Spatio-temporal measurements of visually-evoked fields using optically-pumped magnetometers

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Magnetoencephalography (MEG) is a widely used neuroimaging technique with numerous clinical applications. Technological developments with OPMs has enabled new non-invasive brain function mapping capabilities with OPM-MEG, offering improved sensor placement flexibility, and closer positioning to the scalp, compared to superconducting quantum interference devices (SQUIDs). We used OPM-MEG and SQUID-MEG to show a higher spatiotemporal resolution of OPM-MEG across two full-field visual stimuli; the flash and the pattern reversal. Two OPMs were placed over the primary visual cortex (Oz) and the associative visual cortex (POz) to 3 healthy participants. The evoked responses were highly reproducible with consistency across multiple participants, stimulus paradigms and sensor modalities. A consistent time lag on the order of 10-20 msec was observed between the Oz and POz sensors, enabling further studies of neurophysiological signal tracking. Based on the results, OPM-MEG could be a reliable method to identify the activation patterns of close cortical regions in response to a specific stimulus. It has the potential to be a reliable tool for spatio-temporal tracking of propagating signals and further explore the visual pathway.

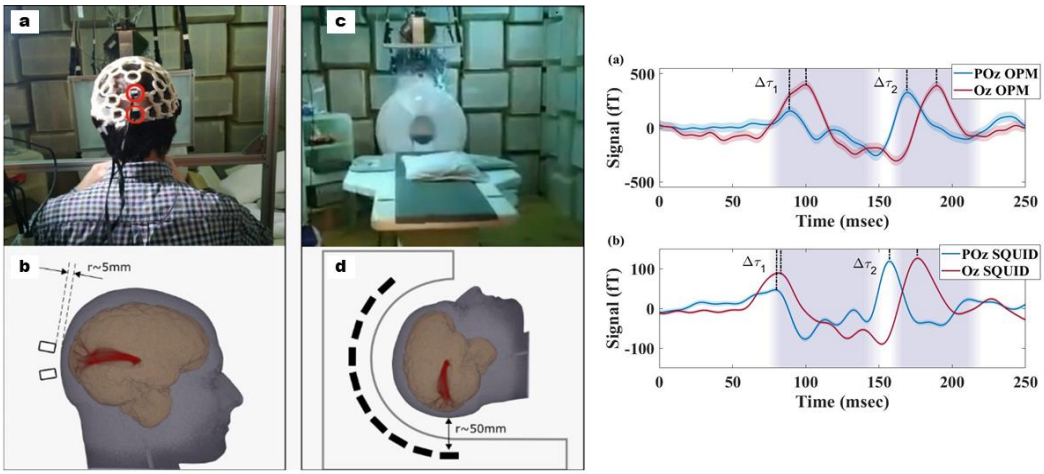

Figure 1: ***Left***: Experimental set-up & sensor placement for OPM-MEG system (a,b) and SQUID system (c,d). ***Right***: Visually evoked responses recorded by a) OPM-MEG and b) SQUID MEG for neighboring sensors.