1. Nonlinear Frequency Compression Algorithm

As conventional amplification does not provide sufficient high-frequency information, an alternative approach is provided by frequency-lowering. This can be achieved by different methods. While all shift the high frequencies to a lower region there are large differences in implementation, which can significantly affect sound quality, speech intelligibility, and awareness of environmental sounds.

Francis Kuk et al. describe a method of frequency transposition ("Re-evaluating the Efficacy of Frequency Transposition," Jan. 20, 2009). They also claim that it is better than frequency compression because "In frequency compression...sounds in the aidable region from 0 Hz to 4000 Hz which do not need to be lowered are nonetheless compressed." Although this may be a correct description of a particular implementation of frequency compression, it leaves the misleading impression that all frequency compression algorithms are implemented in this way.

The SoundRecover algorithm, available from Phonak, compresses frequencies above a programmable cut-off frequency and shifts them to lower frequencies, whereas the frequencies below the cut-off are amplified normally. Although input frequencies up to a defined cut-off frequency do not undergo any frequency compression, nonlinear frequency compression is applied in increasing degrees to higher input frequencies. The figure illustrates the effect of changing the cut-off frequency with (a) showing a high cut-off frequency (at 3 kHz) and a high compression ratio and (b) a lower cut-off frequency (at 1.5 kHz) and a lower compression ratio. Study results have shown no difference in vowel recognition with frequency compression while high frequency consonant recognition has significantly improved with SoundRecover.

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