

S14

EAR PROBE DESIGN FOR INFANTS AND ADULTS

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Any audiometric test relies on a known stimulation of the ear(s), and some need to record sound within the ear canal, such as otoacoustic emissions (OAE). Ear probes can serve for both generating and recording sound in the human ear canal. For different test methods, a probe must fulfill specific needs, such as frequency range, maximum sound level that can be generated or recorded, microphone noise, nonlinear distortions, sealing requirements, robustness against static pressure. Additionally, the probe must be robust and easy to use and clean, which influences mechanical design and the concept of probe body and ear tip.

Calibration of both stimulus and response is needed for reliable results in most audiometric methods. Ear probes are usually calibrated to the individual ear canal by using the feedback signal of the stimulus as picked up by the probe's microphone. However, besides the algorithmic techniques used, probe geometry and coupling to the ear play important roles in individual calibration. While for newborns, due to their small ear canals, calibration is rather simple, resonance effects occur in longer ear canals. Moreover, these effects have a huge interindividual variance. Additionally, the ear tip geometry influences near field effects from speaker outlet to microphone inlet openings. The signal that results from this path is not always clearly discriminable from the desired feedback signal, representing the ear canal sound pressure.

The presentation aims at showing how universal an ear probe can be and where the limits are in providing reliability, usability and accuracy.