



EE599-020
Audio Signals and Systems

Psychoacoustics (Loudness)

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Weber's Law

A **difference limen (DL)** or **just-noticeable difference (JND)** is the smallest perceived change in a quantity.

Weber's Law states that the JND in ΔI (intensity change) is proportional to I (i.e. $\Delta I / I$ is constant).

This implies that a constant in dB for a measure of intensity change would indicate the JNDs for the auditory system for all intensity levels.

For broadband sounds (white noise) greater than 20 dB the DL is 0.6dB. For narrowband sounds (tones) the DL decreases slightly with increasing intensity.

Phons

A phon is not a measure of loudness, but a frequency compensated decibel scale. Tones with the same loudness as a 1000 Hz tone at N dB are N phons.

