
Contribution ID: **36** Type: **Poster**

# Mr Qi

*Thursday 7 August 2025 17:55 (5 minutes)*

Optically pumped magnetometers (OPMs) based MEG has been widely used in biomagnetic imaging applications with the advantages of closer distance to the scalp, mobile measurements, and high sensitivity. However, it may suffer from angular errors of sensitive axis due to low frequency remnant magnetic fields or magnetic field crosstalk from adjacent sensors, which is determined by the requirement of SERF mechanism for zero magnetic field. The orientation of the sensitive axis of the magnetometer may change caused by the DC remnant magnetic fields orthogonal to the OPM's nominal sensitive axis. In inverse problem, the estimation of source locations and time series signal depends on the accurate estimation of the lead field matrix which requires complete geometric parameters of the OPM array, including sensor positions and sensitivity axis directions. Angular error in sensor orientation propagates systematic errors in the forward solution, which will considerably lead to source localization error and impact the spatial resolution of inverse algorithms (e.g. beamforming). Here, we characterized the effect of angular error on the spatial resolution in a typical OPM array to pave the way for understanding the corrective measures necessary for source reconstruction.
Numerical simulations based on realistic head models were conducted to quantify the capacity of OPM arrays to distinguish two adjacent sources. A sensor array was constructed with 6 mm scalp-to-array distance and 30 mm inter-sensor spacing. Two distinct OPM array configurations of single axis or dual axis were implemented. Two orthogonal source time series signals were assigned to two sources with a distance of 6 mm on the MNI template cortex mesh from SPM12 toolbox. Random angular offsets were applied to each OPM's sensitive axis to model the angular error. Then the correlation coefficient between reconstructed source time series can be used as an indicator of spatial resolution of OPM-MEG systems.
Results demonstrated that the effects of angular errors on spatial resolution of single-axis and dual-axis OPM arrays are similar. Correlation values increase with increasing angular error. 2° angular error will make it difficult to distinguish some source pairs. The simulation results also show that the presence of an angular error has a more significant effect on the spatial resolution at higher signal-to-noise ratios.

**Author:** QI, Shengjie

**Co-authors:** Dr JIA; Prof. SONG

**Presenter:** QI, Shengjie

**Session Classification:** Poster Session and Buffet