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Temporal resolution in the hearing system and auditory evoked potentials

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A popular type of investigation with auditory evoked potentials (AEP) consists of mapping the dependency of the envelope following response to the AM frequency. This results in what is called the modulation rate transfer function (MRTF). The physiological interpretation of the MRTF is not straight forward, but is often used as a measure of the ability of the auditory system to encode temporal changes. It is, however, shown here that the MRTF must depend on the waveform of the click-evoked AEP (ceAEP), which does not relate directly to temporal resolution. The theoretical relationship between the spectrum of the ceAEP and MRTF is such that the MRTF should be identical to the ceAEP if a $1/f$ weighting is applied to the ceAEP. Deviations from this relationship indeed reflect temporal resolution capabilities. We measured this in a harbour porpoise. Our devised stimulus was a sequence of 0.5 ms Hann weighted 130 kHz tone pips presented at an increasing rate (chirped) over a time span of 32 ms. The results reveal that the system's responsiveness declines roughly exponentially as a function of click rate with a rate constant of about -0.7 kHz and appears more rate limited than implied by traditional MRTF.