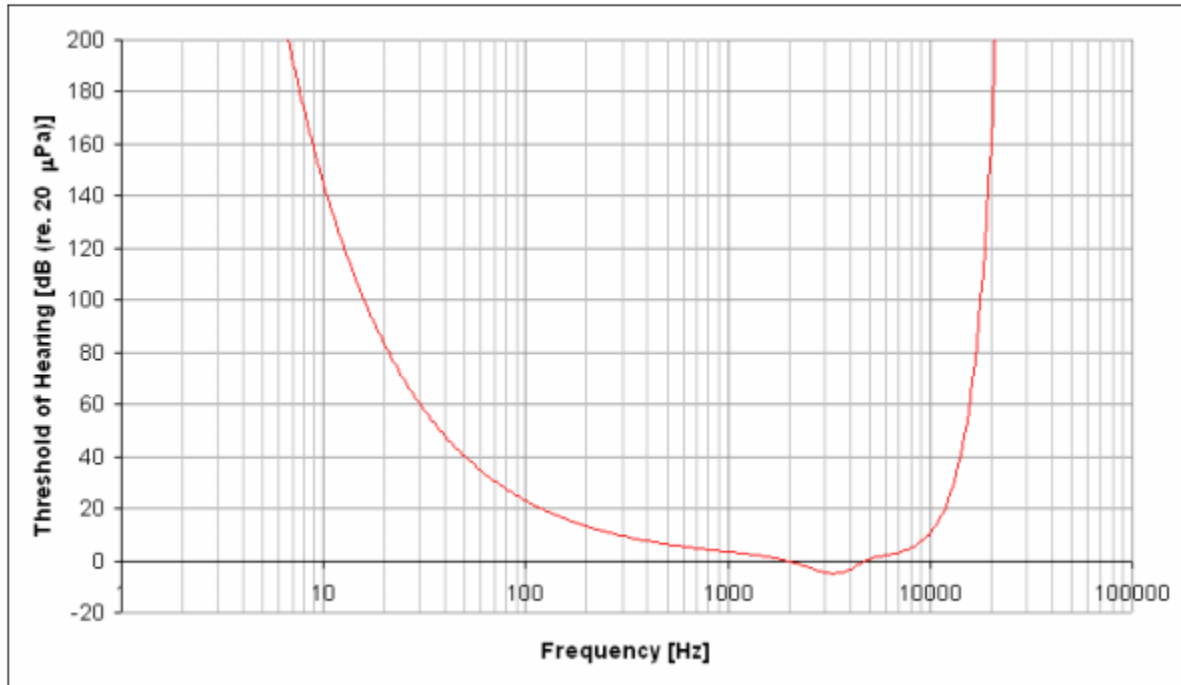


Threshold of Hearing

Human hearing is most sensitive around 3.3kHz. Above and below this frequency the sensitivity decreases. Above 10kHz the sensitivity of the ear rapidly decreases.



Threshold of hearing versus frequency based on equation below.

The threshold of hearing is defined by the equation [Terhardt]:

$$T_q(f) = 3.64 \left(\frac{f}{1000} \right)^{-0.8} - 6.5 e^{-0.6(f/1000 - 3.3)^2} + 10^{-3} \left(\frac{f}{1000} \right)^4$$

Where

T_q = threshold of hearing [dB]

f = frequency [Hz]

This empirical equation overstates the threshold of hearing at very low frequencies (below 20 Hz). Other researchers [Fielder & Benjamin] have found that the threshold of hearing increases at approximately 18 dB per octave (for every halving of the frequency below 20 Hz). Thus at 5 Hz (two octaves below 20 Hz) the threshold has been found to be about 115 dB SPL which is 36 dB higher than the threshold at 20 Hz (about 79 dB SPL).

Reference

E. Terhardt, "Calculating virtual pitch", Hearing Res., vol. 1, pp. 155-182, 1979.

Louis D. Fielder and Eric M. Benjamin, "Subwoofer Performance for Accurate Reproduction of Music", Journal of the Audio Engineering Society, Volume 36, Number 6, June 1988, pages 443-456.

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