MADSEN® Astera²

AURICAL® Aud

FRESH noise™

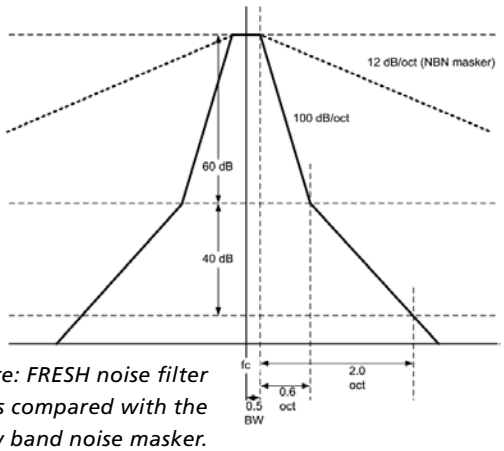

Figure: FRESH noise filter as compared with the narrow band noise masker.

The MADSEN Astera² was the first commercially available audiometer to present a narrow band noise stimulus signal designed for the purpose of measuring hearing thresholds. Now it is available with both the MADSEN Astera² and AURICAL Aud audiometers. Unlike the common narrow band masking noise, which when used for stimulus only gives a loose estimate of the child's hearing capabilities (and only with flat losses), the FRESH noise allows for measuring with increased frequency specific precision also in children with sloping audiogram configurations. This new FRESH (FREquency Specific Hearing assessment) noise is a narrow band noise signal that has been designed with extremely steep filter slopes. That way the skirt of the FRESH noise stimulus signal does not spread beyond the desired frequency region. It is focused on the critical frequency band of the hearing that is targeted with each audiometer frequency setting. In the FRESH noise, the Pure-tone and the Warble tone stimuli now have a worthy companion on your pediatric measuring palette.

Where does FRESH noise fit in clinically?

The use of alternative stimuli such as narrow band noise and warble tones for behavioural threshold testing in young children is a concept that has been widely accepted and used since the 1950's. It is all about the great idea to administer a diverse battery of test signals in order to keep the child's interest in the presented sounds. For that purpose the combination of pure tones, warble tones and narrow band noise signals has proven to be a quite interesting cocktail of sound sensations for the otherwise difficult-to-impress toddler.

Narrow band noise is also traditionally used as an alternative to the warble tone stimulus in order to avoid standing waves when performing sound field testing (as e.g. in Visually Reinforced Audiometry (VRA) testing with speakers). The reason the warble tone should be complemented with an alternative is again simply for variation to maintain the child's interest in the test signal.

The ***FRESH noise replaces the use of the narrow band masking noise as a stimulus*** for threshold assessment.

...and what was wrong with using the masking noise as stimulus, really?

1) Narrow band masking noise is calibrated in Effective Masking Level (EML), not in Hearing Level (HL). EML is the level of a stimulus that is just barely masked by the concurrent masking noise presented at the specific level. Hence the reported masking level and the stimulus level of the audiometer are not comparable in terms of hearing level. The EML correction is in the ANSI standard and is applied when calibrating most audiometers.

In order for the FRESH noise to be suited for- or compared with other hearing level measurements it is calibrated in dB HL not in EML like the masking noise.

2) Narrow band masking noise is too widely spread in frequency to pinpoint only the frequency range that you wish to assess with each frequency setting in tone audiometry. The top plateau of the masking noise is reasonable, but the masking filter slopes are only falling off by 12 dB/octave, so much of this noise is likely to be heard by adjacent frequency bands. If there is a sloping loss, the noise skirts are heard through "off-frequency listening" although the intended test frequency is not heard at all. That will underestimate the hearing loss to a degree that depends on the slope of the loss. This is not a problem with normal or flat audiogram configurations because in those cases there are no frequencies adjacent to the test frequency where the sensitivity is so much better that the noise slopes are detected although the test frequency is not.

In order to minimize errors associated with the bandwidth of the stimulus, the out-of-band energy of the FRESH noise stimulus falls off with a steeper slope than that of any typical threshold curve.

Johannes Lantz
Audiologist
GN Otometrics
jlantz@gnotometrics.com

otometrics
MADSEN · AURICAL · ICS