Auditory-evoked Fields and Auditory Steady-state Responses measured by Optically Pumped Magnetometers

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Magnetoencephalography (MEG) is a functional neuroimaging technique, which non-invasively detects the brain magnetic fields generated by neurons. The auditory steady-state responses (ASSR) at 40 Hz have shown the altered gamma band activities in patients with schizophrenia, bipolar, and autism spectrum disorders [1,2]. Recently, small-sized optically pumped magnetometers (OPMs) have been developed and commercialized. OPMs do not require cryogenic cooling and can be placed within millimeters from the scalp. Here, we arranged 6 OPM sensors on the temporal area to detect the auditory-related brain responses in a two-layered magnetic shielded room. We presented the auditory stimuli of 1-kHz pure tone with 200-ms duration and found the M50 and M100 components of the auditory-evoked fields. We delivered the periodic stimuli with a 40-Hz repetition rate and we observed clear ASSR at 40 Hz. Our results indicate the feasibility of using OPM sensors to detect ASSR at 40 Hz for future clinical study.



Figure 1: OPM sensor array and the auditory brain responses. A) OPM array to detect brain activities from the temporal area. B) The grand-averaged auditory-evoked fields across 22 participants show obvious M50 and M100 components. C) The grand-averaged time-frequency representations show the ASSR at 40 Hz.

References

- [1] Tan et al, Neurolmage **122**, 417-426 (2015).
- [2] Seymour et al., Molecular Autism 11, 56 (2020).