Contribution ID: **67** Type: **Oral presentation**

Evaluating noise suppression algorithms for whole-head OPM-MEG

Friday 8 August 2025 11:20 (20 minutes)

OPMs bring new opportunities to MEG but also come with new challenges. With increasing spread and sufficiently large systems becoming available, interference suppression becomes an important subject for many labs doing OPM-MEG. Traditionally used algorithms for interference suppression like signal space separation (SSS) do not work well for OPM-MEG [1]. Several promising alternatives have been proposed. Here we aim to evaluate and compare some of the most promising, namely: homogenous field correction (HFC) [2], signal space projection (SSP) [3], iterative applied SSS [1], and adaptive multipole models (AMM) [4].
We simulated data with different types of interference using realistic forward models and sensor noise and extracted shielding factors for the different interference sources, as well as, suppression of brain signals, to compare between algorithms. Finally, tested the algorithms on real data recorded with a whole-head HEDSCAN OPM-MEG system to demonstrate their effectiveness.
We found that different algorithms are suited for different environments and types of interference. HFC achieved high suppression for all interference sources, especially at higher orders, but exhibits a strong tradeoff between shielding factor and brain signal suppression when increasing the order. SSP proved powerful for stationary environmental signals and preserves brain signals well. Basic SSS proved instable but with iterative implementation showed good suppression of distant sources. Temporal AMM was best at dealing with “dental wire”interference. Our results can help guide other MEG researchers to find the best methods for their data.

1. Holmes, N., Bowtell, R., Brookes, M. J. & Taulu, S. An Iterative Implementation of the Signal Space Separation Method for Magnetoencephalography Systems with Low Channel Counts. Sensors 23, 6537 (2023).
2. Tierney, T. M. et al. Modelling optically pumped magnetometer interference in MEG as a spatially homogeneous magnetic field. NeuroImage 244, 118484 (2021).
3. Uusitalo, M. A. & Ilmoniemi, R. J. Signal-space projection method for separating MEG or EEG into components. Med. Biol. Eng. Comput. 35, 135–140 (1997).
4. Tierney, T. M., Seedat, Z., St Pier, K., Mellor, S. & Barnes, G. R. Adaptive multipole models of optically pumped magnetometer data. Hum. Brain Mapp. 45, e26596 (2024).

Authors: LEDIN, Lukas (Karolinska Institute); PFEIFFER, Christoph (Karolinska Institute)

Presenter: PFEIFFER, Christoph (Karolinska Institute)

Session Classification: MEG