

Internship Position

Innovative Phase-Change Materials for the High Density Memory of the Future

The near future is Internet of Things, with the need of a data storage infrastructure allowing Big Data processing. The Advanced Memory Laboratory in CEA-LETI is developing the next generations of Non-Volatile Memories, and among them Phase-Change Memory (PCM) is the most mature one. PCM demonstrated capability of high density integration, thanks also to recent 3D integrations (3D XPoint of Intel/Micron). High density storage, long data-retention, speed, endurance and non-volatility make PCM the best candidate for new applications such as Storage Class Memory (SCM). However, several issues still need to be treated to improve the storage density further through multilevel approaches. Moreover, programming speed lower than 1 ns and endurance up to $1E15$ cycles remain a challenge: PCM performance improvement, in order to be competitive with actual 3D NAND technology, requires an accurate engineering of the phase-change material.

The work will start with a bibliographic study, to establish the state of the art of SCM focusing on PCM developments already done in the literature to target these applications. Different innovative phase change material families will be analyzed through physico-chemical characterization, in order to highlight the main layers properties. The candidate will test the electrical performance of single cell devices integrating these new materials, and will perform statistical analysis on advanced memory arrays up to Mb. Endurance and speed improvement will be deeply analyzed targeting a description of the main directions for the following of the engineering and optimization of the technology.

The candidate will deal with material physics and electrical characterization. An experience in RRAM would be highly valuable. The candidate will join a team with experts in various domains (material, device integration, electrical and physicochemical characterization, modelling and design). Good team spirit to interact efficiently with the team members and a good level of English proficiency will be required.

Department: CEA-LETI, 17 rue des Martyrs 38054 Grenoble CEDEX 9
Laboratory: Memory Device Laboratory
Reference: 3386937 (website: <http://www.cea.fr/emploi/Pages/stages/les-stages.aspx>)
Start Date: 02/2018
PhD possibility: YES (starting 10/2018)
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The LETI environnement

A unique scientific, industrial and cultural environment, With its research centers, university campus, 500 foreign companies and 40000 scientists, engineers and technicians employed in the area, the Grenoble-Isère region, otherwise known as the French Silicon Valley, mixes world-class intellectual and scientific dynamism with exceptional quality of life. It is the ideal springboard for LETI's expansion. Located in the heart of a unique scientific, industrial and cultural environment, the CEA-LETI Institute for micro- and nanotechnology research offers researchers alike a rewarding place to work. You will grow in an environment where the scientific community is passionately engaged in technological research: men and women who are ready to share their expertise with you in your scientific and professional development. From technologies to applications, LETI is a world leader in the creation and transfer of innovation within Europe. With 2800 patents, its intellectual property portfolio is unusually rich for a research institute.

With MINATEC, LETI boasts a concentration of resources that is unrivalled in Europe. An international benchmark in micro- and nanotechnology, the MINATEC Campus is home to state-of-the-art infrastructure and equipment that is available to every researcher working at LETI. LETI's special place in the global research community is partly due to its natural surroundings in the heart of the French Alps, which offer an excellent quality of life. Leading experts who have been attracted to this natural environment have helped LETI form its mutually rewarding industrial alliances that provide students an unmatched learning experience (<http://www-leti.cea.fr/en>).