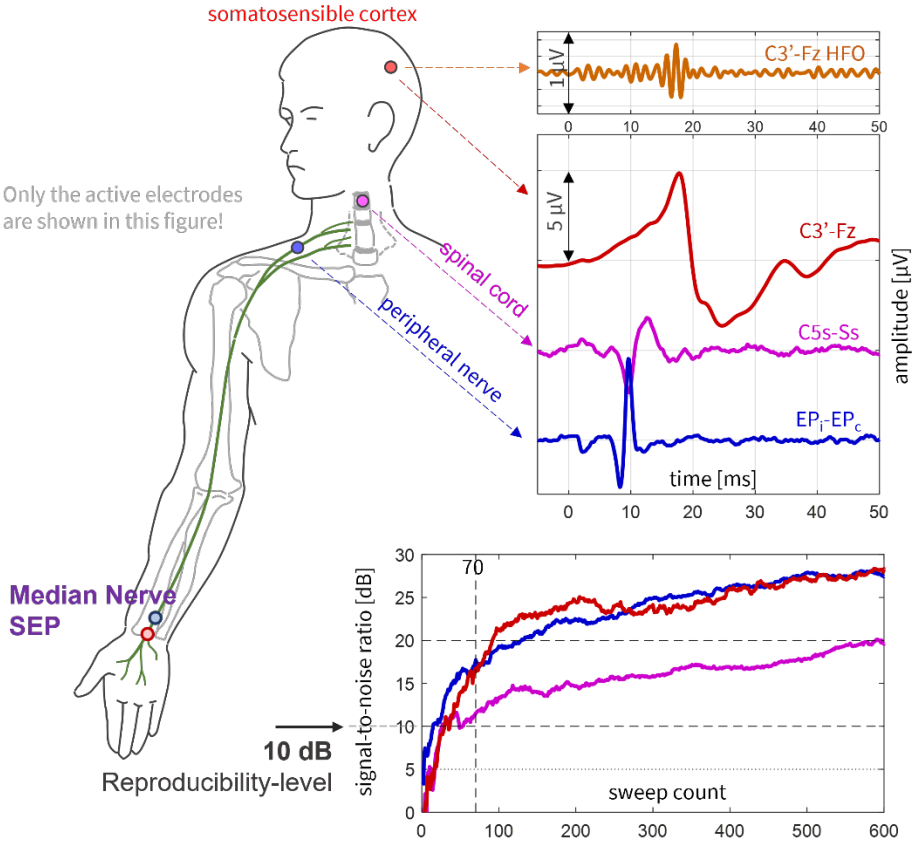
MSc-Thesis –
Experimental Investigation of High-SNR-Electrode Configurations for Evoked Potentials

Background: Evoked potentials (EPs) allow for neurophysiological investigation of neural responses to triggered stimuli (i.e., non-spontaneous activity). This electrodiagnostic modality applies waveform averaging for extracting low amplitude stimulus related activity from recordings containing large amplitude physiological background activity. Typically, monopolar electrode configurations are used which contain one active electrode (near the neural target tissue) and a passive electrode (distant from the target).

Current Research: Full digital signal processing allows for relevant improvement of the signal-to-noise ratio (SNR). However, it has been shown recently, that the actual electrode configurations compose underestimated limitations for obtaining high-SNR. In particular, the actual anatomical location of the passive electrode provides huge potential for optimization. Smart positioning of this electrode can significantly reduce background activity in the recordings. We have recently developed methods which allow to identify key factors for SNR by spectral analysis [1, 2].

Task: In Q2 2026 a series of experiments is planned for systematically testing new electrode configurations in healthy volunteers. We offer the opportunity to support this research by assisting in the experiments and initial data evaluation in the framework of a master thesis.



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Literature

[1] Fischer G., Haueisen J., et al. Spectral separation of evoked and spontaneous cortical activity, Part 1: delta to high gamma band. Biomed. Signal Process. Contr. 2024;92.
[2] Fischer G, Haueisen J, et. al. Converting spectral evoked-to-background ratio into time-domain signal-tonoise ratio - validation for high frequency oscillations. MethodsX. 2025; 15:103617.