

AES Los Angeles Section: Joe Carter, la_section@aes.org
 Los Angeles Section Web Site: <http://www.aesla.org>
 AES Headquarters: 60 East 42nd Street, Room 2520
 New York, NY 10165-2520 USA
 Web: <http://www.aes.org>

AES-LA Section Officers and Executive Committee

<i>Chairman:</i>	John Gordon	cinemageek@gmail.com	<i>Committee:</i>	Duke Aguiar	Greg Lhotka
<i>Vice Chairman:</i>	Jonathan Novick	jonthann@audioprecision.com		John Combs	John Mayberry
<i>Treasurer:</i>	Richard Wollich	staunch@earthlink.net		John Groper	Quinton Nixon
<i>Secretary:</i>	Joe Carter	joe.carter@ieee.org		Tom Levno	Ozzie Sutherland

Monthly Section Meeting Tuesday, February 26, 2008 — 8 pm

Television Audio Levels: A Mystery Story Complete with Detective and Problem

Tomlinson Holman, President, TMH Corporation

High-Definition Broadcast Television (ATSC) contains a number of mechanisms to improve on NTSC audio, on level and other things. So our speaker was surprised to find last April when he got a new HD cable set-top box that in changing between local and network news, the level changed by about 10 dB audibly. Tracing down the source of these level changes took several months and resulted in his hosting a Television Loudness Summit at USC last July. The story became a case of "who to blame" when the standard broadcast saying "clean goin' out-o-here" was heard throughout the chain. As the U.S. prepares for shutting off analog over-the-air broadcasts next year, the issues discussed at the Summit become of even greater importance.



Tomlinson Holman

This talk will deliver the detective story of finding the roots of the problem and what the fixes might be, and how ATSC television is going to work alongside more traditional cable and satellite services which may not be coded with metadata. Among the jargon described will be "dialnorm", "dynrng", "mixlevel", "compr" and such arcane terms as "mixdown", etc.

Tomlinson Holman is a Professor at the University of Southern California School of Cinematic Arts and at the Viterbi School of Engineering, and President of TMH Corporation, consulting to the post-production industry, among other things. He also works with Audyssey Laboratories in the introduction of automated room equalization and other developments to homes and professionals.

Tom was at Lucasfilm for 15 years during which time he developed the four businesses called THX and the Skywalker Ranch buildings and technical infrastructure. He holds twenty-three U.S. and foreign patents and is a fellow of the AES, the British Kinematograph Sound and Television Society, the IEEE and the SMPTE. Awards include a Technical Achievement Award from the Academy of Motion Picture Arts and Sciences, the Silver Medal of the Audio Engineering Society and the IEEE Masaru Ibuka Consumer Electronics Award.

Tom is the author of three books: *Sound for Film and Television*, *Surround Sound Up and Running* and *Sound for Digital Video*, all from Focal Press.



MEETING DATE: Tuesday, February 26th, 2008. **PLACE:** Sportsmen's Lodge Hotel, 12833 Ventura Blvd., Studio City, CA 91604 (at the corner of Ventura Blvd. and Coldwater Canyon).

TIME: Meeting at 8:00 P.M. Pre-meeting dinner (optional) at 7:00 P.M. Dinner cost is \$25, or \$20 if you make a reservation at least 48 hours in advance with the section Treasurer – Richard Wollich at staunch@earthlink.net or the section Secretary – Joe Carter at 805-371-9342. Please put "AES-LA DINNER RESERVATION" in the email subject line.

MENU: Entrée (two choices): 1) Oriental Salad, Marinated Sirloin Steak served with Medley of Vegetables and Mashed Potatoes or 2) A Vegetarian Plate with the same salad as above. Both selections include: Rolls and Butter, Water, Iced Tea, Hot Tea and Coffee. Dessert: Cheesecake

January Meeting Recap

Audio A/D and D/A Conversion Past, Present and Future

Steve Green

Technical Marketing Manager, Cirrus Logic

By John Combs



Steve Green at the screen

For the January 29 gathering, Steve Green, of Cirrus Logic gave a presentation tracing the evolution of audio A/D and D/A converter technology from the early days to the current state of the art, and provided an overview of the theory underlying the latest technology advances.

The presentation began with a review of some basic conversion principles including dither, aliasing, oversampling and digital interpolation/upsampling. Then, ...

Trends The overall trend has been to move difficult filtering problems into the digital domain. Major Architectural Transitions: Replace high-order anti-alias and anti-imaging filters with oversampling and digital filters.

Conversion Techniques Steve spoke of the evolution of converter design, from an early technique using resistor ladders to the latest Multi-bit Delta Sigma units using Phase-Compensated Infinite Impulse Response (IIR) filters. He cited reasons for each advancement. The newest filter topology provides a big reduction in latency over FIR filters: Roughly a 75% reduction. For live applications, this is a significant improvement.

Why do two different products that use the same converter sound different? Possible reasons are clock jitter, design of the analog section and it's circuit board layout.

There are two categories of jitter: First and worst is sampling jitter, which is jitter in the clock driving the converters. Sampling jitter phase modulates the converted signal, and generates a range of complex negative effects including Inter-Modulation-Distortion and elevated noise floor. Once converted with jitter, it cannot be corrected.

Then there is interface jitter, which is jitter in the recovered clock from digital interfaces such as CD, DVD, AES3, IEEE1394, USB, Cobranet.

A New Perspective on Decimation and Interpolation Filters

Steve said that early digital audio conversion systems required steep analog filters. The excessive phase shift of these filters was considered by many to be one of the primary sources of poor audio quality in digital audio systems. These high-order analog filters were replaced by digital interpolation and decimation filters. Partially as a result of the phase response issues associated with the analog filters, these filters were implemented as linear phase Finite Impulse Response (FIR) filters.

FIR filters were adopted for Decimation and Interpolation in the late 70's and early 80's. One of the primary reasons for this was the perceived issues of "phase distortion" and the "linear-phase" response of FIR filters.

The audibility of phase distortion has been studied extensively, and it has been determined that sensitivity to intra-channel phase distortion is much lower than inter-channel phase distortion.

Design goals for next-generation filters: Maximize frequency response, Minimal in-band ripple, Maximize stop-band attenuation, Minimize pre-echoes, Minimize latency, Phase matching between channels is critical, Intra-channel phase distortion is less critical.

Solution for these design goals: Phase-Compensated Infinite Impulse Response (IIR) filters, providing roughly a 75% reduction in latency over FIR filters. For live applications, this is a significant improvement.

Current state-of-the-art

Dynamic range capabilities approaching the limits of human hearing, Signal bandwidths exceeding the accepted limits of human hearing, Distortion performance at -110dB or $.0003\%$, Roughly 80% reduction in price over the last 15 years, Converters are no longer considered the "weakest link" in the chain, Higher resolution formats have not received market acceptance.

Areas for improvements: **dynamic range, distortion, higher sample rates, lower cost.**

Many Thanks

AES-LA would like to thank Steve Green and Cirrus Logic for a timely, lively and educational technical presentation.

www.cirrus.com



For an extended version of this report, go to the Audio Engineering Society L.A. Section web site:
www.aesla.org

Consider joining the Audio Engineering Society and becoming a member of the only professional society devoted exclusively to audio technology. Join today. Visit www.aes.org/info/join.cfm and fill out the online membership application form.

Further Reading on Digital Conversion:

"Dispersive Models for A/D and D/A Conversion Systems" R. Lagadec AES 75th Convention, 1984. Preprint 2097

"Anti-Alias and Anti-Image Filtering: The Benefits of 96kHz Sampling Rate Formats for those who cannot hear above 20kHz" Julian Dunn. AES 104th Convention. Preprint 4734

"Why Direct Stream Digital is the best choice as a digital audio format" D. Reefman; P. Nuijten. AES 110th Convention. Preprint 5396

"Controlled Pre-response Anti-Alias Filters for use at 96kHz and 192kHz" Peter Craven. AES 114th Convention. Preprint 5822

"96kHz: Hip or Hype?" Monte McGuire. Recording; June, 1999

"A Suggested Explanation For (Some Of) The Audible Differences Between High Sample Rate And Conventional Sample Rate Material" Mike Story, dCS. Sept 1997



Audio Precision and QSC are Supporters of AES LA

The AES LA Section needs your help. Our needs continue to grow and at the same time our costs have increased but funding has decreased. We have formally launched a Section Supporter Program to raise additional funds so that we can continue to meet member needs. The supporter program formally acknowledges three different contribution levels with varying degrees of public recognition and discounts on section sponsored events.

We are pleased to announce that AUDIO PRECISION, INC. and QSC are the charter members of the program at the Silver Level. Contact section Vice Chairman, Jonathan Novick, for program details or check our website later this month. Jonathan can be reached at (805) 302-7257 or jonathann@audioprecision.com.

Thank You for the Support

This space contains the logos of organizations supporting the LA Section of AES.



SILVER LEVEL

(Picture your logo here.)

Future Conventions

23rd AES UK Conference - *Audio At Home*
Cambridge, UK - April 9-11, 2008

124th AES Convention - *New Horizons in Audio*
RAI Conference and Exhibition Center
Amsterdam, The Netherlands
Saturday May 17 - Tuesday May 20, 2008

Please visit the Audio Engineering Society's web page at www.aes.org for AES Conference details.

Jobs in Audio

Go to <http://www.aesla.org> to check the latest job postings.

Go Paperless

Most copies of this newsletter are distributed electronically. If you receive yours as a printed copy via the US Mail, others are getting the news first. To join the list of those who receive it via email, send your e-mail address to the section secretary Joe Carter, la_section@aes.org.

Get the latest in AES-LA news and information at <http://www.aesla.org>

Upcoming AES-LA Events

Please visit the AES-LA home web page at www.aesla.org for meeting details. Audio CDs of most AES-LA monthly meetings are available for the cost of \$10 per meeting. Please email requests to la_section@aes.org for availability and payment instructions.

AES-LA February Monthly Meeting

Topic: Television Audio Levels
February 26, 2008

AES-LA March Monthly Meeting

Topic: TBD
March 25, 2008

AES-LA April Monthly Meeting

Topic: Audio for the Oscars
April 29, 2008

Coming Soon:

Recording the Beatles
The History of Audio

This newsletter is printed on 30% post-consumer recycled paper.



The Los Angeles section is one of the Audio Engineering Society's largest and most active. Don't miss out on the section's activities. Check the web site at <http://www.aesla.org>.

You can save money for the section and resources by receiving the newsletter electronically instead of regular mail. Send your e-mail address to the section secretary Joe Carter, la_section@aes.org. Most are distributed by email.

Section newsletter editor: Tom Levno



c/o Lori Jackson, Section Administration
60 E. 42nd Street, Room 2520
New York, NY 10165-2520

RETURN SERVICE REQUESTED

FIRST CLASS MAIL

Meeting Date: February 26, 2008