



SEMINAR INVITATION

LOUDSPEAKER DESIGN FOR SMART SYSTEMS MODELING, MEASUREMENT, CONTROL

This seminar is based on selected material of the module *Electro-Acoustics* at the Dresden University of Technology.

PRESENTED BY: **Prof. Dr. Wolfgang Klippel, KLIPPEL GmbH**

DATE: JANUARY 11TH AND 12TH, 2018. SEMINAR BEGINS AT 9AM BOTH DAYS.

LOCATION:

**Harman Northridge Experience Center
8500 Balboa Boulevard Northridge, CA 91329**

REGISTRATION FEE: \$350

(SEE BELOW FOR SPECIAL HOTEL OFFER)

Space is limited so register early!

CONTACT INFORMATION:

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ABSTRACT:

Digital signal processing used in active loudspeaker systems creates new degrees of freedom in the design of the Electroacoustical transducer to increase the efficiency and maximum output while decreasing size, weight and cost. Adaptive nonlinear control can compensate actively for loudspeaker nonlinearities and protect the transducer from mechanical and thermal overload. The seminar presents the theoretical basis for understanding the transducer in the small and large signal domain considering the modal vibration, the dominant nonlinearities inherent in loudspeakers and the heating process. The seminar makes the relationship between symptoms and physical causes of the distortion more transparent and addresses the perceptions of various signal distortion. Attendance is highly recommended for transducer and system engineers in the audio industry active in research and development, manufacturing and quality control.

CONTENT:

ELECTRO-ACOUSTICAL MODELLING:

- Fundamentals - transduction, vibration, radiation
- Abstraction - models with lumped and distributed parameters
- Small Signal Performance - linear approximation and transfer function
- Large Signal Performance - thermal dynamics and nonlinearities
- Time-varying properties - influence of climate and aging



MEASUREMENTS AND ANALYSIS:

- Persistent excitation - artificial and natural stimuli
- Monitored signals - electrical, mechanical and acoustical sensors
- Complex structures - digital and analogue components
- Sound field - measurements in the near and far field
- Interaction with the room - direct and diffuse sound part
- Measurement time - ultra-fast and long-term (power) testing
- Distortion analysis - linear and nonlinear components
- System identification - optimal fitting and parameter estimation
- Transformations - Fourier, wavelet and perceptual modelling
- Data compression - separation of unique and redundant information

INTERPRETATION AND DIAGNOSTICS:

- Interpretation - measured symptoms and physical causes
- Perception - audibility and impact on perceived sound quality
- Evaluation - selection of optimal drive units for system design
- Specification - minimal but comprehensive set of data
- Tolerances - variation of parameters and influences

NEW TOPICS ADDRESSED THIS YEAR:

- Micro-speakers
 - Root cause analysis of rocking modes (mass, stiffness, BI)
 - Measurement of the nonlinear stiffness and damping of diaphragms
 - Air nonlinearities in leaky boxes
 - Distortion generated by nonlinear cone vibration
 - Experimental modal analysis
- Simulation
 - Thermal simulation of loudspeakers systems with time lapse technique
 - Auralization of loudspeaker distortion
- Holographic measurement of loudspeaker directivity in 3D Space
 - Measurement of transducers mounted in baffles
 - Distributed sound sources (line arrays)
 - Personal acoustic zones
- Active control of loudspeaker systems
 - Overview mechanical protection schemes
 - How to specify protection parameters?

REGISTRATION BELOW
(Please note hotel and special offer below)



Registration (please print or use e-form, registration closes December 27, hotel reservations separate and the responsibility of attendee- see below):

Organization:

Attendee (please include email):

Does attendee require special accommodations or have specific food allergies/requests?

Visa/Amex:

CC#:

Expiration:

Security Pin#:

Name as it appears on card:

CC Billing Address

Please submit registration to:
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***Hotel**

Hilton Woodland Hills/Los Angeles

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Please use this link to reserve your room now by December 27th:

<http://www.hilton.com/en/hi/groups/personalized/B/BURWCHF-WW118-20180110/index.jhtml>

*Free Breakfast and WiFi both days!