

Magnetoencephalograms with a multi-channel OPM using a K-Rb hybrid cell

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We have developed optically pumped magnetometers (OPMs) with K-Rb hybrid cells [1]. The hybrid cells are suitable for multi-channel measurements due to their spatially homogeneous sensor properties and accurate measurement positions [2]. Multi-channel measurements with high spatial resolution are required for estimations of source activation in magnetoencephalograms (MEGs). Therefore, we fabricated a 20-channel probe beam detector with the sensor density of 2.5 cm^{-1} [3]. The sensor cell contains K and Rb with He and N_2 as buffer and quenching gasses. We controlled the densities of K and Rb, and utilized K as probed atoms and Rb as pumped atoms. In this study, we carry out MEG measurements with the OPM to examine their ability for human subjects. The measurement was operated in the magnetic shield box with the shielding factor of 10^4 at 1 Hz. First, we carried out MEG measurements of event-related desynchronizations (ERDs) during subjects open and close their eyes alternately and observed clear attenuation of MEG variance in the alpha band when the subjects opened their eyes. Subsequently, we attempted to measure visual and auditory evoked fields (VEFs and AEFs) and found that the OPM has sufficient sensitivity for the evoked field measurements.

This work was partially supported by the Konica Minolta Imaging Science Encouragement Award (Outstanding) through the Konica Minolta Science and Technology Foundation.

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