

A new generation of OPM for high dynamic and large bandwidth magnetoencephalography: the ^4He OPMs

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Magneto-Encephalo-Graphy (**MEG**) provides a direct measure of neuronal activity at a millisecond time scale. **From these signals, one can non-invasively derive the dynamics of physiological or pathological brain activity.** Conventional MEG systems (SQUID-MEG) use very low temperature to achieve the necessary sensitivity. This leads to severe experimental and economical limitations.

A new generation of MEG sensors is emerging: the optically pumped magnetometers (**OPM**). In OPM, an atomic gas enclosed in a glass cell is traversed by a laser beam whose attenuation depends on the local magnetic field.

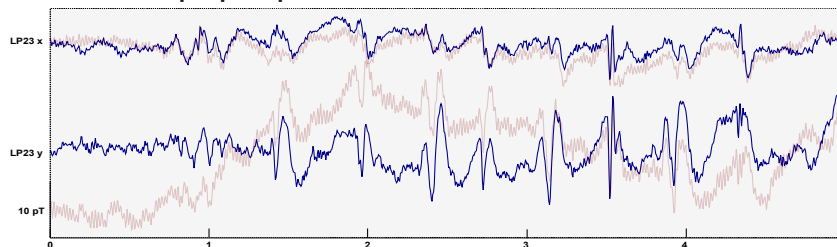
MAG⁴Health is developing beyond the state-of-the-art OPM using Helium gas (^4He -OPM). They operate at room temperature with a large dynamic range, a large frequency bandwidth and output natively a 3D vectorial measure of the magnetic field. In this study, five ^4He -OPMs were compared to a classical SQUID-MEG system in a group of 18 volunteers to evaluate their experimental performances. Considering that the ^4He -OPMs operate at real room temperature and can be placed directly on the head, our assumption was that ^4He -OPMs will provide detailed recording of physiological magnetic brain activity.

Indeed, the results showed that the ^4He -OPMs, despite having a lower sensitivity, showed very similar results to the classical SQUID-MEG system by taking advantages of a closer distance to the brain.

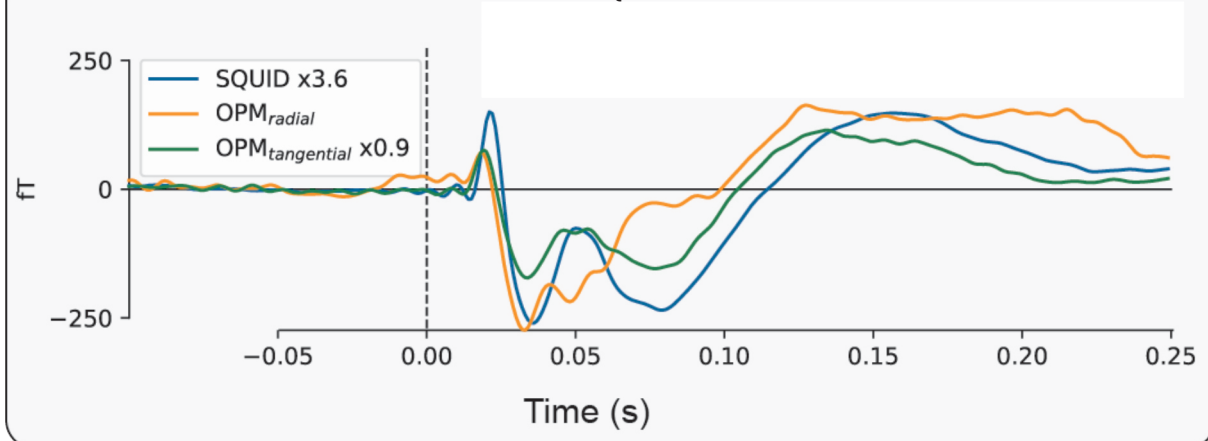
Here we demonstrate that ^4He -OPMs represent a viable alternative for non-invasive recording of brain activities, paving the way for the development and democratization of a wearable system for recording high-fidelity electromagnetic brain signals for both clinical practice and neuroscience research.



Inter-ictal epileptic spikes - OPM data



Median nerve stimulation evoked field - OPM vs SQUID



On-scalp OPM MEG Symposium

Friday March 10th from 11am to 1pm

CRNL Amphitheater - Vinatier - Bron

We will present recent results obtained in the NEW_MEG project where we tested and evaluated the performances of new MEG sensors working at room temperature: the ⁴He-OPMs developed by MAG⁴Health, a startup from Grenoble (www.mag4health.com).

Program:

11H00-11H30:

Presentation of the NEW_MEG project and of the first results obtained in epileptic patients. D. Schwartz [CERMEP / CRNL]

11H30-12H00:

A new generation of OPM for high dynamic and large bandwidth MEG: the ⁴He OPMs - First applications in healthy volunteers. T. Gutteling [CERMEP / CRNL]

12H00-12H15:

The MEG system from MAG4Health: Current system and future developments. E. Labyt [MAG⁴Health]

12H15-13H00:

Open discussion about the future of the MEG lab of CERMEP