



## Master thesis “Development of a Novel Vector-Matrix Multiplier for Artificial Neural Networks”

Job-ID: 5012/23 | Dept.: Circuit Design | Limitation: 6 months with option of extension | Entry Date: as soon as possible

We offer the possibility to work parallel as a student or research assistant, with a working time of max. 19h per week, remuneration according to the guidelines of the state of Brandenburg on the working conditions of research and student assistants.

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 330 people. It operates a pilot line for technological developments and the preparation of high-speed circuits with 0.13/0.25  $\mu\text{m}$ -SiGe-BiCMOS technologies, located in a 1.500 m<sup>2</sup> cleanroom.

### Master thesis project:

In-Memory computing targets high performance low power computing and is an emerging field of research. The goal of this project is to analyze existing architectures of vector-matrix multipliers (VMM) and develop one in analog domain. The pre-defined VMM architecture is based on a technology independent concept. Further research will focus on accuracy evaluation and speed limitations of a VMM developed within this project.

### The Research/Position:

- Analyzing and evaluating of existing in-memory-computing concepts
- Implementation of a vector-matrix multiplier in IHP design environment based on a certain IMC concept
- Evaluating the accuracy and speed limitations of the developed matrix-vector multiplier
- Potentially physical realization of a test chip
- After successful completion of the master thesis project, a PhD degree can be pursued and will be encouraged.

### Your Qualifications:

- Bachelor's degree in the field of electrical engineering
- Good knowledge of analog design techniques
- Fundamental hands-on experience in design and simulation of integrated circuits using CAD tools (Cadence Virtuoso, Spectre) would be desirable
- Very good English language skills.

### Your team:

You will be a member of the research group “Converters and High-Speed Logic Circuits”, which also deals with analog in-memory computing architectures. A motivated and committed team, consisting of both experienced and younger scientists, is looking forward to welcoming you. Wide experience in chip design and test is available to support your





work. Flat hierarchies and mutual support are important to us. We see diversity of perspectives as an opportunity for the team and we strive for a balanced gender representation.

**Our Offer:**

You have the possibility to work in a dynamic and multinational research institute for microelectronics and to gain insights into the work of renowned scientists in future-oriented research projects. During your stay at IHP, you will have 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.

**Your application:**

Have we sparked your interest? Then we look forward to receiving your application via our [online application form](#).

For further information regarding the position please contact Dr. Philip Ostrovskyy: [career@ihp-microelectronics.com](mailto:career@ihp-microelectronics.com)