Program and Event Guide

WELCOME BACK!

SCAN ME

Scan the QR code to link to our full abstracts and presenter bios.

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Keynote Address

Banquet area. Sunday, June 5 at 8:30AM

The Golden Age of Audio is Now

By Andrew Bellavia: Director of Market Development at Knowles Electronics

People often talk of the "golden age of audio" as being sometime in the past, usually in the context of music quality. While listening to music is still a primary use case, audio has become so much more. From hearing aids to smart speakers, in-ear computers to voice-controlled cars, the audio industry has never seen such diversity of applications, nor breadth of challenges. Audio permeates our existence like never before, enriching our lives in numerous and unexpected ways.

A life-long lover of music, **Andrew Bellavia** is right at home as director of market development for Knowles' portfolio of drivers for in-ear monitors and true wireless hearables. He is also an advocate for hearing protection and care through his writing, podcast appearances, and webinars. In addition to serving on the business advisory board of ALTI, he is Knowles' representative for IEMITO, an organization promoting in-ear monitors and their value in protecting music industry professionals' hearing, and is a member of the advisory board of Tuned, a company delivering personalized, inclusive hearing care. Contact info:

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LinkedIn: https://www.linkedin.com/in/abellavia/
Twitter: @AndyB_Knowles

The FIRST annual ALMA Awards will be introduced at ALTI's annual Banquet on June 5, 2022. Please join us to honor the industry's best!

A global association needs a truly global awards process. Join the ALMA Awards sponsor. Joao Martins of AudioXpress as we introduce the new ALMA Awards.

ALTI began as ALMA in 1961. Our name has evolved to better embrace our goals and mission, but calling this the ALMA Awards is a worthy homage to our heritage that has provided the foundation for ALTI. All award winners will be determined by the industry at large except the ALMA Member Service Award.

The categories will be (note that the formal names may change by ALTI-EXPO):

- **Lifetime Achievement**
- **Technology Achievement**
- **Industry Contribution**
- **Company or Product Innovation Award**
- **ALTI Member Service Award** (the only award chosen by ALTI CEO)

Join us at the Annual ALTI Banquet on Sunday evening as we introduce the next generation of audio industry focused awards.

Speaker Builders Workshop takes place on June 5 in NAPA A from 8AM to 5PM.

Anyone may observe, but Hands-On experience and activities will be limited to the first 20 attendees.

Note: All start/stop times are approximate.

5-Jun SBW	
Time	NAPA A
8:00	Welcome + Customer driver requirements B.Vogel
8:30	Modeling/Simulation of Linear Speaker Behavior S. Irrgang
9:00	Overview On Measurement of Parts
9:30	Evaluation of Prototype S. Irrgang
10:00	Loudspeaker Assembly Lecture: J Zazzi
10:30	
11:00	Speaker assembly
11:30	
Noon to 2PM	Speaker Dry Time
2:00	Speaker Measurement Checklist A. Lutzo
2:30	Dats v3 Brian Myers
3:00	
3:30	Loudspeaker Measurements and EOL QC L. Quindipan
4:00	Testing Attendee Drivers L. Quindipan
4:30	
5:00	General Discussion
5:30	and Q&A

IMPORTANT NOTE:

All attendees participating in the "hands-on" portion of the work-shop does so at their own risk. Glues, sharp instru-ments and tools will be used.

4-Jun	5-Jun	SBW		Main Exhibit
	Time	NAPA A	NAPA B	Floor
	8:00	Welcome + Customer driver requirements B.Vogel		Breakfast 7:30 to 9:00
	8:30	Modeling/Simulation of Linear Speaker Behavior S. Irrgang		8:30-Keynote
	9:00	Overview On Measurement of Parts	Testing Quality of Micro-phones	
	9:30	Evaluation of Prototype S. Irrgang	Gregor Schmidle- Nti	
	10:00	Loudspeaker Assembly Lecture: J Zazzi		
	10:30	Speaker assembly		
	11:00		Audio Quality Perception	
	11:30		Jacob Soendergaard- HEAD acoustics	
Exhibitor Set up and Badge	Noon to 2PM	Speaker Dry Time		Lunch Noon to 2PM
Pick-up	2:00	Speaker Measurement Checklist A. Lutzo	Enhanced Perceptual Rub and Buzz	
Noon to	2:30	Dats v3	Steve Temme- Listen, Inc	
5PM	3:00	Brian Myers	FINE Suspension FEA soft-ware	
	3:30	Loudspeaker Measure-ments and EOL QC L. Quin-dipan	Peter Larsen Loudsoft	
	4:00	Testing Attendee Drivers L. Quindipan	Making Speaker and Mi-crophone Measurements without an Anechoic Chamber	
	4:30		Audio Precision	
CEO's Reception	5:00	General Discussion	Res-Core by Resonado Labs B Danovi and P Vedier	
	5:30	and Q&A		
	6:00	Disclaimer: All scheduled items are accurate at time of publication. Any last minute changes will bested on the ALTI website and outside the breakout rooms. ALTI is not responsible for any content cancelled by the presenter or		Cocktail Reception
	6:30			Gala Annual Ban-quet
	7:00	SBW Series	Seminars	6:30 to 8:30
	7:30	Advertorials	Forums	
	8:00	Papers		

6-Jun			Main Exhibit		7-Jun
Time	NAPA A	NAPA B	Floor		Monarch
8:00	Beyond Analog Circuit Modeling of Electroacoustic Transducers Stephen Thompson- Penn State		Breakfast 7:30 to 9:00		
8:30		Making Membership Pay Barry Vogel			
9:00	Possibilities of Engineered Speaker Diaghrams	Listen, Inc			Advisory Boards Meeting
9:30	Martin Turesson	Les Quindipan			
10:00	Controlled Loudspeaker Inductance Le(x) - Peter Larsen- LOUDSOFT	What is the best high frequency response for earphones? C. Downey and T. Miller- Knowles			
10:30					
11:00	Application of Musical Modulated	Multi-Domain Transducer Measurement Warkwyn/ Klippel			
11:30	A. Voishvillo & B Kakonyi-Harman				
Noon to 2PM	Lunch Noon to 2PM		Lunch Noon to 2PM		
2:00	Global Supply Chain Strategies	AC Power, Grounding, Shielding			
2:30	Rosemary Coates	Bill Whitlock			
3:00	Supply Chain Panel				
3:30					
4:00	Listen	How Do I Get Good Data? Aaron Lutzo- Biamp			
4:30	Steve Temme				
5:00			Cocktail		
5:30			Closing Party		
6:00			Exhibitor		
6:30			Breakdown		
7:00					
7:30					
8:00					

Our Exhibitors

Booth #2 **NTi Audio** 7405 SW Tech Center Dr., Suite 130, Tigard, OR 97223
503-684-7050 https://www.nti-audio.com/

NTi Audio AG is a leading manufacturer of test and measurement solutions for acoustics, audio and vibration applications.

Booth #3/4 **HEAD acoustics** 6964 Kensington Rd, Brighton, MI 48116
+49 2407 577-0 www.headacoustics.com

Since foundation in 1986, HEAD acoustics has been a reliable partner wherever acoustics, vibrations, or speech, audio and sound quality play an important role. We are not only one of the world's leading companies in the comprehensive analysis of sound and vibration; our expertise and pioneering role in the measurement and optimization of speech and audio quality in all areas of communications technology are also recognized world-wide.

Booth #6 **Composite Sound** Foretagsgatan 24, Sweden 50464 www.composite-sound.com +46 (0) 33 340 18 08

Everything we do at Composite Sound is about enabling you to make it sound like you want it to sound. We use state of the art material science, advanced simulation tools and a unique engineering approach to create speaker cones and diaphragms.

Booth #7/8 **Ferrotec USA** 33 Constitution Drive, Bedford, NH 03110 +1 603-204-8103
www.ferrotec.com

Ferrotec provides customers with advanced technology solutions that make their products work better, more precisely, and more reliably. Founded in 1980 on a technology core of FerroFluid magnetic liquid and Ferrofluidic® sealing products, our company and our product portfolio have grown to meet the evolving needs of our customers. Ferrotec is a world leading manufacturer, marketer, and distributor of advanced material, component, and assembly solutions used in a broad array of end products, manufacturing systems, and industries.

Our Exhibitors

Booth #9 **Audio Precision** / **GRAS** 5750 SW Arctic Dr., Beaverton, OR 97005 +1 800-231-7350 www.ap.com

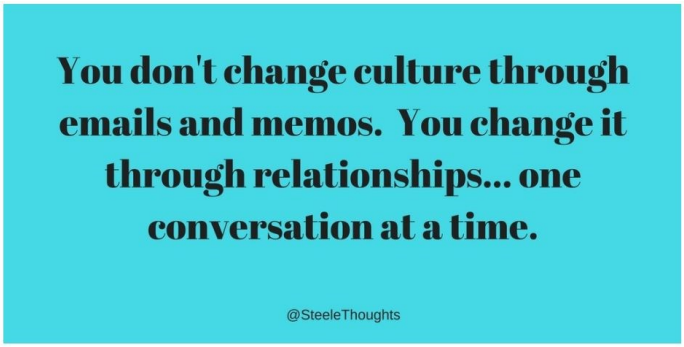
Audio Precision is the recognized standard in audio test. For over thirty-five years, AP has offered high-performance audio analyzers, accessories and applications to help engineers worldwide design, validate, characterize and manufacture consumer, professional and industrial audio products. Ongoing innovation has been a key theme for the organization since its founding, with market-leading THD+N performance, a wide range of digital interfaces, software that combines power with ease-of-use, and tools for electro-acoustic and perceptual audio testing.

Booth #10 & 11 **Warkwyn Associates/MISCO/Klippel**

1771 Energy Park Dr., Suite 400, St Paul, MN 55108 +1 612-759-4042 www.warkwyn.com "Precision Measurement and Innovative Design".

www.miscospeakers.com +1 800-276-9955 "All in One USA Audio Provider".

www.klippel.de +49 351 5019390 "Offering Measure-



Our Exhibitors

Mark your calendar for ALTI-EXPO '23 at DoubleTree by Hilton at Universal Studios in Orlando, Florida. June 11 and 12, 2023!

Booth #14 AudioXpress, Voice Coil, Loudspeaker Industry Sourcebook
Exclusive Media Sponsor www.audioxpress.com

audio xpress
ADVANCING THE EVOLUTION OF AUDIO TECHNOLOGY

VOICE COIL

LIS LOUDSPEAKER INDUSTRY SOURCEBOOK

Booth #15 Parts Express / Dayton Audio 725 Pleasant Valley Dr., Springboro, OH 45066
+1 800-338-0531 www.parts-express.com

PARTS EXPRESS
AUDIO COMPONENTS & SOLUTIONS

Our passion is to provide quality electronics at affordable prices to you, our customer.

DAYTON AUDIO
Your path to great sound.™

Booth #16 Yunsheng USA 430 N. Canal St., S. San Francisco, CA 94080
+1 650-827-7928 www.yunshengusa.com

YUNSHENG USA

Yunsheng USA Inc., a subsidiary of the Ningbo Yunsheng Co. Ltd, is focused on developing, manufacturing and marketing high strength, high performance rare earth permanent magnets and magnetic assemblies. Ningbo Yunsheng Co. Ltd., is located in Ningbo prefecture, the "Silicon Valley of Magnetics" in China, home to 100+ magnet manufacturers.

Our Exhibitors

Booth #17 & 18 Resonado Labs 1400 E Angela Blvd., Unit 134, South Bend, IN, 46617
+1 860-305-5521 https://www.resonado.com/

RESONADO LABS

Sound enables human connection. Provides immersive entertainment. A creative outlet. We love all of those things. So we engineer technology to elevate the way sound is experienced.

Booth #19 JL Mag Rare-Earth Co., Ltd West Jinling Road, Development Zone, Guangzhou City, Jiangxi Province, 34100 China +1 310-990-6158
http://www.jlmag.com.cn/en/

金力永磁 JLMAG 用稀土创造美好生活

With excellent manufacturing capabilities, JL MAG's products are widely used in wind power, new energy vehicles, inverter air conditioners, energy-saving elevators and other industrial energy-saving motors; JL MAG has built close strategic partnership with international leading companies in various industries.

Booth #20 **LOUD**SOFT Agern Alle 3 DK-2970 Horsholm Denmark +45 20119842
www.loudsoft.com

LOUDSOFT

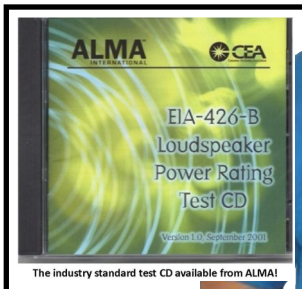
The FINE Circle software solutions encompass the motor, cone, box, x-over, QC Test. QC Headphone, Fine R+D and Fine DSP

Our Exhibitors

Booth 21 USOUND Kratkystrabe 2, Styria, 8010 Austria +43 676 5540173
www.usound.com

MEMS speakers for a superior audio experience

USound is a fast-growing audio company, developing and producing the most advanced audio systems for personal applications based on MEMS technology.



Available at
Registration Desk

Show Special!

ALTI T-Shirt *PLUS* ALMA Test CD Combo.

BOTH!

$19.99

Booth 24 Listen, Inc. 580 Harrison Ave., Boston, MA 02118 +1 617-501-6297
www.listeninc.com/

Listen is a world leader in audio and electroacoustic test and measurement. Founded in 1995, when its flagship product, SoundCheck® was launched, the company has pioneered electroacoustic measurement techniques for 20 years and sets the standard in the marketplace with powerful and innovative test methods and algorithms, fast and flexible testing, and excellent service and customer support.

Electro-Voice

To be Raffled off at ALTI-EXPO '22

A PAIR of Electro-Voice ND86 Dynamic Supercardoid Vocal Microphones.

(A $400 value!)

Donated by Bosch Security Systems

Our Exhibitors

Booth 26 Echo Test + Measurement 402 East Carillo, Suite A, Santa Barbara, CA 93101
+1 619-808-7713 www.echotm.com

Echo test hardware is used globally to verify audio quality for millions of devices every year. With over 25,000 units installed worldwide, there's a good chance the device you are using to read this was tested with an Echo product.

Booth 27 Dinaburg Technology 2618 Henderson Ave., Dallas, TX 75206
+1 972-413-0734 www.dinaburgtech.com

PERFECTING THE SONIC EXPERIENCE

Our Mission - Continuously enhance the sonic experience by delivering unparalleled clarity, energy efficiency and fidelity for a superior listening experience through science and advanced technology and processes.

Global Supply Chains In Chaos – Strategies For Moving Forward
By Rosemary Coates- Reshoring Institute

Monday, June 6 in NAPA A at 2PM.

All are welcome. Join us!

Thanks to Badge Sponsor Composite Sound!

Our Product Showcase

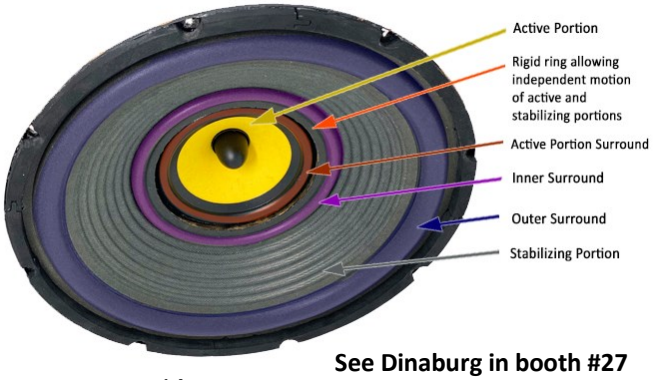
The HEAD acoustics HMS II.3 is the one artificial head for all applications. With its modular concept, it can be adapted quickly and easily to fit the measurement task. With the new ITU-T P.57 type 4.4 ears, the head is equipped with anatomical pinnae, conchae, and ear canals, which is mated to a special low noise coupler that allows us to measure below the threshold of human hearing. And with a two-way loudspeaker design offering full band transmission, it can perform all your voice, speech recognition and communication quality measurements without parallel.
Whether you're measuring ANC headphones, mobile phones, smart speakers or any other voice and audio product, the HMS II.3 artificial head is the one head for all those use cases.

See HEAD acoustics in booth #3/4

PERFECTING THE SONIC EXPERIENCE

Our Mission - Continuously enhance the sonic experience by delivering unparalleled clarity, energy efficiency and fidelity for a superior listening experience through science and advanced technology and processes. **www.dinaburgtech.com**

DINABURG TECHNOLOGY



See Dinaburg in booth #27

Our Presentations *June 5, 2022*

ALL exhibitors, presenters, and attendees may attend Advertorials and The Speaker Builders Workshop.
ALL Access Pass holders, exhibitors, presenters, may attend ALL activities including food services and the annual Banquet on Sunday evening

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SCAN ME

NAPA A ***8AM to 5PM*** ***Speaker Builders Workshop***

Start and finish times are approximate for SBW sessions

8AM to 8:30AM: **Welcome and setting "customer" requirements and how to moderate them.** Barry Vogel and Stefan Irrgang

8:30AM to 9AM: **Modeling and Simulation of Linear Speaker Behavior** by Stefan Irrgang from Klippel
There are many unnecessarily complicated steps between receiving the customer's specification and building a prototype that "hits the bullseye." In this presentation, the student will learn how the innovative "Klippel Approach" reduces and even eliminates the costly iterative process of building numerous expensive and time-consuming prototypes before meeting the customer's expectations. The Klippel Approach combines a unique and novel combination of various modelling programs readily available from numerous vendors and accurate component parts measurement. The result a is significantly shortened product development timeline. The student will learn how the Klippel Approach yields the most direct, accurate, and quickest path from concept to marketplace.

9:15AM to 9:45AM: **Overview on Measurements of Parts**– Stefan Irrgang

9:45AM to 10:15AM: **Evaluation of the Prototype**– Stefan Irrgang

10:15AM to 10:45AM: **Loudspeaker Assembly Lecture**– Justin Zazzi of Rockford Corp.

10:45AM to Noon: **Students Assemble a loudspeaker**– Justin Zazzi

Noon to 2PM: **Lunch and Exhibits Time**

Our Presentations *June 5, 2022*

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NAPA A 8AM to 5PM Speaker Builders Workshop

Start and finish times are approximate for SBW sessions

2PM to 2:30PM: **Speaker Measurement Checklist**– Aaron Lutzo of Biamp

In this session some of the basic considerations of measuring a speaker will be discussed, providing the "do's" and "don'ts" of the technique. Have you determined the type of measurement you want? Do you have confidence in your measurement system? How do you isolate the data you want to see from the data you don't? All and more will be answered during the session

2:30PM to 3:15PM: **How to derive T/S parameters with the Parts Express DATS V3 system-** Brian Myers of Parts Express/Dayton Audio

DATS V3 is a unique, multipurpose test system consisting of the hardware and full-featured software. The DATS V3 main emphasis is deriving accurate Thiele/Small parameters of a loudspeaker from the impedance profile data and is the focus of this presentation. To measure the impedance response of a loudspeaker and derive a complete set of Thiele/Small parameters is as easy as connecting a driver and starting the test! The DATS V3 system provides the electrical stimulus to the driver, measures the driver's impedance in seconds and then creates a high-resolution graph (30,000 data points!) with no additional hardware required.

This session will demonstrate some of the DATS V3 capabilities.

3:30PM to 4PM: **Introduction to Loudspeaker Testing**– Les Quindipan- Loudsoft

In this short introduction to loudspeaker testing, Les Quindipan explains various loudspeaker measurements such as frequency response, distortion, sensitivity, phase/polarity and impedance, and how they might offer indications as to potential defects in a speaker. Typical test configurations for both R&D and end-of-line production test will be shown. A complete speaker test will be demonstrated using SoundCheck, and the results discussed.

4PM to 4:45PM: **Testing Attendee Drivers**

4:45PM ro 5:30PM: **Wrap up and Q&A.**

Take your project drivers home!

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NAPA B

Title: **Testing Quality of Microphones**
Presenter: Gregor Schmidle- NTi Audio
Time/Location: 9AM, 5 June NAPA B

Description: Due to the increasing use of microphones in many applications such as automotive or artificial intelligence, the demand for fast and reliable processes for testing the quality of the microphones is growing. In this seminar we will describe a typical microphone test system, and explain the function of each component. Besides explaining the theory, we will also perform practical measurements with different types of microphones. We will identify common pitfalls and show strategies to implement reliable and reproducible procedures.

Title: **Audio Quality perception – advanced headphone measurements**
Presenter: Jacob Soendergaard- HEAD acoustics
Time/Location: 11AM, 5 June NAPA B

Description: How do we properly evaluate modern headphones and headsets? Consumers can read reviews online. In some cases, they can go to a store and try them on. An additional and more objective way is to look at frequency response measurements.

- But is this parameter sufficient to evaluate the audio playback performance of an audio device?
- Is there more to the audio playback quality perception than what can be captured in a frequency response?

This paper will introduce a new quality metric, MDAQS: Multi-Dimensional Audio Quality Score, which can be used as a holistic measure of the audio quality perception in headphones (and other audio playback devices) and provide a much easier way to interpret whether the headphone is good or bad.

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NAPA B

Title: **Enhanced Perceptual Rub & Buzz Measurement for Production Line Use**
Presenter: Steve Temme
Time/Location: 2PM June 5 NAPA B

Description: Perceptual distortion measurements are often considered the holy grail of end-of-line tests because rejecting devices with only audible faults increases yield. Although such measurements have been around since 2011, production line adoption has been slow because until now, sensitivity to background noise has made limit-setting challenging. In this paper, we introduce a new algorithm that uses proprietary technology to reduce the impact of background noise on the measurement and offer more repeatable results. This facilitates limit setting on the production line, and makes it a truly viable production line metric for increasing yield. Results from various algorithms will be shown, and their correlation to subjective and other non-perceptual distortion metrics explained.

Title: **FINE Suspension FEA Software**
Presenter: Peter Larsen
Time/Location: 3PM June 5 NAPA B

Description: FINESuspension is Non-Linear FEA (Finite Element Analysis) software which is ideal for designing the spider and surround for most loudspeaker drivers.
Starting from a template, the user only needs to input dimensions and select a material from a database to get started.

The deformed surround is displayed in steps up and down.

The calculated stiffness versus displacement K(x) curve is now shown in the upper right window (shown on next page). When the surround is stretched out the stiffness increases, which is displayed as higher K(X) at maximum excursion up (+) and down (-). This curve shape is preferable as the increased stiffness help controlling the loudspeaker cone at extreme excursions up and down.

Ideally the U-shaped Kms curve should be symmetrical along the Y-axis. A non-symmetrical Kms curve will produce a DC offset (X) of the VC position, which would cause intermodulation distortion.

Therefore, the mirrored Kms curve is shown as the dashed curve, making it easy to spot any non-symmetries.

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NAPA B

Title: **Making Speaker and Microphone Measurements Without an Anechoic Chamber**
Presenter: Tony Spica Audio Precision
Time/Location: 4PM, 5 June, NAPA B

Description: Speaker and microphone measurements are traditionally made in a fully anechoic chamber. However, it is possible to perform useful measurements of these devices without a perfect acoustic environment. In this presentation we will review techniques on how to perform meaningful measurements of speakers and microphones in a normal room.

Title: **Res-Core by Resonado Labs – High-Performance Racetrack Driver Architecture**
Presenter: Benny Danovi and Paul Vedier Resonado
Time/Location: 5PM, 5 June, NAPA B

Description: Racetrack speaker drivers, also known as oval or elliptical drivers, are becoming more prevalent every day as audio product design continues to evolve. Resonado Labs engineered a proprietary motor optimized for the racetrack driver form factor with a planar voice coil and bobbin assembly situated between parallel magnets. The technology, known as Flat Core Speaker (FCS) technology, will debut this fall under the brand name Res-Core. The bobbin runs along the length of a flat diaphragm, leading to even force distribution, and therefore pistonic movement, while utilizing a thin profile with a flat diaphragm. COMSOL simulations and Klippel measurement data support these claims and show evidence of this technology having comparable performance to conventional drivers in a slimmer profile and heavily outperforming conventional racetrack drivers.

This talk will take a deep-dive into the company's flagship technology, Res-Core, and unveil recent structural innovations.

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NAPA A

Title: **Beyond Analog Circuit Modeling of Electroacoustic Transducers: Including nonlinearities and thermoviscous losses**
Presenter: Stephen Thompson, PhD Penn State University
Time/Location: 8AM June 6 NAPA A

Description: Linear analysis based on analog circuit models of loudspeaker systems can be done either with analytical matrix computation methods or with a code based on SPICE or another electrical circuit analysis code. There are several good codes based on these methods that provide reasonably accurate models of small signal performance of speakers in sealed and ported enclosures. However, we must move beyond these linear models to predict large signal behavior and frequency dependent losses in enclosures and ports. Such models can be implemented with multidomain modeling codes that use the Modelica language, or with Simscape. These methods use a combination of ordinary differential equations and algebraic equations to calculate the performance in each physical domain (e.g. mechanical, electrical, magnetic, etc.) and provide the necessary physical coupling between the domains. They provide reasonable fidelity with less computational intensity than full FEA, so they can be used as components in a larger modeling system that includes programmable controls to reduce distortion or energy losses. This seminar will demonstrate the use of Simscape to model a moving coil speaker including multiple nonlinearities. It will demonstrate the ability to model a control system around the speaker for improved far field performance.

Title: **The possibilities of engineered speaker diaphragms: Introduction to the second generation Thin-ply Carbon Diaphragms – Composite Sound Metamodal®**
Presenter: Martin Turesson- Composite Sound
Time/Location: 9AM, 6 June, NAPA A

Description: The first generation TPCDs showed that it is possible to increase the range of pistonic motion while at the same time reduce the mass and achieve a more controlled behavior compared to conventional hard diaphragms. Through proper engineering, the second generation TPCD enables performance and tailored behavior far beyond what is possible when relying on material properties alone. By tailoring the thickness and stiffness (including in different directions) in any given point of the Composite Sound Metamodal diaphragm, the range of pistonic motion can be maximized, the moving mass minimized and the way resonances occur can be controlled.

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NAPA A

Title: **Controlled Loudspeaker Inductance Le(x)**
Presenter: Peter Larsen- Loudsoft
Time/Location: 10AM June 6 NAPA A

Description: The Voice Coil Inductance is among the non-linear loudspeaker parameters which strongly depends on the Voice Coil position due to the influence of iron in the magnet system.
Inserting a short circuit ring around the pole piece is a known remedy for reducing the Voice Coil inductance. This will be investigated in detail using transformer theory. The inductance versus displacement Le(x) will be simulated with magnetic FEA software
In addition to a ring or pole cap, more rings and caps in different materials may be added below and above the magnet airgap depending on the coupling with the flux produced by the Voice Coil. In this way the inductance non-linearity Le(x) can be optimized to be virtually independent of the Voice Coil position.
Examples hereof are given for both normal outside ferrite magnet systems as well as inside neodymium magnet systems.

Title: **Application of Musical Modulated Multitone stimulus for detection of non-harmonic distortion in horn drivers**
Presenters: Alex Voishvillo, Balazs Kakonyi- JBL/Harman Professional
Time/Location: 11AM June 6 NAPA A
Multitone stimulus is known to provide test results that have a better correlation with perceived sound quality than a swept sine wave stimulus. An exhaustive review of multi-tone theory, history, and application is presented in [1] and [2] by Czerwinski et al. A well-known publication on multitone by R. Belcher [3] presents experimental evidence that multitone stimuli provides superior correlation with the audibility of nonlinear distortion than swept sine wave stimuli. Multitone stimuli, used in [1]-[3], have an equal spacing between the tones on a logarithmic frequency scale. Subjectively, the stimulus sounds anharmonic, dissonant, and noise-like.

Continued next page

ALL exhibitors, presenters, and attendees may attend Advertorials and The Speaker Builders Workshop.
ALL Access Pass holders, exhibitors, presenters, may attend ALL activities including food services and the annual Banquet on Sunday evening

NAPA A

Continued from previous page

The new MMM (Modulated Musical Multitone) signal was developed to bridge the gap between objective testing data and subjective perception of sound. The MMM signal consists of E-minor triads in several octaves with amplitude modulation to match the crest factor of particular musical signals.

In [4], MMM was used for the detection of audible distortion in horn drivers. In [5], the nonlinear response to the MMM signal was post-processed in the frequency domain to obtain the Multitone Total Nonlinear Distortion (MTND) response. MTND represents all the nonlinear distortion products averaged within a sliding window in the frequency domain [6]. The windowed and averaged value of spectral components within the sliding window are then plotted at the center frequency of that window. By repeating this process at different frequencies, distortion products can be identified across the frequency domain. In [5], this approach was used to profile nonlinearities in full-band loudspeaker systems by calculating MTND responses across various input voltage levels and plotting them as 3D graphs.

Title: **Global Supply Chains In Chaos – Strategies For Moving Forward**
Presenter: Rosemary Coates
Time/Location: 2PM June 6 NAPA A

Description: We've all experienced the chaos of supply chains during the pandemic. Shortages of products and parts caused by factories closing and opening and closing again and skyrocketing logistics costs have wreaked havoc. Shifts in demand and the persistent import tariffs make global sourcing unpredictable and more expensive. These things and others have been a true wake-up call for manufacturers.

What strategies for mitigating risks in the future should be considered? Where in the world should you look for sources now? Should you try to develop domestic suppliers? Should you maintain higher inventory levels? Is inventory sharing across the industry possible? What kind of disaster planning should you undertake for the future? What opportunities are on the road ahead?

Rosemary Coates will introduce new ideas for you to consider and what manufacturers are doing now that will change the landscape of manufacturing in the future.

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SCAN ME

NAPA B

Title: **Audio Test from the R&D Lab to the Production Line**
Presenter: Les Quindipan Listen, Inc
Time, Location: 9AM June 6 NAPA B

Description: SoundCheck is the most powerful and flexible audio test system. It can measure virtually any audio device, from simple transducers to complex telecoms, Blue-tooth and voice-controlled devices.

Since its launch in 1995, our modular, hardware-agnostic, software has led the market-place with fast and accurate audio test algorithms, simple and user-friendly test devel-opment, and flexibility for a broad range of applications. Our hardware is specifically designed for audio measurement applications, offering ruggedness, multifunctionality and 'plug and play' software integration. Compatibility with a wide range of ancillary test equipment offers unlimited customization and expansion of your system.
With up to 128 channels of measurement, and software packages to suit every budget, we can configure a system for your precise needs. Results are fully portable between systems. Whether you need a single system, or a platform that offers full compatibility across R&D labs, production and home labs, let us show you how SoundCheck could work for you.

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NAPA B

Title: **What is the best high frequency response for earphones? (Extending the Harman Curve)**
Presenter: Cristina Downey and Tom Miller- Knowles
Time/Location: 10AM June 6 NAPA B

Description: Sean Olive and team did a fantastic job developing the Harman recommended curve for earphone response. This curve has been widely adopted by the earphone industry. However, they admittedly didn't really study response above 10 kHz, citing technical limitations of the gear at the time. Knowles has taken up the challenge of discovering what listeners really prefer for that last octave of music, using methods similar to Sean's along with improved equipment. The results are surprisingly brighter than the Harman curve. We will describe how we developed a new recommended headphone curve, and how we overcame the challenges of getting reliable listener results at high frequencies.

Title: **Multi-Domain Transducer Measurement**
Presenter: Kent Peterson Warkwy Associates
Time/Location: 11AM June 6 NAPAB

Description: Electro-acoustic transducers used in loudspeaker systems typically translate an electrical signal into acoustic sound by mechanically actuating a diaphragm or cone with an electro-magnetic motor. Comprehensive transducer testing therefore requires a multi-domain approach with measurements in all relevant domains: electric, mechanic, acoustic, and magnetic.
A broad range of measurements and methods will be shown including single point measurements, distributed measurements (laser scanning) and measurement methods based on model fitting for linear as well as non-linear behavior. The multi-domain measurement approach provides a wealth of relevant data, enables a much deeper understanding of the transducer, its behavior and its defects, and enables symptoms to be linked to their actual root causes. The presented measurement methods are in most cases faster than traditional measurements and only require normal semi-reverberant rooms with minimal acoustic treatment. This enables savings in time and resources both in the short and long run by reducing measurement time, eliminating the need for special facilities like anechoic rooms and, cutting down research time and the amount of necessary prototype iterations.
This presentation discusses important electrical, mechanical, and acoustical measurement performed on the KLIPPEL Multi-Scanning Workbench according to IEC 60268-21 and 22. Kent Peterson will be joined by Dr. Stefan Irrgang of Klippel GmbH.

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NAPA B

Title: **AC Power, Grounding, and Shielding**
Presenter: Bill Whitlock
Time/Location: 2PM June 6 NAPA B

Description: Bill Whitlock of Whitlock Consulting shares results of his own peer-reviewed research and 30 years of experience at solving system noise issues for thousands of Jensen customers. He'll debunk common myths and pseudoscience by explaining, in simple "electronics 101" language, the physics underlying hum and buzz in audio systems and "random" misbehavior in digital systems. You'll learn relevant aspects of National Electrical Code and what normal AC power is and how it indirectly causes noise problems. You'll discover why light dimmers are so notorious for causing "buzz" in sound systems and what simple steps can be taken in new systems to avoid the problems altogether. For existing systems, a simple no-instruments troubleshooting method teaches how to use observation, system controls, and simple logic to pinpoint the exact cause and location of a noise issue. A variety of solution strategies and devices will be compared with respect to performance, cost, and safety, including why some so-called "solutions" actually put your customer's life at risk – and expose you to lawsuits. Attending this course will not only make you smarter but you'll avoid the embarrassment and expense of recalls to fix the system … your hard-earned reputation is at stake!

Title: **How Do I Get Good Data?**
Presenter: Aaron Lutzo- Biamp
Time/Location: 4PM, 6 June, NAPA B

Description: When testing a loudspeaker, so many moving variables can open the door for inaccuracies in your measurements. The test engineer or acoustician breaking into the field will undoubtedly have questions as they dive in. This session in focused on providing tips towards "getting good data", and saving yourself time on the essentials. We will discuss understanding the type of measurement you are after, isolating what you want to see from the test environment, and keeping in mind the resolution and bandwidth of your data. All this will then be related to balloon modeling data used frequently in the pro audio industry.

Our Presenters

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SCAN ME

A life-long lover of music, **Andrew Bellavia** is right at home as director of market development for Knowles' portfolio of drivers for in-ear monitors and true wireless hearables. He is also an advocate for hearing protection and care through his writing, podcast appearances, and webinars. In addition to serving on the business advisory board of ALTI, he is Knowles' representative for IEMITO, an organization promoting in-ear monitors and their value in protecting music industry professionals' hearing, and is a member of the advisory board of Tuned, a company delivering personalized, inclusive hearing care.

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Twitter: @AndyB_Knowles

Rosemary Coates is a highly-skilled executive with deep experience in corporate strategy and global operations. Founder and Executive Director of the Reshoring Institute and President of Blue Silk Consulting. She is a Chinese Manufacturing Expert Witness, a Global Supply Chain Management Consultant, with an MBA, 35+ years of experience in Management Consulting. Rosemary is often selected as a Keynote speaker at business events and conferences.

STEFAN IRRGANG studied electrical engineering at the University of Technology in Dresden, Germany and received a Ph.D. in Technical Acoustics in 1997.
In 1998, he joined Klippel GmbH as one of the first employees. Since 2016, Stefan is the company's head of development for measurement applications. His team provides unique test solutions for lab use, quality assurance and product validation to the audio industry.
His special interests are signal processing and test optimization. He gives lectures and workshops on loudspeaker testing, diagnostics, and optimization.

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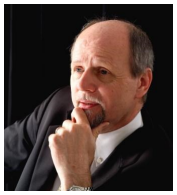
Balazs Kakonyi is a Principal Engineer, Transducers at JBL Professional. Balazs grew up in Hungary and studied Electical Engineering in Budapest. He has a Masters degree in Electro-Acoustics from Le Mans University in France. He started his professional career interning for Klippel GmbH in Dresden, Germany. He joined Harman in 2015 and worked as an automotive Transducer Engineer on projects for Mercedes-AMG and PSA. Later, he joined AKG Professional as an Acoustic Engineer and helped develop beamforming algorithms for circular microphone arrays. In 2019 Balazs moved to Los Angeles to work at JBL Professional. His work is focused on the design of next generation professional transducers. He is developing new platforms and technologies for measuring, designing and simulating transducers and waveguides.



Peter Larsen, B.Sc. EE. started his career with SEAS in 1974 and was Chief Engineer for Vifa-Speak 1979-1987. Thereafter Dynaudio 1987-1990 and JBL in USA until 1993.

From 1993 Peter Larsen has worked as an independent consultant for leading loudspeaker factories all over the world: Audax in France, KEF Audio in UK, Goldmax in China, Vifa-Speak in Denmark, Peerless Fabrikkerne of India, NXT in UK, Microlab in China, Apple in USA and many others.

During the period as an independent consultant Peter Larsen has specialized in in-depth analysis of loudspeakers and manufacturing techniques, research concerning new components and materials, advanced Acoustic Finite Element modelling, new measuring methods, novel speaker design concepts and development of several customized products (private label).

During the same period Peter Larsen has developed and marketed globally special FINE-software for speaker development and design.

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SCAN ME

Aaron Lutzo is currently an acoustic engineer at Biamp. His daily responsibilities deals with loudspeaker design and data acquisition. He focus' on device endurance, reference data for simulation and 3D modeling, GLL creation, and optimization filters. Currently working with FEA modeling techniques and applying them to COMSOL acoustic-structural multi-physics simulation. Aaron started out as an ALTI student member and through some persistence and networking he was able to secure a position at Biamp. "I've had a love for loudspeakers ever since I was in high school, so it feels good to finally be "living the dream". "

As a long-standing employee of Parts Express Brian Myers has been passionately working in the loudspeaker/audio business since 1996. Brian has held many positions at Parts Express from Technical Advisor to Project Manager. His experience and passion give him a unique perspective in the audio industry. He is versed in acoustics by spending countless hours of research measuring raw drivers, passive radiators, enclosures and amplifiers. Unknown to most, for the past 15 years, he has designed raw drivers for the Parts Express house brands Dayton Audio, GRS and Epique. Not surprisingly, prior to Parts Express he was an audio fanatic and avid speaker builder. Deemed by many as an adept loudspeaker designer by day a "car guy" on the evenings and weekends.

Kent Peterson is Warkwyn's Sales and Marketing Manager. In his over 25-year career in the audio manufacturing, sales, marketing and acoustical consulting fields Kent has worked with Electro-Voice, SEH Engineering, HDR Engineering, and Williams Sound. Kent attended the University of Minnesota Duluth where he studied Music, Communications and Acoustics. He is an expert EASE programmer and a musician and producer with three Minnesota Music Awards to his credit.

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Les Quindipan is the Sales Manager at Listen, Inc. for over 6 years and has worked in professional audio for over 28 years. Prior to Listen, he held various management positions at MOTU including sales, operations, software and support, and he has supported many high profile artists, producers and touring acts. Les holds degrees covering music, business and recording, and is also a keen guitar player. He was instrumental in driving the inclusion of Mentor A2B interface support in SoundCheck, and has assisted several customers in implementing this feature.

Gregor Schmidle is Product Manager at NTi Audio in Schaan, Liechtenstein. He completed a Bachelor of Science degree at the Interstate University of Applied Sciences of Technology in Buchs, Switzerland in 1992 and a Master of Science degree at the University of Applied Sciences in Dornbirn, Austria in 2004. Gregor has been in the audio and acoustic Test & Measurement industry for 25 years. After working several years at NEUTRIK as a hard and software developer, he continued his career at NTI Audio as an applications support engineer. In his current position, Gregor Schmidle is in charge of NTi Audio's industrial key customers worldwide.

Jacob Soendergaard is an Audio and Acoustics aficionado privileged to be employed in the industry. Receiving a B.Eng from Imperial College and MSc from University of Sussex, Jacob spent the following 7 years working for GRAS Sound & Vibration in a variety of technical and commercial roles focusing primarily on the Consumer Audio and Hearing Health industries. Since Jan 2016, Jacob transitioned to an Account Manager role with HEAD acoustics Inc working with consumer, business, and military customers on the goal of improving audio, voice and conversational quality in their products.

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Tony Spica is a Sales Engineer for Axiometrix Solutions which comprises Audio Precision, GRAS and imc. He has spent over fifteen years in the sound and vibration test industry and has presented seminars on a wide range of topics such as loudspeaker and headphone testing, building acoustics, vibration measurements and general acoustics measurements. In his spare time, he enjoys playing guitar (poorly) and running (slowly).

Steve Temme is founder and President of Listen, Inc., manufacturer of the SoundCheck audio test system. Steve founded the company in 1995, and for the past 20 years the company has remained on the cutting edge of research into audio measurement, regularly introducing new measurement techniques, algorithms and hardware. Prior to founding Listen, Steve worked for many years as an acoustic test and measurement applications engineer at Brüel & Kjær, and also as a loudspeaker design engineer at Apogee Acoustics. He holds a BSME from Tufts University, has authored numerous papers on acoustic testing, and has lectured extensively throughout the world.

Martin Turesson has a master in mechanical engineering from Chalmers University of Technology in Gothenburg and is Head of Thin-ply Carbon Diaphragms at Composite Sound.

Martin Turesson
Head of Thin-ply Carbon Diaphragms (TPCD)

Composite Sound
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Steve Thompson received a PhD in Physics with a dissertation on the sound production mechanism in wind musical instruments. He then worked for over 25 years in industrial R&D developing acoustic transducers, first for naval sonar systems, then for hearing aids and headsets. In 2005 he returned to the academic environment at Penn State University, where he is now a Research Professor in the Graduate Program in Acoustics. He does research on devices and systems using acoustic transducers and occasionally teaches courses on basic and advanced electroacoustic transducer design and analysis.

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Dr. Alexander Voishvillo Fellow at Harman, Acoustics Engineering. He graduated from the State University of Telecommunications in Saint Petersburg, Russia. He worked at Popov Institute for Radio and Acoustics. While there he designed loudspeaker systems and studio monitors and did research on loudspeakers. His PhD thesis was on computer optimization of loudspeaker crossovers. He is the author of numerous publications on transducers and loudspeaker systems including an engineering book on loudspeaker theory and design published in Russia. He is one of leading specialist in design, research, and development of professional transducers. Alexander holds US and international patents on transducers; he has authored publications in JAES, presented numerous papers at AES, ASA, and ALMA conventions, meetings, and symposia. He actively participates in the AES Standard Committee's working group on loudspeaker modeling and measurement, and in the AES Technical Committee on loudspeakers. He is an AES conventions publications reviewer. In 2008 Alexander was awarded AES Fellowship for his advanced work in horn drivers and assessment of nonlinearity in audio equipment. He is a 2012 ALMA Titanium Driver Award recipient, and a recipient of 2019 Harman Awards for technical leadership, inventions and patents. Alexander holds the position of Fellow, Acoustics Engineering at JBL/Harman Professional, and he leads the transducer engineering team.

Bill Whitlock has been designing analog electronics since 1972 and was chief electronics engineer for Capitol Records from 1981-1988 prior to becoming owner and chief engineer of Jensen Transformers 1989-2014. Through his research at Jensen, he's become a widely-recognized expert on AC power, grounding, and signal interfaces. His seminars and lectures at trade shows and universities, including an invited lecture at MIT in 2007, have helped thousands unravel the mysteries of noise and misbehavior in AV and other electronic systems. His writings include numerous AES papers, dozens of magazine articles and white papers, as well as several chapters in Glen Ballou's "Handbook for Sound Engineers." He's a CEDIA-certified instructor, and was voted technical instructor of the year by NSCA students in 2010 and 2011. His five patents include the InGenius® balanced input circuit IC and the ExactPower® high-speed AC voltage regulator. He's a Life Fellow of the Audio Engineering Society and a Life Senior Member of the Institute of Electrical and Electronic Engineers. Bill currently does free-lance consulting from his Ventura, California office.

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SCAN ME

Justin Zazzi is most comfortable with a problem on his mind and tools in his hand. When he does not yet understand something, it pains him (physically) until he solves it. He first attended AISE in 2014 as a student and has attend-ed every year since. He has degree in Mechanical Engineering and is current-ly working on a Master's degree in Acoustics at Penn State. Justin got his dream job as a product design engineer at Eminence Speaker Company, an opportunity that was made possible by a presentation he made a previous AISE event. He has now advanced his dream with a position at Rockford Corp. Justin has been called many things including teacher, Lego commander, and wilderness guide, but his favorite is **Wave Shepherd**.

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By day, **Cristina Downey** is an electroacoustic engineer at Knowles Electronics where she works in R&D for balanced armature devices and on the fringe of perceptual audio. She holds an MS in Acoustics from The Pennsylvania State University, an MFA in Recording Arts & Technologies from Middle Tennessee State University, and a BS in Metallurgical & Materials Engineering from Colo-rado School of Mines. By night she functions as a freelance recording and mix engineer with fluency & proficiencies spanning the breadth of large format analog consoles and 24-track tape to in-the-box processing and sound synthesis. In between working on technical audio projects, she continues working with select patient artists of various genres with the antici-pation of building a studio in the Chicago area within the next 5 years.

Tom Miller is an Engineering Fellow at Knowles Electronics, a title he has earned by succeeding in hanging out there for over a quarter century. Over those years he has helped to create many of Knowles' balanced armature receiver designs and has been granted over a dozen patents. More recently he has been studying how Knowles microphones and receivers affect system level issues, such as the control of wind noise pickup and active noise cancel-lation. Tom is an AES Fellow, a former Regional Vice President of the AES, and has held every local office except treasurer. Back in a previous century when LP's were king and were sold in places called record stores, Tom obtained a Bachelor's degree in Electrical Engineering from the University of Michigan. Upon graduation, he worked for a dozen years as chief technical engineer of Uni-versal Recording, a major Chicago recording studio in its day. After that, he spent a few years working on signal processing for loudspeakers at International Jensen before moving on to Knowles Electronics. In his spare time he creates electronic music under the name Shadreaux (shameless plug - Bandcamp).

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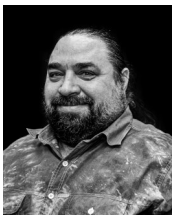

Benny Danovi is Principal Transducer Engineer at Resonado Labs where he spearheads the expansion of the company's proprietary Res-Core transducer architecture. A highly experienced acoustic transducer engineer with nearly four decades in the industry, Danovi held previous roles at Sonos, Pioneer and Harman, where he designed over 100 automotive OEM drivers under brands such as Bowers & Wilkins, Harman Kardon, JBL, Mark Levinson, and Revel, many with unique motor and suspension topologies. Danovi also previously led OEM automotive transducer design at Alpine and worked on collaborations with brands such as McIntosh and Sonus Faber.

Paul Vedier received his Bachelor of Science in Acoustics at Columbia College Chicago and earned his Masters in Acoustics from the University of Salford U.K., where he specialized in transducer design, digital signal processing, and psychoacoustics. Paul is now based out of Resonado Labs' headquarters in Chicago, Illinois. As Lead Transducer Engineer at Resonado Labs, Paul leads a number of the transducer designs for commercial transducer platforms through electromagnetic, mechanical, and acoustic simulation. Paul is also at the forefront of further transducer innovation within the Resonado Labs research and development team.

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Barry Vogel

CEO's Message

Just saying "Welcome Back" just doesn't seem like it's enough. After 2 years of delays and cancellations due to the global pandemic, it feels like much more than 2 years. And even if 2022 is not a complete return to "normal", it is a vital step in that direction. Indeed, ALTI is fully engaged in designing an association that will embrace what normal will look like going forward. Not just because of Covid, but because of the changing expectations that our Members and the industry will demand of associations to accomplish their needs and goals. Watch our newsletter in the months to come for more on this. As always, I welcome your ideas and observations.

A huge thank-you to our Sponsors, our Exhibitors, and our Presenters for stepping up to make this event happen. Speaker Builders Workshop is back with new content and new presenters. Many new presenters are here. Education and information sharing is at the very core of ALTI. *Always.*

ALTI will introduce the completely revamped and renewed **ALMA Awards** with our co-sponsor **AudioXpress.** A global association must present a global approach to recognizing the industry's best. Be sure to attend our Banquet on Sunday evening for details.

In the meantime, please enjoy **ALTI-EXPO** and feel free to call upon us if we may help you to make your time with us more productive and enjoyable.

Barry