

CJS Labs

Technology · Research · Strategy · Solutions

Lab Notes



Electroacoustics & Audio

- Consulting
- Design / Testing
- Training

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Training Services

CJS Labs offers customized in-house training. Our design experience, proven processes, and measurement expertise will make your product development more efficient. Learn how to optimize both your designs and test routines. Having a thorough understanding of fundamentals, correct terminology, and proper techniques will also enable you to make more informed decisions and communicate more effectively with your customers and vendors as well as within your own organization. Understand why certain failure modes are problematic, even if they are not obvious or audible. Sample course outlines and details are available on our website:

http://www.cjs-labs.com/training_seminars.html

Contact us to schedule a training course for your organization.

Loudspeaker Design Tutorial at AES 146th in Dublin, Ireland

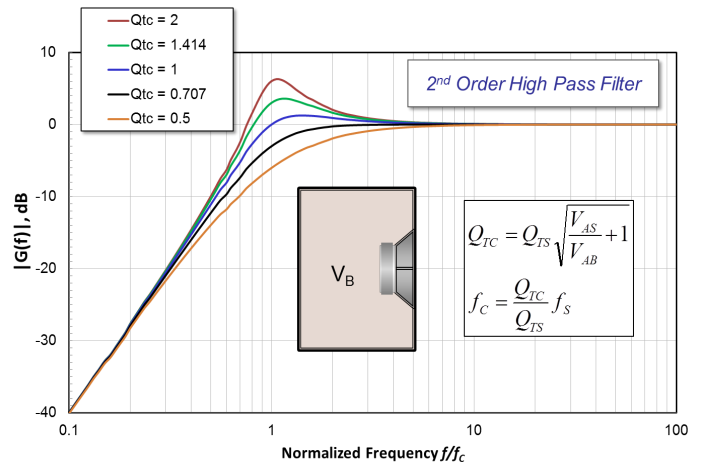
The AES 146th Convention takes place 20-23 March 2019 in Dublin, Ireland.

<http://www.aes.org/events/146/>

On Thursday, 21 March 2019, I will be presenting a tutorial entitled “Almost Everything You Ever Wanted To Know About Loudspeaker Design”:

<http://www.aes.org/events/146/tutorials/?ID=6597>

The session is T-17 taking place at 12:45. I hope to see you there!



News and Upcoming Events

Standards Meetings at ASA in Louisville, KY

ASACOS and the S-Committees will meet at ASA in Louisville, KY which takes place 13-17 May 2019.

<https://acousticalsociety.org/asa-meetings/>

Please contact us if you plan to attend and would like to set up a meeting.

Fundamentals of Electroacoustics—Santa Clara, CA

The 1-day *Electroacoustics* training course on held in Santa Clara, CA in February

in conjunction with Listen, Inc. was a huge success, with over 40 attendees. The psychoacoustics module now features live sound demonstrations. The sessions were lively with lots of questions from the participants

ASA Standards Video

A short video I produced giving an overview of the ASA Standards Program is now posted on the ASA Standards homepage:

<https://acousticalsociety.org/acoustical-society-standards/>

Please contact us and let us know how we can be of service to you and your organization.

Christopher J. Struck
CEO & Chief Scientist

CJS Labs





CJS Labs

“Sound Advice Spanning 3 Decades”

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CJS Labs is a consulting firm based in San Francisco, CA. We specialize in audio and electroacoustics applications. With over 30 years of industry experience in engineering and technology management, our areas of expertise include transducers, acoustics, system design, instrumentation, measurement and analysis techniques, hearing science, speech intelligibility, telephony, and perceptual coding. We also offer project management, technology strategy, patent & IP evaluation, and training services

Back issues of Lab Notes are available on our website at:
http://www.cjs-labs.com/lab_notes_links.html

Shotgun Microphone Directivity

The interference tube or “Shotgun” microphone is a specialized, high directionality device used to pick up distant on-axis sounds and reject off-axis noise.

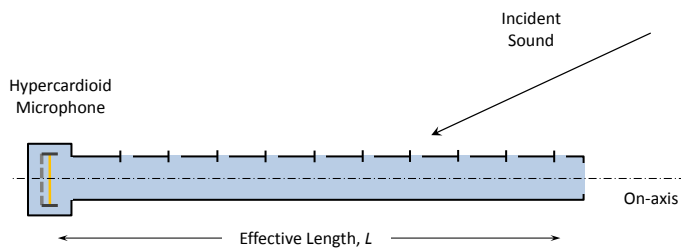


Fig. 1 Shotgun microphone.

For sound arriving on-axis, the signal will be the in-phase sum of all contributions from the various openings along the length of the tube. For off-axis sound, phase cancellation will occur due to the differences in the individual path lengths. The acoustic impedance at each opening is adjusted so that sound entering the tube does not exit at the next opening, but instead propagates along the length of the tube to the first order directional microphone element, usually a hypercardioid.

The polar response for a shotgun microphone with an effective tube length of 0.3m is shown in Fig. 2.

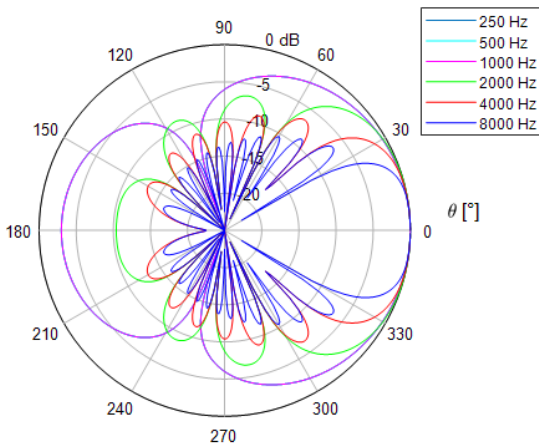


Fig. 2 Polar response of 0.3m shotgun microphone.

The system is effectively a summing array. The net sum of the contributions along the length of the shotgun tube as a function of wavelength and angle of incidence yields the polar response of the shotgun microphone for a given effective length, L

$$\rho(\theta) = \frac{\sin\left[\frac{\pi}{\lambda}(L - L\cos\theta)\right]}{\frac{\pi}{\lambda}(L - L\cos\theta)}$$

The tube acts to increase the directivity of the first order microphone element above the frequency $f_0 = c/2L$. Below this frequency, the device is essentially only the first order directional microphone.

The Directivity Index and Distance Factor for the 0.3m shotgun microphone are shown in Fig. 3.

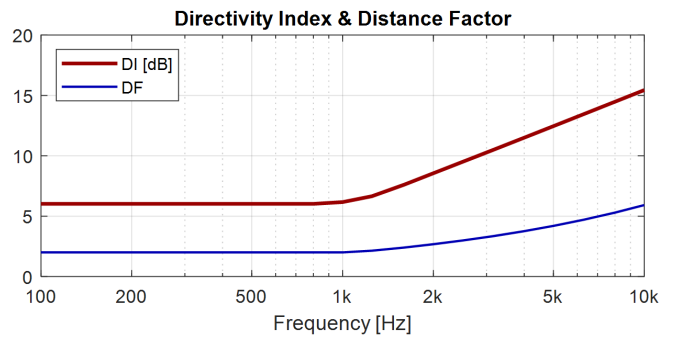


Fig. 3 DI and DF of 0.3m shotgun microphone.

The shotgun microphone is typically used in broadcast journalism, live sporting events, film, video, and surveillance applications.

Please contact us for more information.