The next-generation of magnetoencephalography (MEG) – a non-invasive brain imaging technology – will enable unprecedented access to our brains. Magnetic fields permeate the world around us and pass unaffected through most objects. In this way, electrical signals from deep within our brains can be “seen” by measuring the magnetic fields produced by these signals; thus the name, magneto-encephalography.

As part of a new international research project, we want to broaden and improve the applicability of optically pumped magnetometers (OPM). These magnetometers belong to the new field of "quantum technologies", in which one wants to use photonic or atomic quantum states as a new sensing technology. At their core, OPM are small laser spectrometers in which the otherwise perturbing magnetic field dependency of the absorption spectrum is exploited to measure an external magnetic field. Thus, OPM enable the measurement of extremely weak magnetic fields with comparably little effort.

The topic of the doctoral thesis is the development of particularly compact, highly integrated sensors using microsystem technology (MST) methods. The frame for this thesis is an international research project in cooperation with Prof. Svenja Knappe (University of Colorado Boulder, USA), who is one of the pioneers of microfabricated OPMs. The subject of the work will be the conception and implementation of optical, mechanical, and electrical components of the OPM, with the aim of further miniaturization and improvement of the detection sensitivity.

The position is based under the Professorship for Optical Systems at IMTEK (Prof. Karsten Buse). It is planned that part of the work will be carried out in Prof. Knappe's working group at the University of Colorado Boulder, in close cooperation with the group »Non-linear optics and quantum sensing« (PD Dr. Frank Kühnemann) at Fraunhofer IPM. We are looking for a candidate with an above-average master’s degree in physics, photonics, microsystems technology, or the like. The candidate should display an interest in working in a challenging research topic and the ability to work independently in an interdisciplinary environment of physicists and engineers. The employment is based on a 75% E13 job for 3 years. Requirements are very good English and German language skills and the willingness to undertake longer research stays at the University of Colorado Boulder.

Applications (letter of motivation, curriculum vitae, certificates) are requested to PD Dr. Ingo Breunig (ingo.breunig@imtek.de). He will also be happy to answer questions about the job advertisement.