



NIMFEIA

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Report on participation in two industry events

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1. Meeting of the INNOMAG e.V. ('Innovationsplattform Magnetische Mikrosysteme')

Magnetic microsystems are of considerable economic importance along the value chain from sensors and modules to a wide range of applications. The Innovation Platform Magnetic Microsystems INNOMAG brings together the interests and potentials of manufacturers, service providers and users as a network. This potential, which exists in Germany and Europe in particular, also represents an opportunity for volume markets, including the production of sensors and magnetic materials. This is an opportunity that arises especially for innovative SMEs and in a manageable but already begun time window and should be taken up pragmatically. The possible variety of applications from practically all industrial sectors and recognizable new approaches to solutions speak for successful work in the network. Among other things, the strength of the automotive industry, the dominant importance of German and medium-sized companies in automation, drive technology and position sensors, the development know-how and range of services offered by assembly and test companies, engineering offices and institutes and, last but not least, the high research potential and level of training at universities offer an excellent infrastructure and basis. In addition, there is the current situation that the manufacturing processes for magnetic solid-state sensors are becoming accessible for customer- and application-specific designs. Semiconductor and ASIC manufacturers offer integrated Hall sensors for monolithic system solutions, and application-optimized GMR and AMR sensors are created on state-of-the-art MR wafer fabs. INNOMAG has recently expanded from German members to European memberships.

The INNOMAG association is an 'eingetragener Verein' in Germany with 40 members from industry and few contributing universities. It provides for two yearly meetings that foster networking between the partners. At each meeting, some partners share their networking ideas which are then discussed. Furthermore, it supports outreach, e.g. by organizing a joint booth at the Hannover Messe, the largest industry fair in Europe for the members that are interested in participating.

At the meeting in Berlin on 17 May, 2023, new members from Slovenia (RLS) and Switzerland (Senis) introduced themselves and the Johannes Gutenberg-University Mainz (JGU) presented their recent activities with respect to magnetic sensing. Prof Jakob from JGU gave a talk on: '*MagSens: A technology platform for magnetic sensors and unconventional computing as exemplified by NIMFEIA*'. MagSens is a ForLab established within an infrastructure project of the BmBF that provides state of the art hardware for magnetic sensing and can be used for current sensors. The vision for future sensing and unconventional computing established in the NIMFEIA project have been presented to the industry members.

2. LETI Innovation Days

The LETI Innovations Days are a yearly event hosted by CEA LETI in Grenoble, France. It comprises several key notes by industry leaders, a technical conference with multiple sessions, an exhibition showcasing the latest demos and start-ups, as well as the opportunity for focused business meetings via break-out sessions directly on site. Highlights of the 2023 edition in June were key notes given by high-level executives such as INTEL CEO Pat Gelsinger, LAM Research CEO Tim Archer, SOITEC CEO Pierre Barnabé, Google X CSO David Andre, and many more.

In the "Emerging memory technologies for edge computing"-session, Dr Johannes Müller, GlobalFoundries (GF), was giving an invited talk on recent advancements in STT-MRAM technologies. In the best spirit of the session focus, his talk also included an introduction to the NIMFEIA



project, and its innovative approach to facilitate and accelerate such edge computing tasks via reservoir computing. This potential application of magnetism in the field of pattern recognition was a valuable addition to the main content of the session. Especially in the sector of AI accelerators classical magnetic memories are not considered promising candidates. This field is largely dominated by “analogue”, multi-level-capable NVMs such as RRAM or FeFET that rely on the Compute-In Memory (CiM) principle. The proposal to use magnetism-based reservoir computing was well received but also sparked some critical discourse that continued into the adjacent panel discussion. One valid argument as a potential downside was concerned with the magnetic immunity of such concepts. Especially in the case of the NIMFEIA approach small magnetic fields need to be sensed that may be prone to external disturb fields. However, this argumentation is not new to STT-MRAM technology in general and needs to be addressed by precise magnetic immunity characterization and definition of the mission profile of the final application. Considering the TRL of the NIMFEIA project those disturbs need to be considered by the consortium, but cannot yet be quantified.

3. European Neuromorphic Research Day: Bridging the Gap Between Science and Innovation

On May 15, 2024, the International Iberian Nanotechnology Laboratory (INL) hosted the European Neuromorphic Research Day, a dynamic one-day event that brought together about 100 researchers in the neuromorphic computing field. This gathering successfully fostered rich discussions on the advancements and future directions of neuromorphic computing. The event’s primary focus was on how Europe can effectively ‘bridge the gap’ between scientifically sound technologies and their practical applications. This theme underscored the need for a collaborative approach to transforming cutting-edge research into innovative, real-world solutions.



Group photo at the European Neuromorphic Research Day at the INL in Braga, Portugal.



Representatives from thirteen ongoing European research projects in neuromorphic computing attended and shared insights and updates on their latest findings. A lineup of esteemed speakers presented at the event, each bringing unique insights from their various scientific backgrounds into the neuromorphic computing landscape. Additionally, two representatives from leading companies that have successfully integrated neuromorphic computing into their technologies provided valuable industry perspectives. By merging presentations on technologies at various stages of maturity, the organizers aimed to identify common approaches and best practices for advancing neuromorphic technologies across Europe.

Attendees engaged in presentations and discussions that delved deep into the technological and practical aspects of neuromorphic research. By bringing together experts from different fields—such as spintronics, electronics, and photonics—the event aimed to foster interdisciplinary collaboration, which is crucial for the advancement of neuromorphic computing. Discussions centered on the current tools available in neuromorphic computing and the future challenges that need to be addressed. The goal was to identify pathways to accelerate innovation and application of these technologies in various sectors.

NIMFEIA was proud to sponsor the European Neuromorphic Research Day. As a European project committed to advancing the frontiers of neuromorphic computing, we recognize the importance of such events in driving forward research and innovation. The event was a resounding success, providing a platform for insightful discussions, networking, and collaboration.

