MEASUREMENT OF HEARING AID INTERNAL NOISE USING SYNCHRONOUS AVERAGING

James D. Lewis      Shawn S. Goodman      Ruth A. Bentler

Department of Speech Pathology & Audiology The University of Iowa, Iowa City, Iowa 52242

ABSTRACT

Equivalent-input noise (EIN) is specified in ANSI S3.22-2004 as a useful and industry-standard way to evaluate internal-noise levels of hearing aids. Questions regarding the validity and usefulness of the EIN measurement are usually the following: (1) The use of EIN presupposes that the noise measured at the HA receiver is internal noise multiplied by 0.5. An assumption that cannot be true. (2) The EIN is not intended to be predictive of the user’s sensitivity. (3) Measurements are contingent upon the state of the HA’s filters and feedback reduction, digital noise reduction, and directional-mic scheme. (4) Noise measurements have been made in a lab setting using controlled input signals. However, the equivalent input noise computed in this manner is not reflective of the internal noise levels that are typically measured in the user’s environment. There is little evidence that EIN is an accurate or reliable measure of internal noise. The noise variability is often judged by trial-and-error methods. These methods are prone to error and not practical for real-world applications. This paper describes a test methodology designed to measure internal noise levels in the user’s environment. The noise levels were measured at a loudspeaker located at 1 m and 0° azimuth from the HA. Data were collected in realistic listening situations, such as a meeting, movie theater, car, or classroom. The data were used to develop a method of measuring internal noise that is sensitive to location of internal noise — in prediction of the noise audibility — and of measuring noise with adoption features enabled.

CONCLUSIONS

RELATIVE LOUDNESS RATING COMPASSION

Figure 8. Perceptual and objective relative loudness rankings. The shaded area of the HA's loudness (black line) is in time agreement with the subjective rankings of HA noise loudness (light blue). These rankings did not agree with the rankings of the manufacturers’ EIN values, suggesting that the EIN should not be used to quantify the relative loudness of HA internal noise.

REFERENCES


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CONTACT

james.lewis@uiowa.edu

http://www.uiowa.edu/audiology/Research/Publications.html