Using OPM magnetometers for source localization in magnetoencephalography

Urban Marhl[1,2], Anna Jodko-Wladzinska[3,4], Rüdiger Brühl[4], Tilmann Sander[4], Vojko Jazbinšek[1]

[1] Institute of Mathematics, Physics and Mechanics, Department of Physics, Ljubljana, Slovenia
[2] University of Maribor, Faculty of Natural Sciences and Mathematics, Maribor, Slovenia
[3] Warsaw University of Technology, Warsaw, Poland
[4] Physikalisch-Technische Bundesanstalt, Berlin, Germany

Magnetoencephalography (MEG) is a non-invasive technique in neuroscience, which determines activity within the cortex based on the measurement of magnetic field near the head [1]. The main disadvantage of the standard MEG system is the use of liquid helium for cooling the superconducting SQUID magnetometers. In the last decade, commercial optically pumped magnetometers on alkaline metal vapor (OPM) have appeared on the market, which have slightly lower sensitivity as the standard SQUID magnetometers, but don't need cooling [2]. Therefore they are suitable for the magnetic field measurements in MEG. In this work we present our first measurements of the brain auditory evoked fields with OPM sensors that can detect both radial and tangential components of the magnetic field. Aim of this study is to compare these measurements with results obtained with the SQUID system. We first obtain a MRI scan for each subject and build a custom holder for OPM sensors. For source localization we apply two methods: fitting the current dipole source inside a spherical symmetric conductor and the minimum norm estimate (MNE) [3]. We present important steps and algorithms used in the source reconstruction analysis. Localization results obtained by the OPM and SQUID systems are comparable. We also find that the added tangential components to the OPM system increases the stability of localization.

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