.

[8] E.g.: Phones, Tablets and Laptops.