

Popular science summary of the PhD thesis

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Title of the PhD thesis	Temporal charge interactions in cochlear implant listeners
PhD school/Department	DTU Electrical Engineering

Science summary

More than half a million people with severe to profound hearing loss have a cochlear implant (CI). This surgically implanted device restores partly hearing by electrically stimulating the auditory nerve. Many CI users understand speech well in quiet, but even the most successful struggle in noisy situations, with a minority performing poorly even in quiet.

Not much is known about the integration of electrical currents by the auditory nerve. A reason for this stems from the clinical use of charge-balanced biphasic pulses. These consist of two phases with opposite-polarity currents, and create complex patterns of activation and cancellation at the level of the neurons.

This thesis investigated the polarity-specific temporal integration of currents. This was achieved by measuring the loudness, detection thresholds and localization abilities of CI users with pulse pairs, while varying the inter-pulse interval and the polarity of each pulse.

Overall, results showed a variety of inter-pulse and polarity effects, as well as interactions between both factors. These results are not only relevant for clinical applications, such as the estimation of neural survival in the auditory nerve, but also for the development of models of the electrically activated auditory nerve.

Please email the summary to the PhD secretary at the department