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Estimating the effective frequency of cochlear implant electrodes using contralateral residual acoustic hearing

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For some cochlear implant (CI) users a contralateral hearing aid provides significantly improved speech perception. Important factors in the bimodal transmission of speech spectral information are likely to include the extent to which the frequency selectivity of residual hearing allows additional place-coded channels, and mismatches between frequency-to-place maps across modalities. When acoustic place coding extends above around 500 Hz an overlap of frequency coverage between acoustic and electric hearing may result in interaural conflicts. However, addressing this issue requires accurate knowledge of CI frequency-to-place maps. Effective characteristic frequencies of CI electrodes have previously been estimated using comparisons of the pitch produced by electrical stimulation with that produced by contralateral acoustic sinusoids In the present work, the acoustic stimuli used for pitch comparisons are either sinusoids or 1/3 octave bands of noise. The latter minimize temporal pitch cues and may reduce differences in perceived quality between electrical and acoustical auditory sensations. Electrical stimuli are high-rate (900 pps or greater) single-electrode pulse trains. Comparisons are performed at different levels spaced over the dynamic range and both paired-comparison and adjustment tasks are used. Results will be discussed in relation to speech processing approaches for optimally combining an implant and contralateral hearing aid.