IHP GmbH -
Leibniz Institute for High Performance Microelectronics/
Leibniz-Institut für innovative Mikroelektronik

PhD Position (m/f/d) for “Design and implementation of RRAM based spiking neural circuits”

Job-ID: 0086/25 | Department: Material Research | Salary: as per tariff (TV-L) | Working Time: 40h/week | Limitation: initially two years with option of extension | Starting Date: as soon as possible

IHP is an institute of the Leibniz Association and conducts research and development of silicon-based systems and ultra high-frequency circuits and technologies including new materials. It develops innovative solutions for application areas such as wireless and broadband communication, security, medical technology, industry 4.0, automotive industry, and aerospace. IHP employs approximately 380 people. It operates a pilot line for technological developments and the preparation of high-speed circuits with 0.13/0.25 µm-SiGe-BiCMOS technologies, located in a 1500 m² cleanroom that meets the highest industrial nanotechnology requirements.

The position:
As a PhD student in the research team “Adaptive Materials” within the department “Materials Research,” you will contribute to advancing the understanding of resistive random-access memory (RRAM) devices under harsh environmental conditions. Your work will support the development of next-generation memory technologies with improved robustness for aerospace and space applications.
Your responsibilities will include:

- Evaluating the best approach for spiking neural networks based on RRAM devices
- Characterization of 1T1R RRAM devices with regard to their suitability for pulse train programming
- Design of RRAM based spiking circuits
- Characterization of the developed spiking circuit
- Development of a complete system consisting of neurons with flexible routing
- Design of a modeling approach for RRAM-based neurons and embedding in existing frameworks

Your project:
The PhD candidate will contribute to a cutting-edge research project focused on the energy optimization, prototyping, and full validation of an RRAM-based memory block for critical applications in space. The central goal is to ensure reliable and efficient memory operation under harsh conditions, including radiation exposure and low temperatures. The candidate will perform comprehensive electrical characterization of RRAM devices under various radiation sources to study TID and SEE. These experiments will take place at specialized radiation facilities across Europe. The data gathered will inform the optimization of device operation and contribute to radiation-hardened memory designs. The project involves close collaboration with national and international partners, each contributing to complementary areas such as device modeling, circuit design, and system-level simulation. The candidate is

expected to work closely with the project manager, lab supervisors, and the RRAM team at IHP, actively contributing to joint milestones and project reviews. This position requires a high degree of autonomy, strong problem-solving skills, and the ability to collaborate effectively in interdisciplinary and international teams. The project offers an exciting opportunity to work at the intersection of device physics, radiation effects, and space technology.

Your qualifications:
You hold a Master's degree in Physics, Electronics, or a related field. You have a solid foundation in semiconductor devices and are familiar with the fundamental principles of neuromorphic circuits. You have good knowledge in design, simulation and implementation of hardware based spiking neural networks. We are looking for a team member who is able to structure their own work and to bring a well-organized and systematic way of working into the cooperation with creative minds. In this position, you need to be a strong team player. You are an ideal candidate for this position if you possess strong experimental, analytical, and problem-solving skills. You have excellent communication abilities and a quick learning capacity when it comes to operating advanced technical equipment and using various software tools. It is necessary that you confidently handle the English language. Knowledge of the German language is welcome but not required. The deepening of German language skills is expected and highly encouraged, for example in in-house language courses and intensive courses.

Our Offer:
Conduct research in a challenging, multinational environment giving you excellent career opportunities. You will have the chance to establish international reputation at the edge of top-notch technologies.
It is important to us to support the individual career developments (e.g. conferences, advanced trainings) as well as the personal needs of our employees by offering flexible working hours and the possibility to work off-site. The compatibility of work and family is highly valued. More information about our scientific excellence and the working environment at IHP can be found on our website.
IHP is TOTAL E-QUALITY-certified for equal opportunities for women and men at work and actively pursues the equality of all gender and all groups of people. We promote the professional development of women and strongly encourage them to apply. Disabled applicants, qualified according to the above criteria, will be given preference over other candidates with equivalent relevant qualifications.

Further advantages:
30 days holiday | special annual payment | Company pension scheme (VBL) | Flexible working hours, also part-time (no core working hours) | Possibility to work up to 40 % independent of location according to company agreement | A wide range of further training opportunities in-house or within the framework of business trips | Discounted company ticket with monthly allowance of € 15 for various fare zones | Good transport connections, free parking at the institute | Structured induction and actively supported integration into the institute (welcome workshop, intercultural workshop, joint leisure activities)

Your application:
Have we sparked your interest? We look forward to receiving your application in German or English via our **online application form.**