

An Acoustic Coupler for Bone Conduction Calibration

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AMWARE –
Self-Calibrating Audiometer

An Acoustic Coupler for Bone Conduction Calibration

THE CALIBRATION of the bone conduction system of an audiometer has been a problem to the clinical audiologist for years. The basis for this problem has been the lack of a reliable instrument for measuring the output of the bone vibrator.

Olsen WO. 1967. Artificial mastoid calibration of bone vibrators. Arch Otolaryngol 85, 100-104.



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“Basic to the design of an artificial mastoid is the fact that the bone vibrator must be placed on a material or device that will simulate, accurately and reliably, the mechanical impedance of the skin, flesh, and bone of the human mastoid” (p. 248).

Sanders JW, Olsen WO 1964. An evaluation of a new artificial mastoid as an instrument for the calibration of audiometer bone-conduction systems. J Speech Hear. Dis. **29**, 247-263.

The artificial mastoid “must present to the bone vibrator under test the same mechanical impedance as average human mastoid over the required frequency range ...

Whittle LS (1970). Problems of calibration in bone conduction. British J Audiol 4, 35-41.



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Goals of Bone Conduction Calibration

- Insure that the stimulus levels (in dB HL) comply to standards
 - Stability
 - Cost
 - Accessibility
 - Convenience

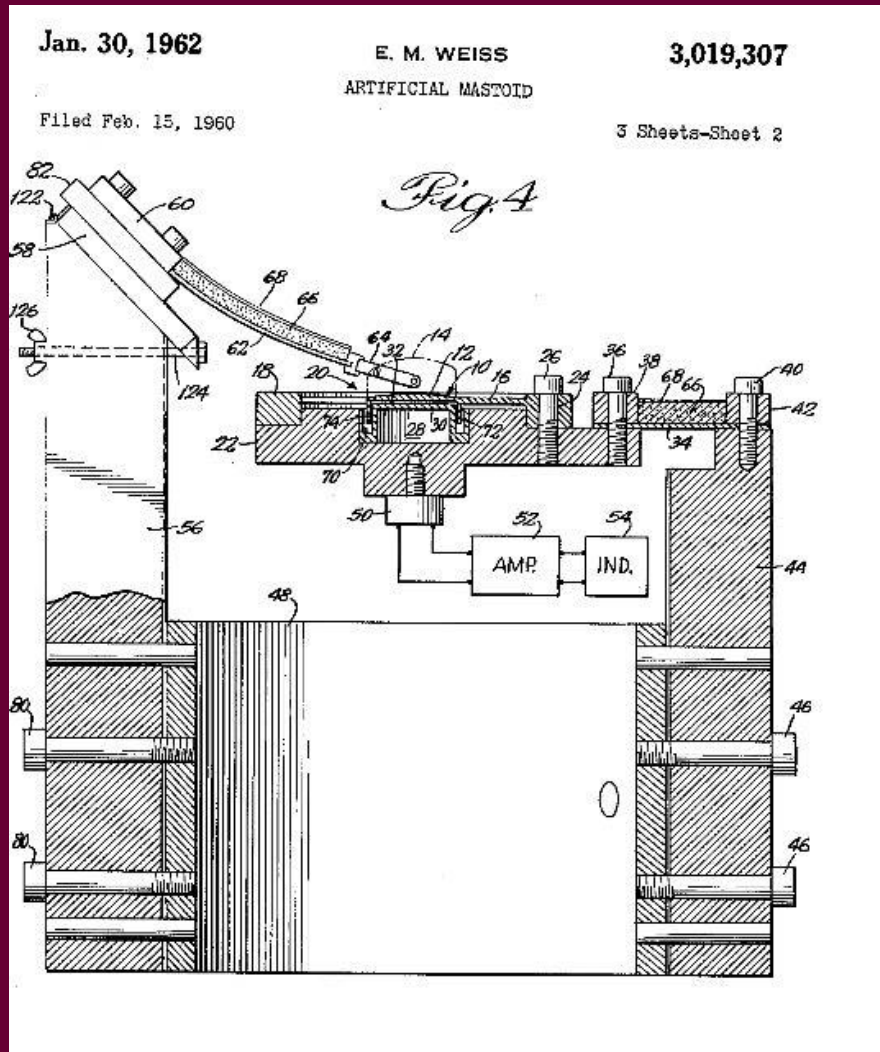
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Fact and Must

The bone conduction calibration system **must** provide a stable, repeatable measurement of the signal level delivered by the bone vibrator that can be related to the normal threshold of hearing at each frequency.

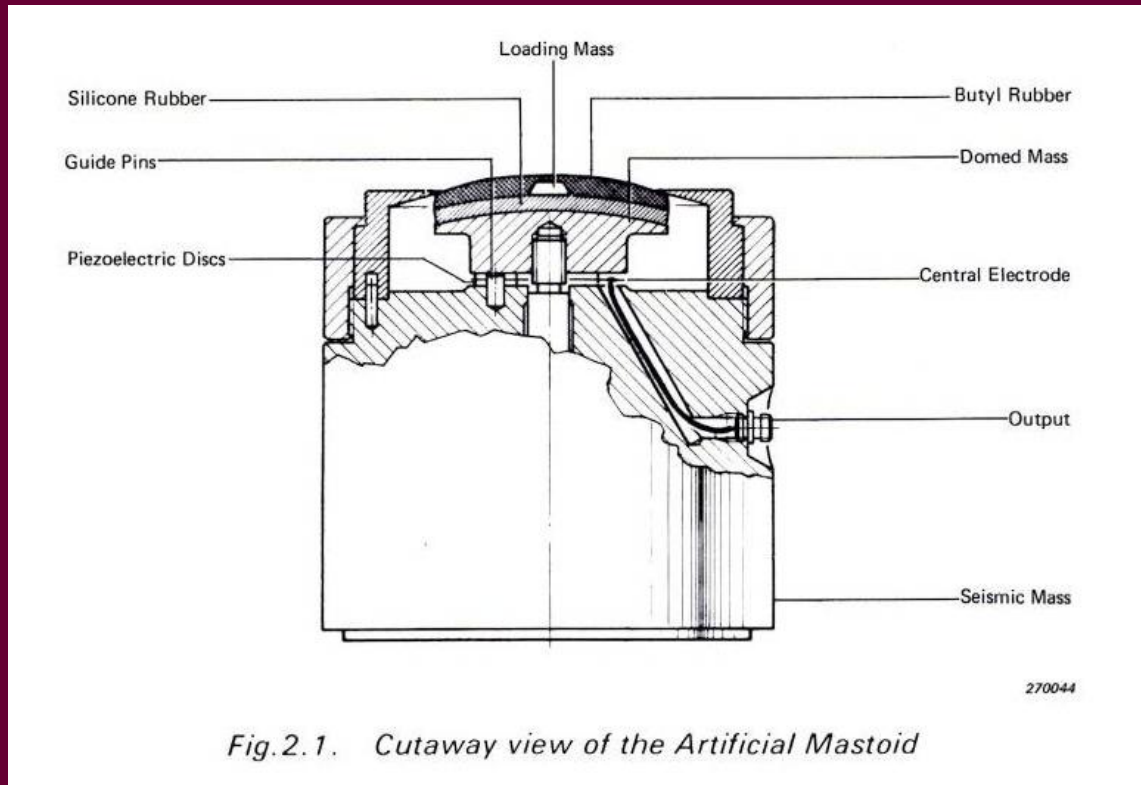


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Beltone 5A Artificial Mastoid

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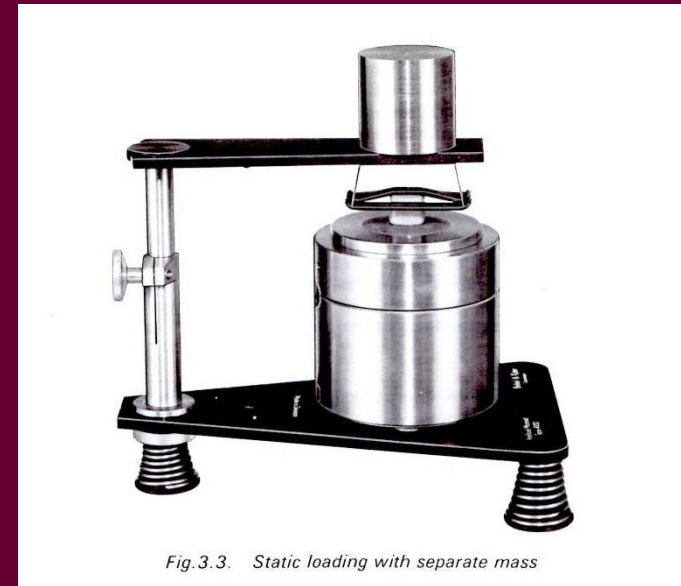
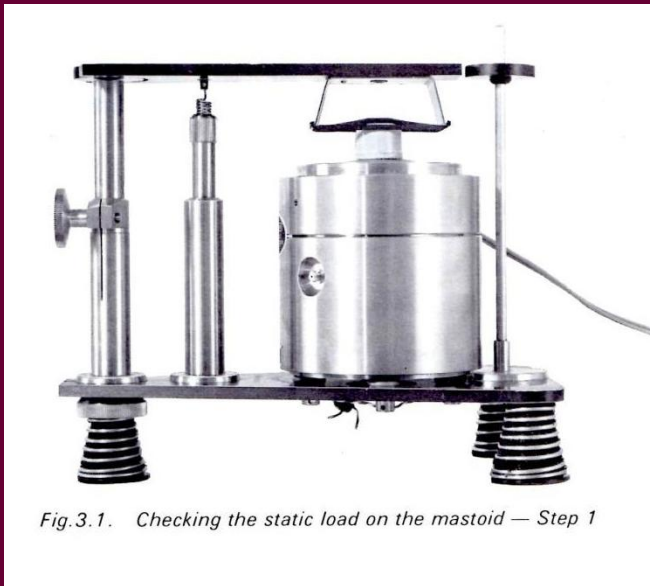
Bruel & Kjaer Type 4930 Instruction Manual

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Brüel & Kjær Type 4930 Artificial Mastoid

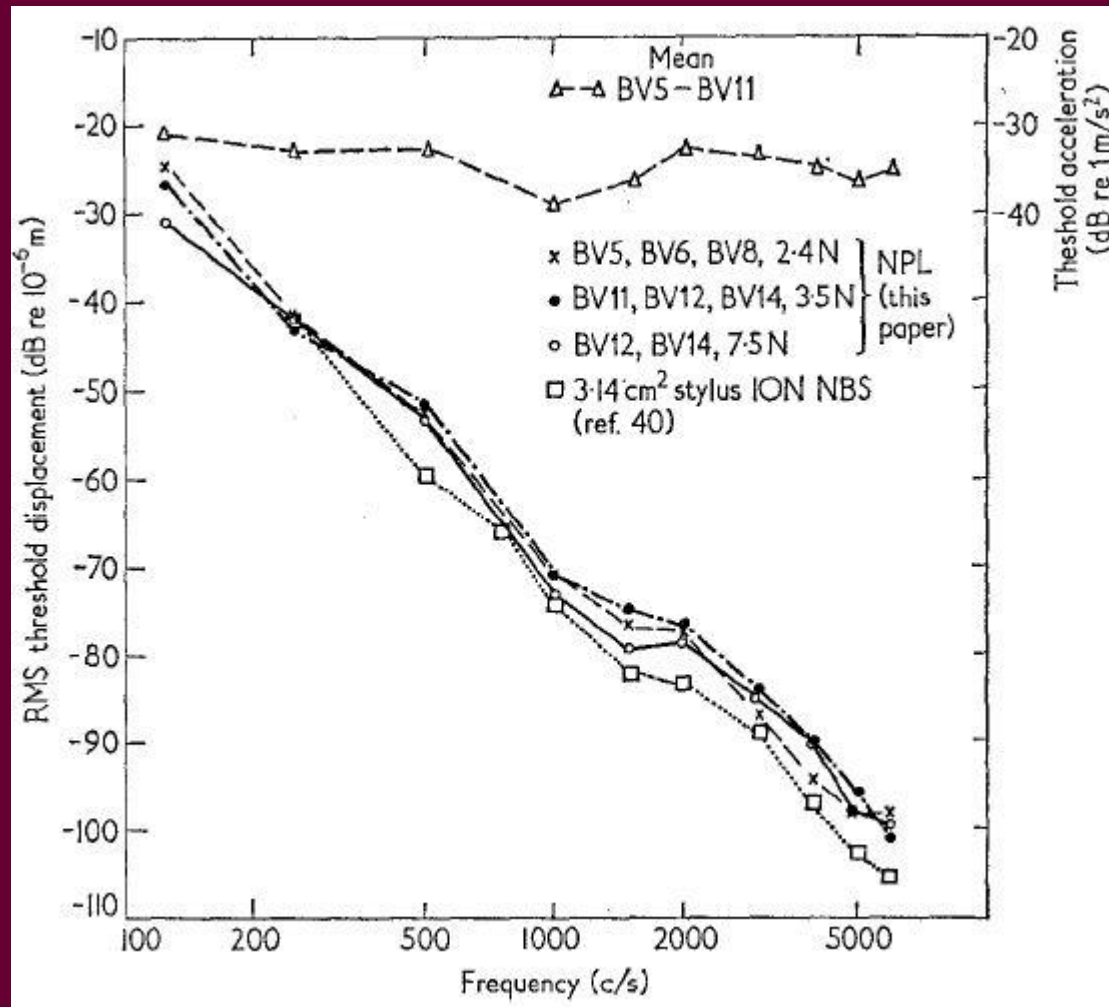


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Bruel & Kjaer Type 4930 Instruction Manual

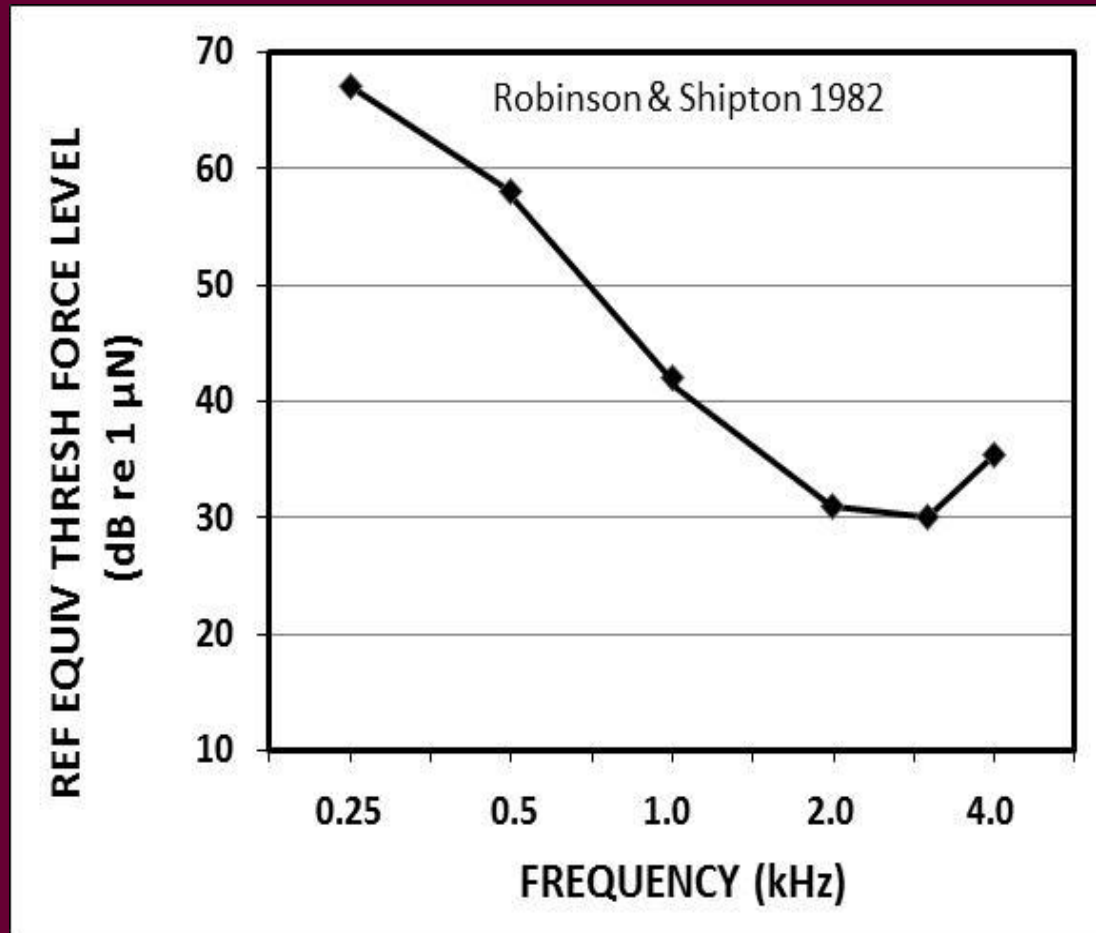
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Whittle 1965

NPL Artificial Mastoid

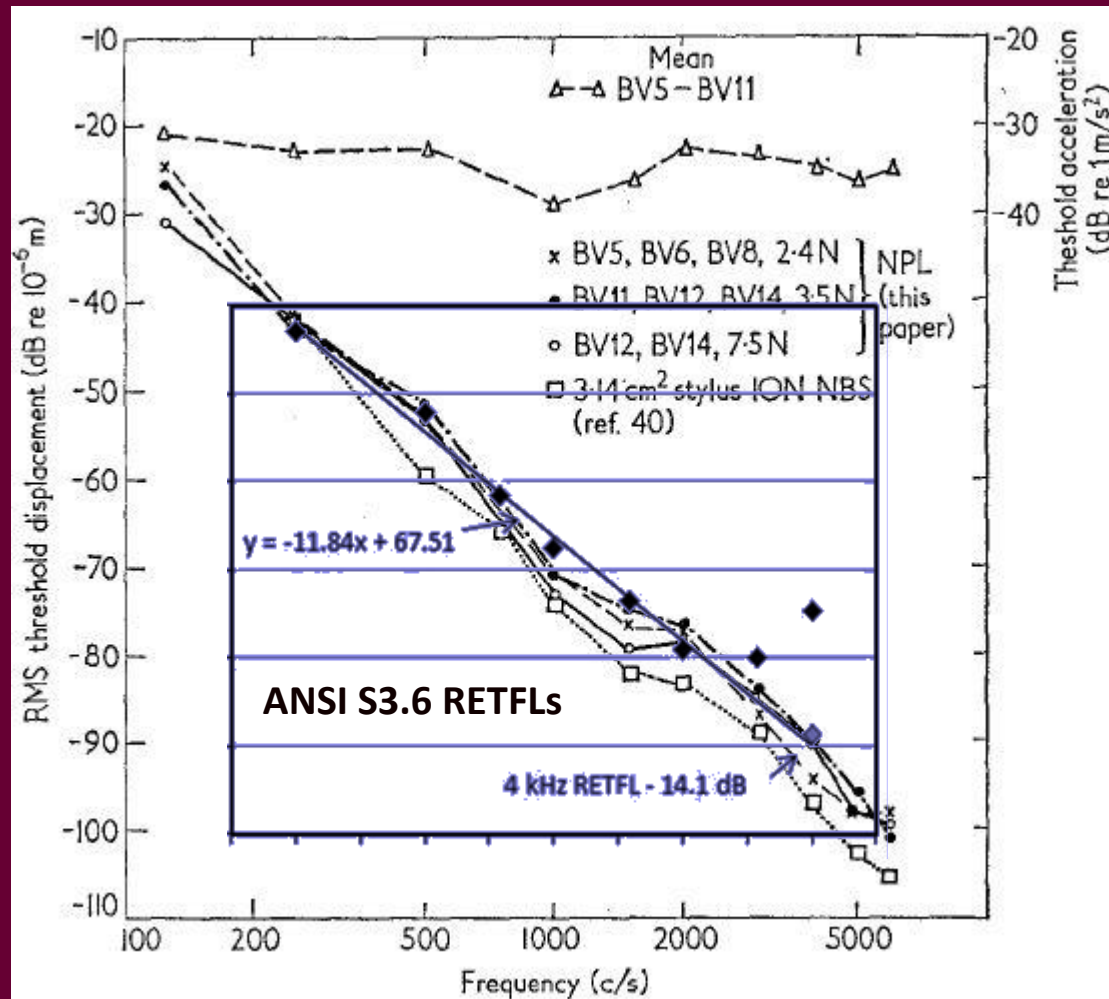
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Robinson & Shipton 1982

B&K Artificial Mastoid

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Whittle 1965



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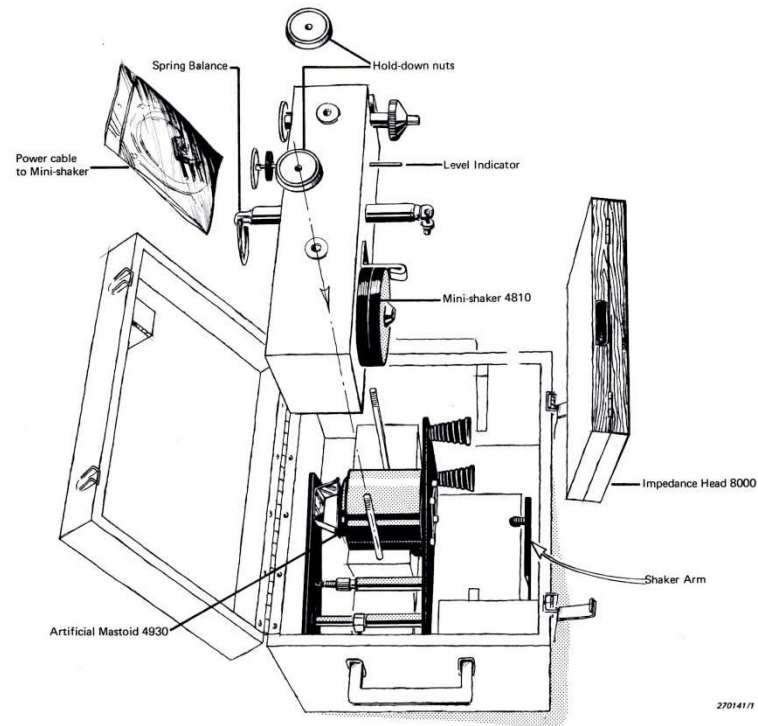


Fig. 4.2. Sketch showing how the Calibration Set fits into its carrying case

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AMBONE

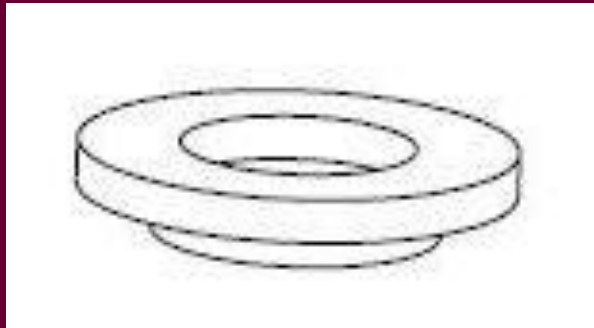
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Acoustic method for calibration of audiometric bone vibrators

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University of Minnesota. Department of Otolaryngology, MMC 396, Minneapolis, Minnesota 55455

J. Acoust. Soc. Am. 131 (2), February 2012



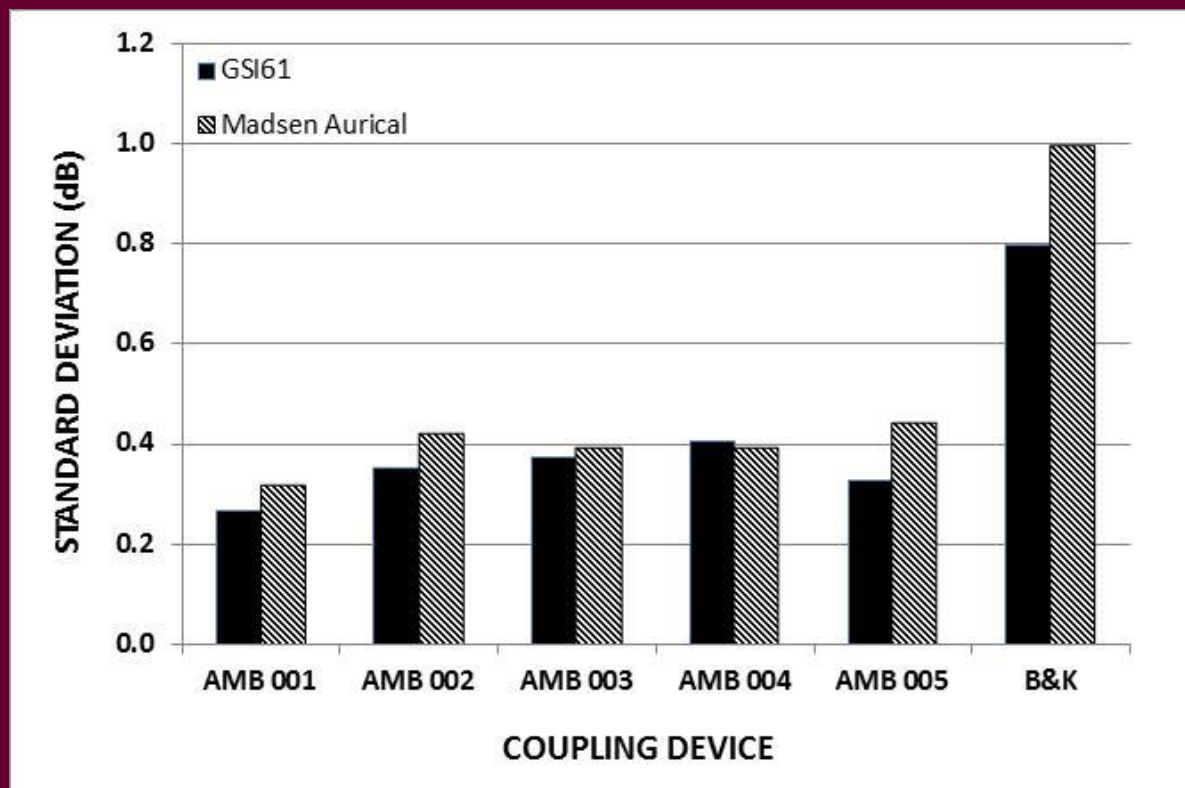
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AMBONE

Acoustic Method for Calibration of Bone Conduction Vibrators

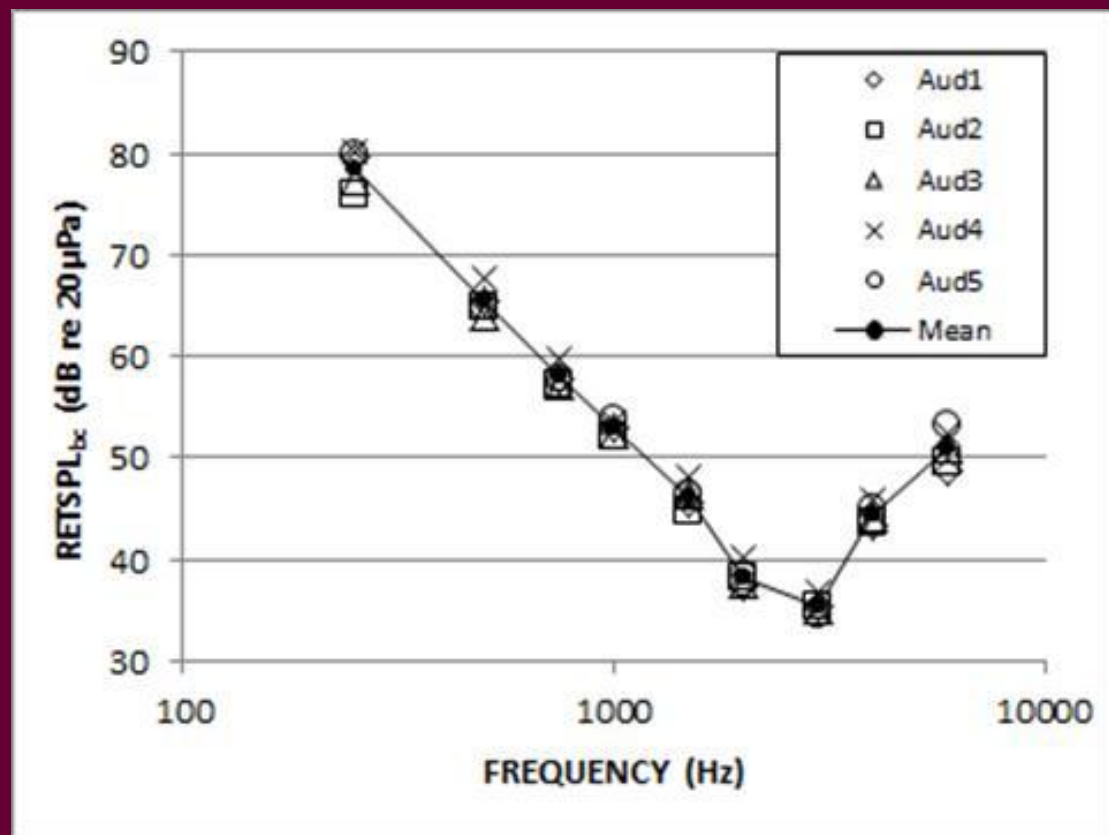


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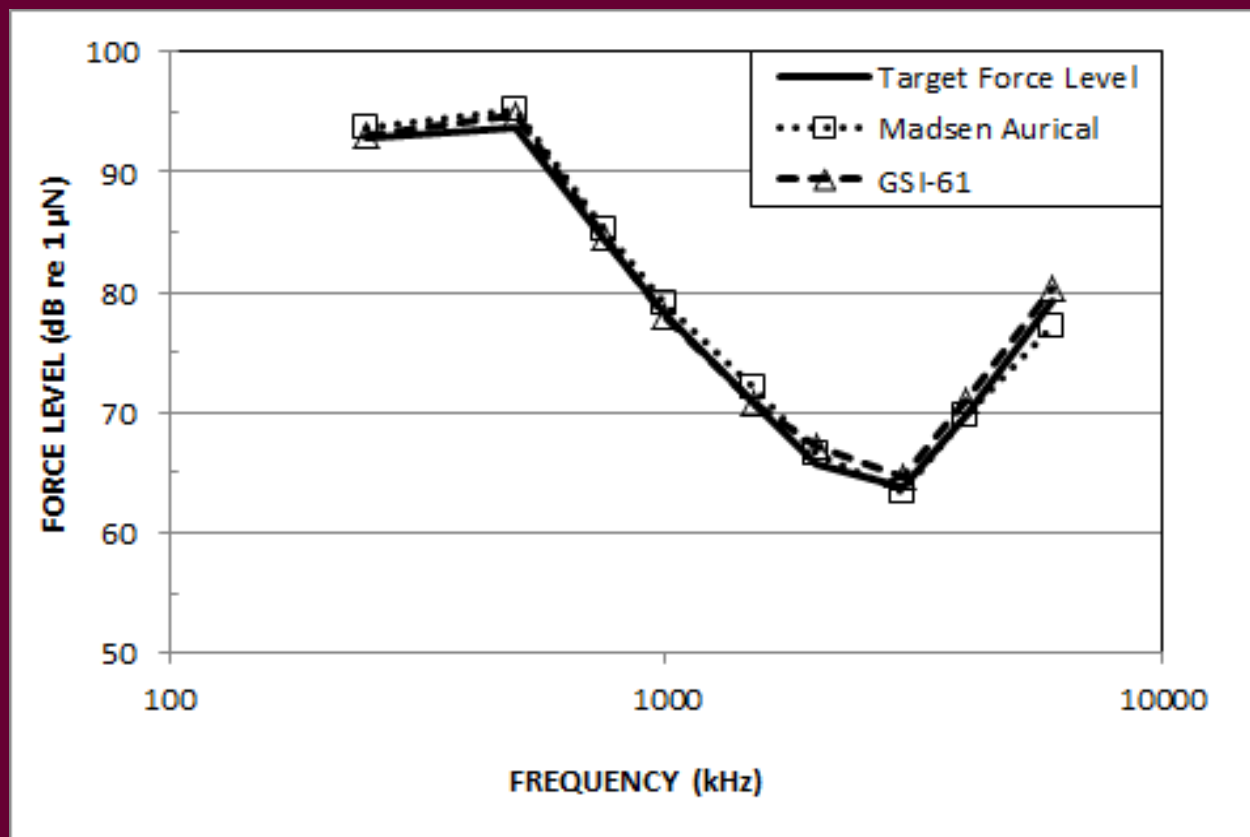
Standard deviations of repeated measurements made over five days for two audiometers on five AMBONE couplers and a B&K Type 4930 Artificial Mastoid. Each value is the average standard deviation across the nine test frequencies.

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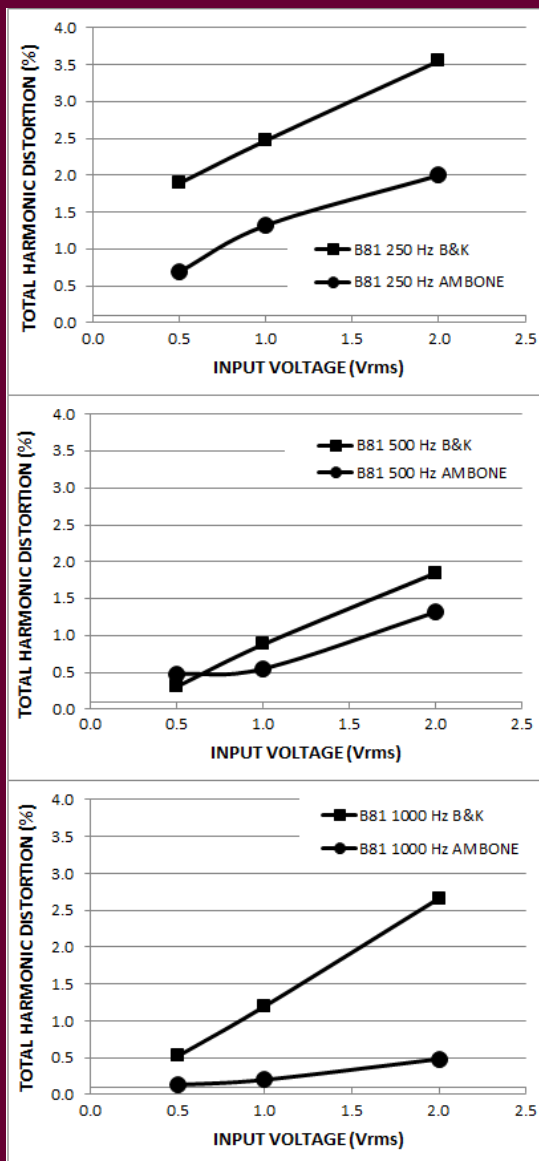
Reference Equivalent Threshold Sound Pressure Levels (RETSPL_{bc}) for bone conduction stimuli calculated from five audiometers (Aud1 – Aud5).

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Force levels measured with a B&K 4930 Artificial Mastoid for two audiometers that were previously calibrated with AMBONE.

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Radioear B81 Bone Vibrator Harmonic Distortion

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