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Cochlea Implantate: Grundlagen.

Encoding signal intensity with stimulation rate: Forward masking measures

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In today's cochlear implant systems, the signal intensity is usually encoded directly into the stimulation level of the charge-balanced biphasic stimuli. One of the main factors limiting the spatial resolution is the electric field spread. This resolution is further compromised with increasing stimulation intensity, since the electric field spread is expected to increase accordingly. One possible alternative to minimize the electric field spread would be to use the stimulation rate to encode the signal intensity, while keeping the stimulation level constant.The present study investigates the accompanying change in the electric field spread when using either the stimulation rate (at a constant stimulation level) or stimulation level (at a constant stimulation rate) to achieve the same change in loudness, with the hypothesis that the former results in less changes in the electric field spread compared to the latter. Psychophysical forward masking functions were measured for three masker rate/level combinations: Firstly, the masker (e11, 500ms) was loudness matched at a comfortable level for either 250Hz or 2000Hz (at stimulation levels L250 and L2000 respectively, typically L2000 < L250). Additionally, the masker was set at 250Hz and L2000, corresponding to a lower loudness percept. The masked thresholds of a 250Hz 20ms probe, presented 4ms after the end of the masker, were then measured for locations either side of e11, in an adaptive 2down-1up 3IFC task.Results with 5 CI subjects indicate a greater increase in the amount of forward masking when the stimulation level was changed from L2000 to L250 (both at 250Hz), compared to when the stimulation rate was changed from 250Hz to 2000Hz (both at 2000Hz), supporting the hypothesis. The implications of these results will be discussed.