



Optimization and characterization of ${}^4\text{He}$ plasma for high-sensitivity optically-pumped magnetometers

Key-words: Atomic and Plasma Physics, Helium, Quantum Sensors, MEG, Startup

Context: MAG4Health is a startup company of 8 people founded in 2021. MAG4Health produces MagnetoEncephaloGraphes (MEG) which are medical imaging devices designed to record the human brain activity opening new possibilities for the diagnosis of diseases like epilepsy, traumatic brain injury or Alzheimer. The MAG4Health MEG system is based on a type of quantum sensors called Helium Optically-Pumped Magnetometers (OPM). These sensors have been developed for 30 years, first for space exploration and now for medical applications at CEA-Leti in Grenoble where MAG4Health is incubated from. Thanks to the advantages of these sensors we aim to democratize MEG and to reduce its environmental impact, while providing breakthrough imaging tools to the medical doctors.

Subject: MAG4Health is in constant search for improving its MEG system to make always better diagnosis and open new possibilities in the field of brain imaging. Throughout this internship we offer to work on the long-standing effort to improve the performances of our magnetometer from the ground up. Our OPM is based on the optical pumping of metastable ${}^4\text{He}$ atoms produced in a radio-frequency plasma. The candidate will work on new schemes to optimise the number of metastable atoms in the discharge. Other aspects of the project will include the building of characterization optical setups (saturated absorption and emission spectroscopy). The candidate will join the R&D division of MAG4Health, and will be under the supervision of 10+ year experienced researchers in atomic and quantum physics.

Level of study: 5th year of higher education (Master 2 or 3rd year of Engineering School for France-based applicants or equivalent for international applicants)

Start Date: 1st quarter of 2023 (to be discussed)

Duration: 6 months or equivalent

Required/Necessary Skills:

- Laboratory experience in optics and laser

Desired Skills:

- Computing (experiment control and data analysis) ideally Python but no mandatory
- Organized

Location: Grenoble area, France

Opportunity to continue with a PhD: Yes (but not mandatory)

If you are interested in this internship, please send your resume or any query at rudymain@mag4health.com.