Testing Quality of Microphones

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Virtual ALTI-EXPO 2020

INTRODUCTION

Covered Topics

- Motivation & Scope
- Microphone Technologies
- Test Parameters
- Sound Source
- Test Box
- Practical Demonstration
- Q&A

Duration approximately 25 minutes

Gregor Schmidle

Markus Becker

MOTIVATION & SCOPE

Everybody and now everything is listening

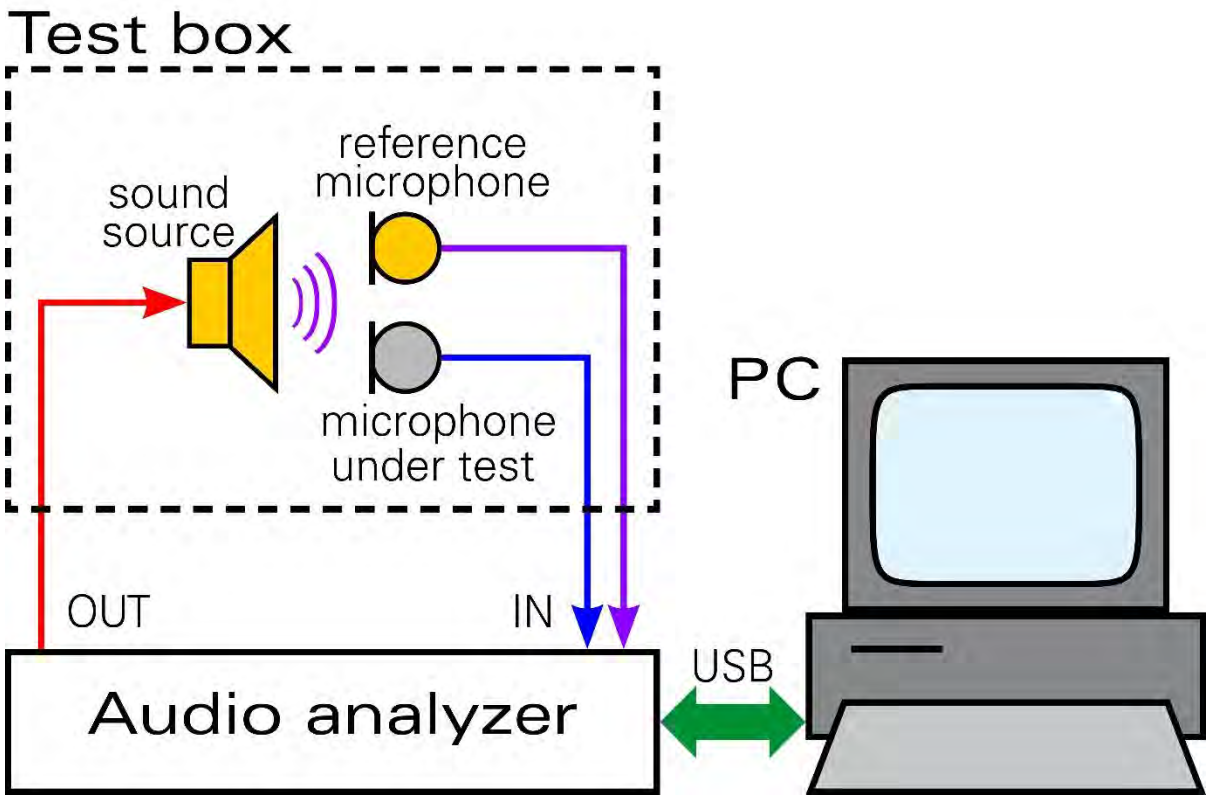
- Traditional products like your phone
- Your car
- Digital assistance systems
- Household appliances
- …

MOTIVATION & SCOPE

Microphone Cluster

- Voice Recognition
- Beamforming
- Active Noise Cancellation
- Echo Reduction

Basic Test Concept



MICROPHONE TECHNOLOGIES

Dynamic Microphones

- Live & Event Sound
- Robust

MICROPHONE TECHNOLOGIES

(True) Condenser Microphones

- Studio / Recording
- Measurement applications

MICROPHONE TECHNOLOGIES

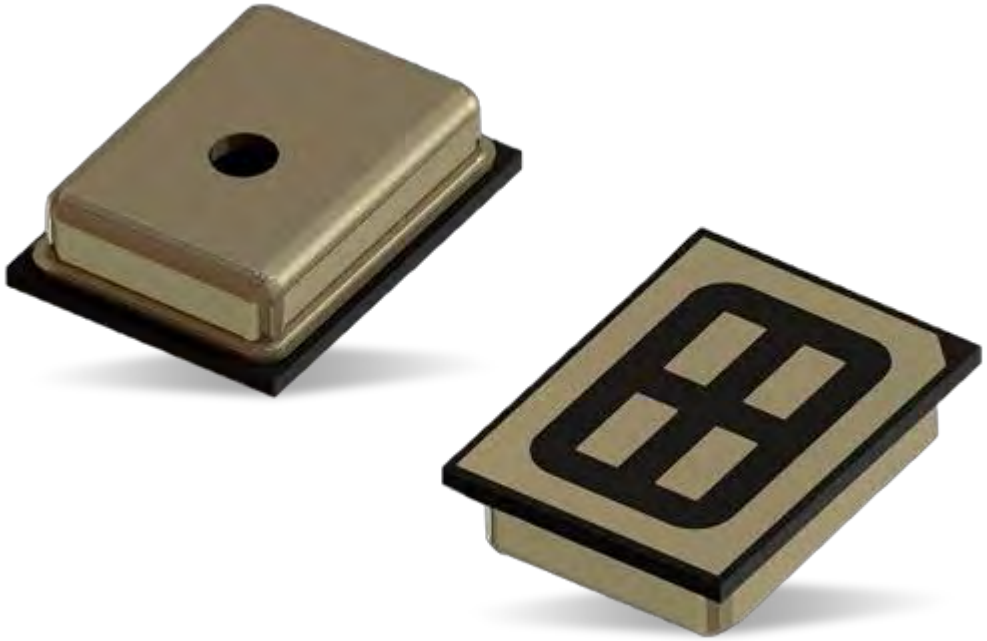
Electret Microphones

- Low cost
- Consumer products
- Automotive

MICROPHONE TECHNOLOGIES

MEMS Microphones

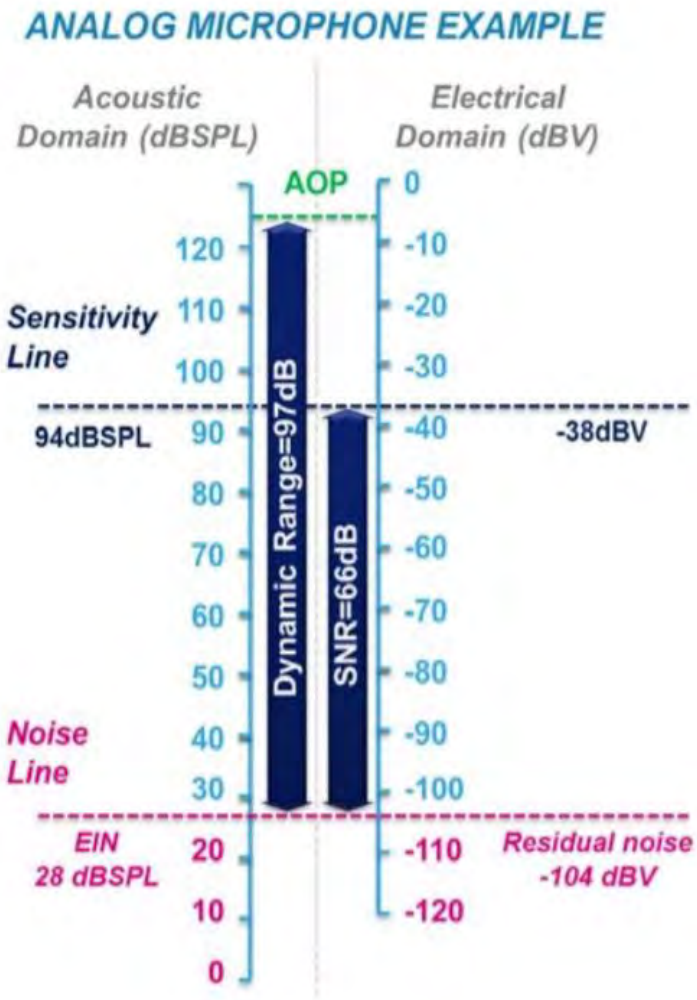
- ½ cycle PDM digital output
- Smart devices
- Automotive



TEST PARAMETERS

Sensitivity (analog)

- mV/Pa
- dBV/Pa

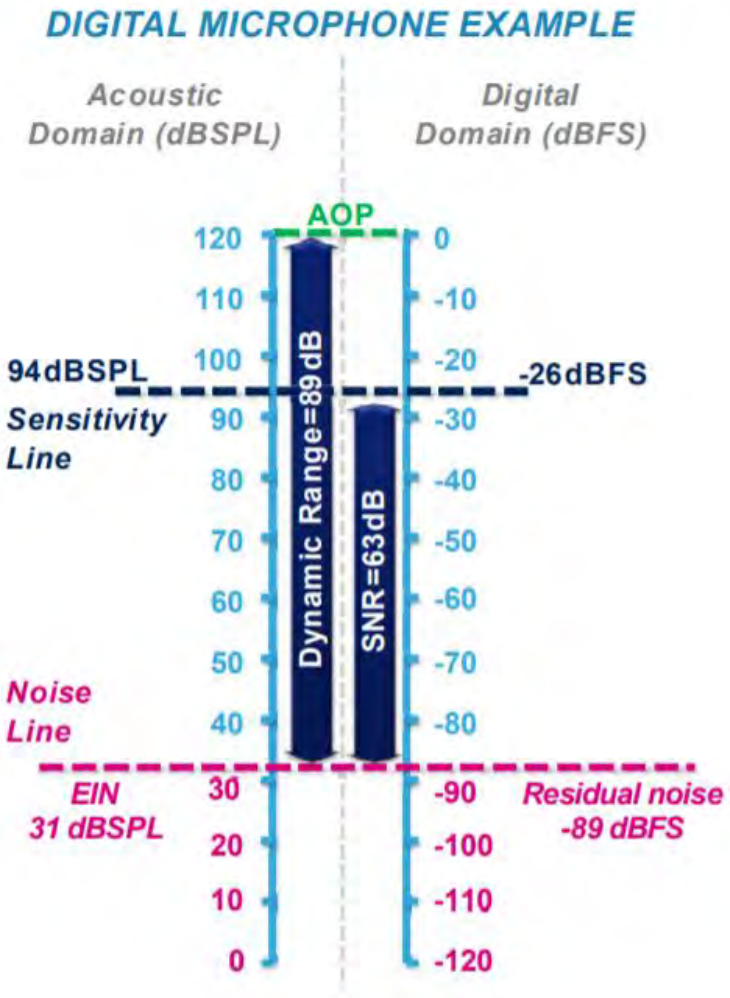


Source: STMicroelectronics www.st.com

TEST PARAMETERS

Sensitivity (digital)

- dBFs
- Sensitivity Span

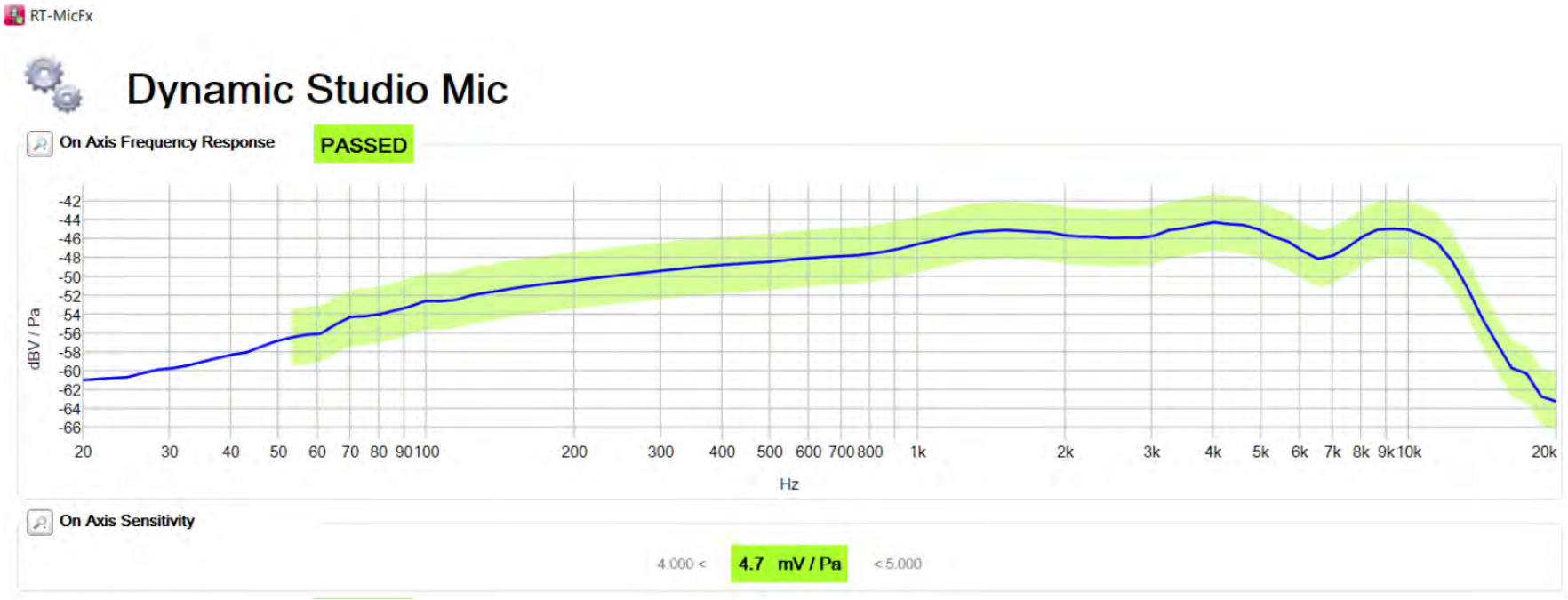


Source: STMicroelectronics www.st.com

TEST PARAMETERS

Frequency response

- dBV/Pa (absolute)
- dB (relative, to e.g. 1kHz)



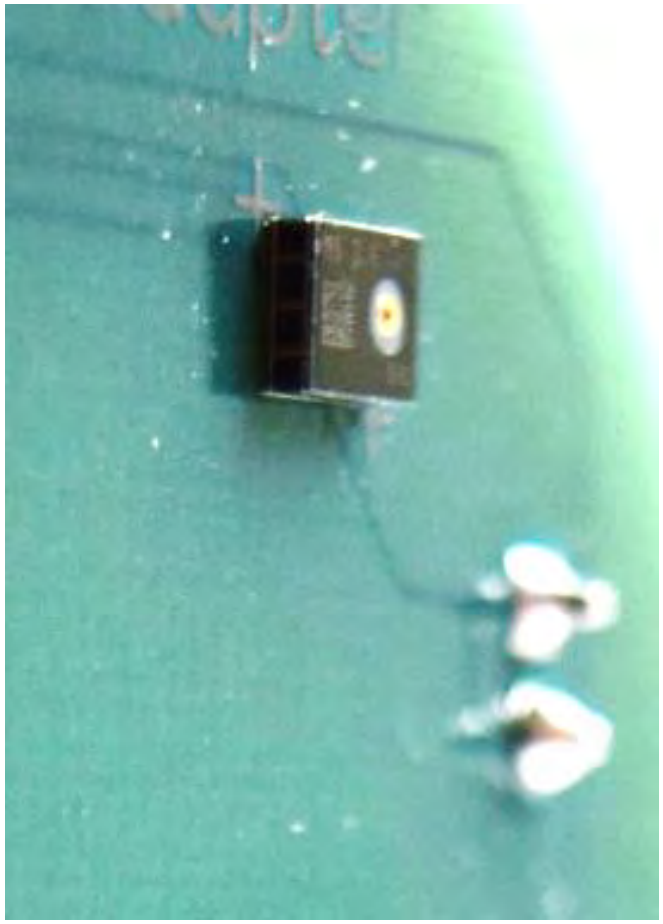
TEST PARAMETERS

Distortion

- Response or single frequency
- SPL (THD = 1%) > 106 dBSPL

Signal to Noise Ratio (SNR)

- Difficult to test in manufacturing environment



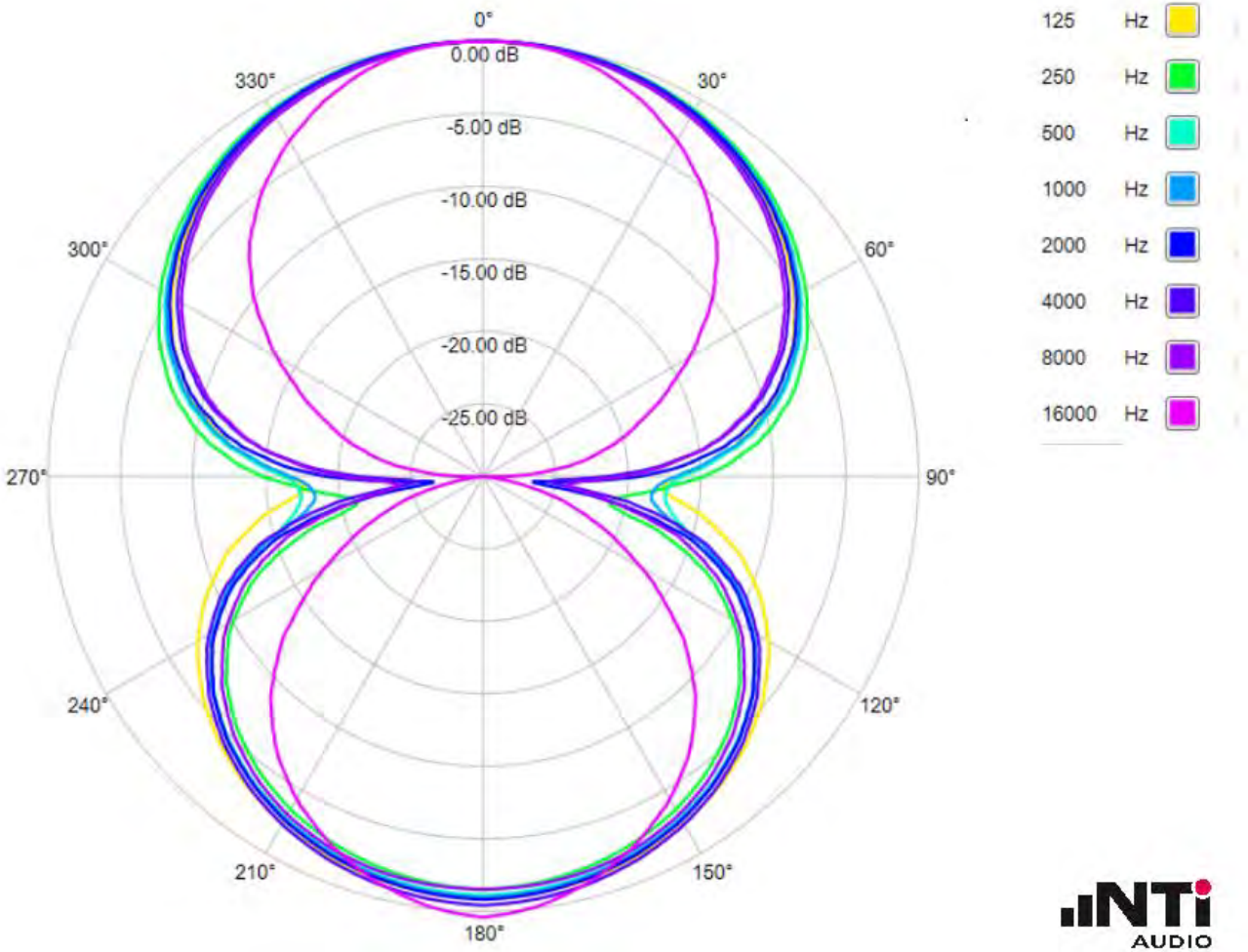
Polarity & Phase

- Phase span within one module

TEST PARAMETERS

Off-Axis measurements

- Directional behavior of microphones



SOUND SOURCE

Qualities

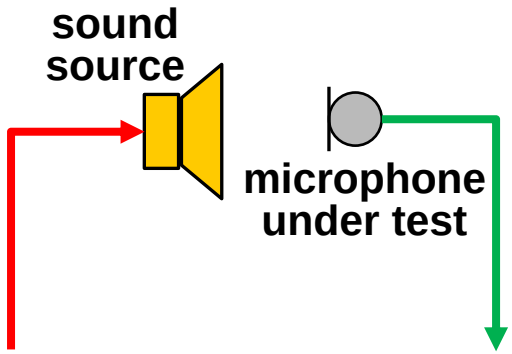
- Homogenous dispersion of sound
- Sufficient bandwidth / SPL / Low Distortion
- Flat response

- Wideband application
  - Coaxial design studio monitor

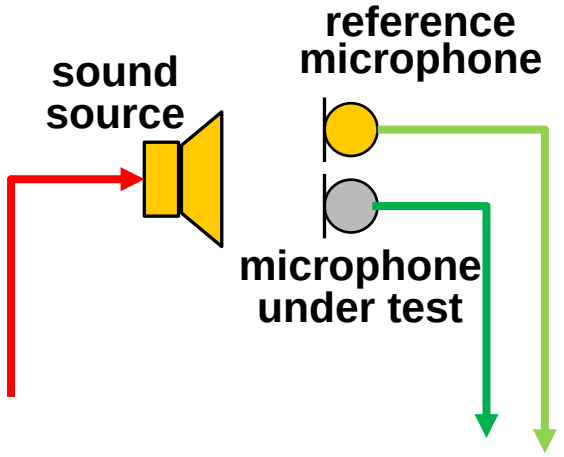
- Voiceband application
  - Calibrated active loudspeaker

Sound Source Control

- Needs to be calibrated and/or permanently controlled
  - Periodic calibration with reference microphone

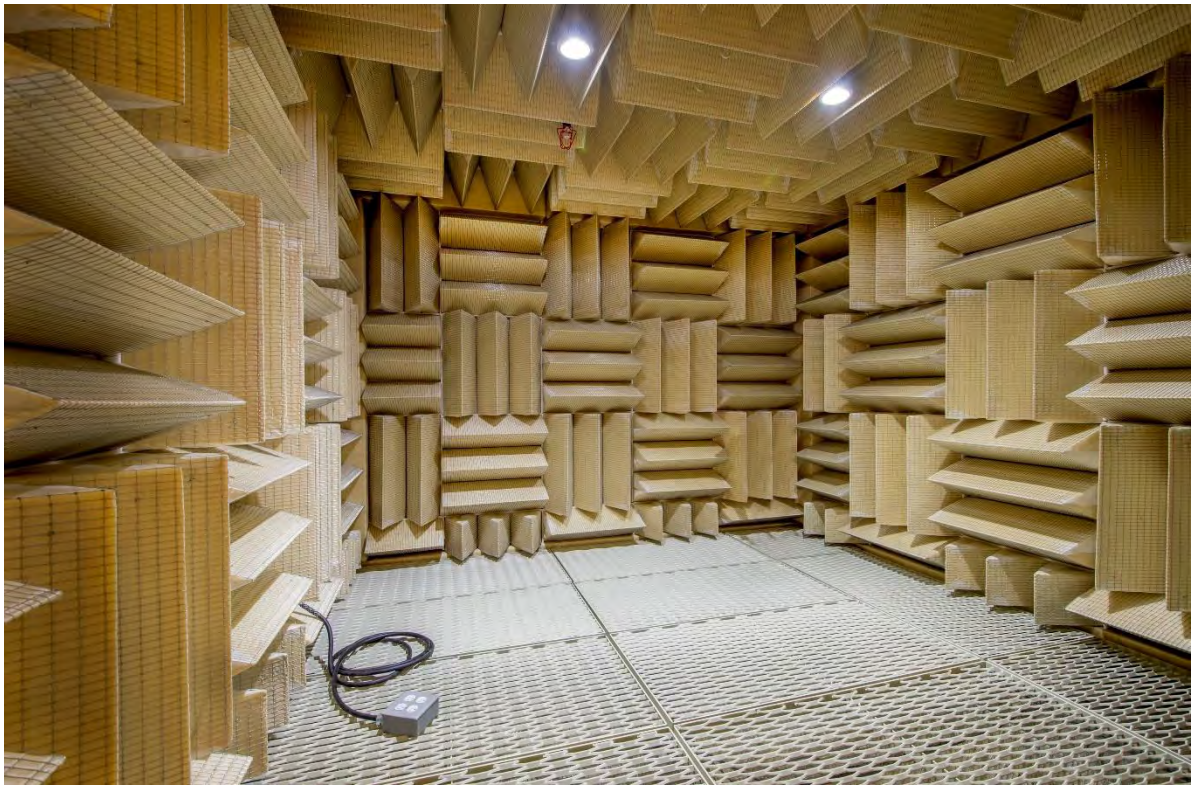


  - Permanent control with reference microphone



Acoustic Test Environment

- Accurate and repeatable results
- Requirements
  - Sufficiently low noise floor
  - Non reverberant environment
  - Repeatable positioning of microphones

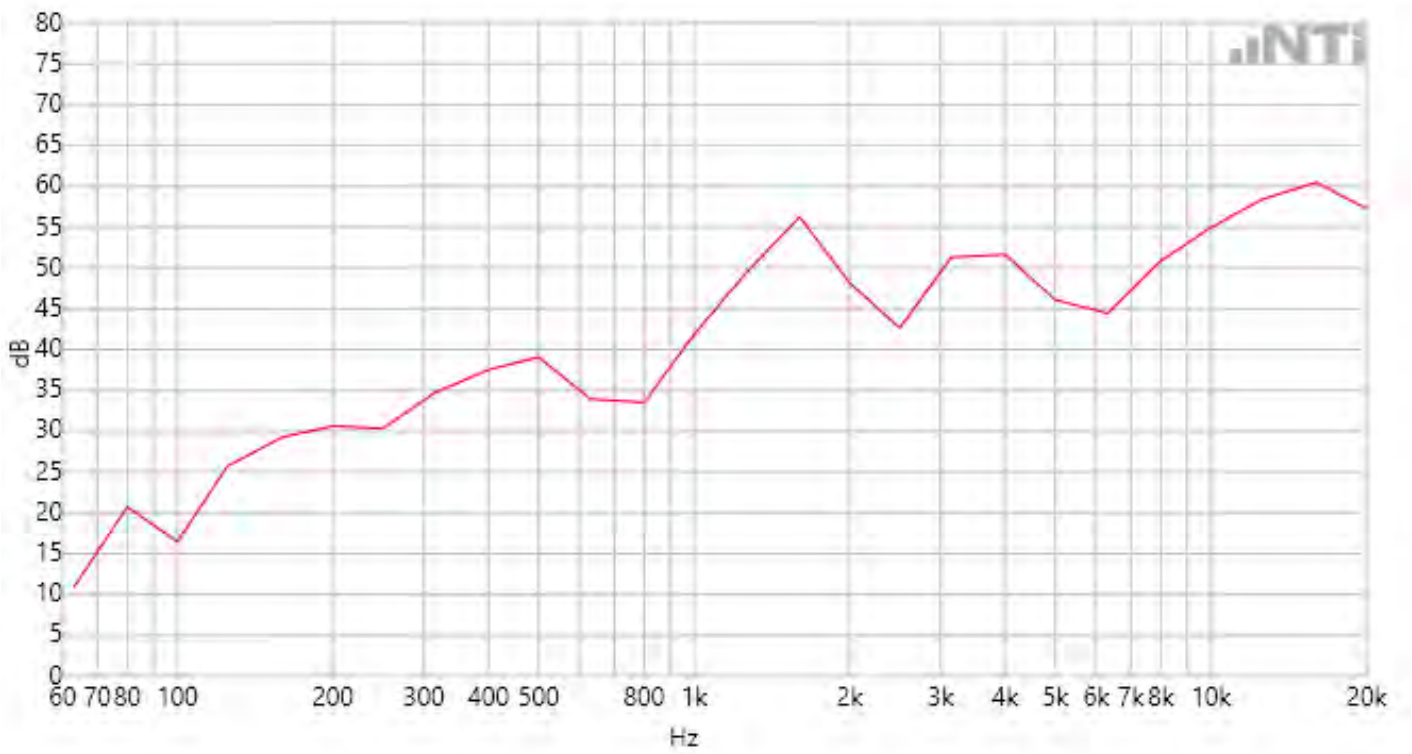


Acoustic Test Box Implementation

- Lab & QC use
- Automotive customer

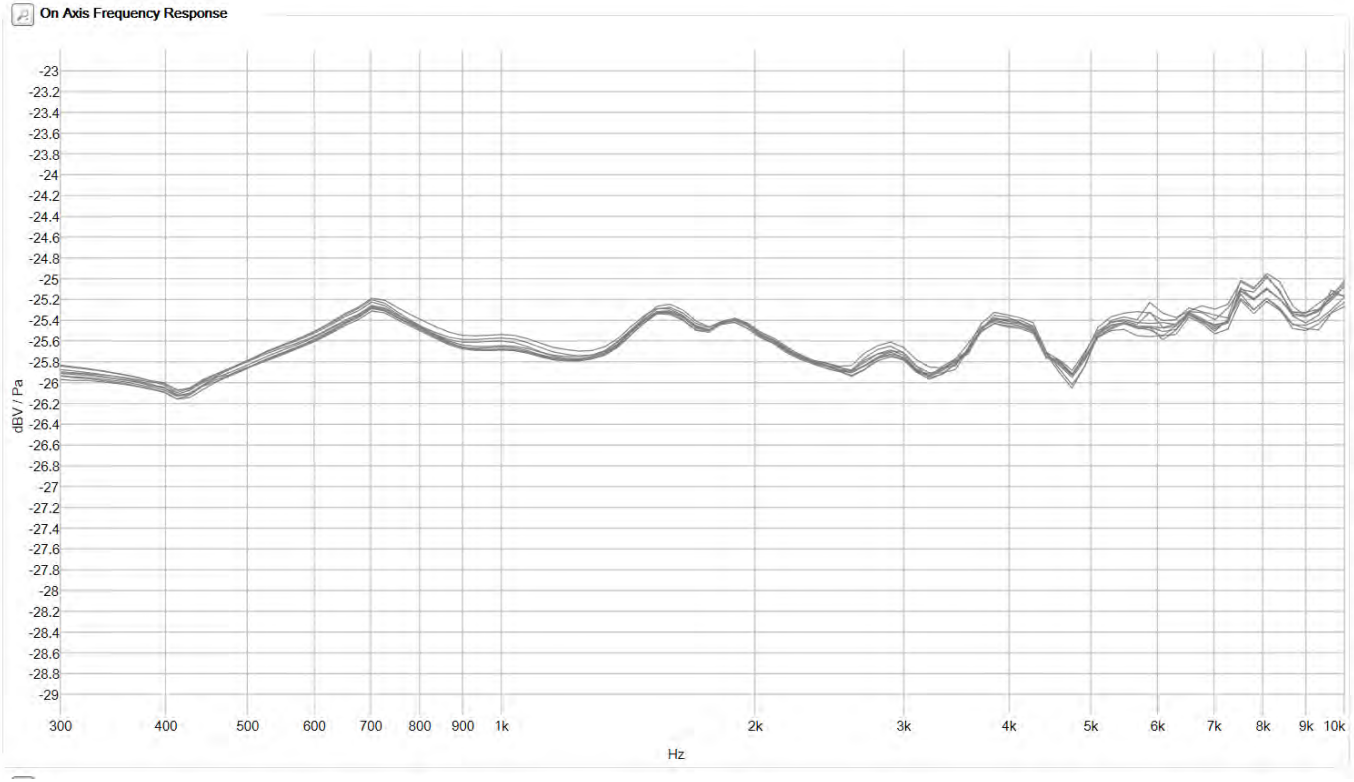
Acoustic Test Box Implementation

» Insertion loss vs. frequency



Acoustic Test Box Implementation

- Frequency response repeatability (same microphone 10 times repositioned)



PRACTICAL DEMONSTRATION

Live Demo

QUESTIONS AND ANSWERS

- Questions are welcome! Please use the Webinar Chat function.
- info@nti-audio.com

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