Master thesis project:

Nanofabrication of Integrated Ultrafast All-Optical Logic Memory

About Us

IBM Research Europe - Zurich is a vanguard of European research, shaping future technologies through dynamic collaborations with academia and industry. We are dedicated to advancing novel computing technologies such as all-optical computing, addressing critical issues like power consumption and computing speed[1].

Novel all-optical transistor devices based on exciton-polaritons offer very high switching rates and nonlinearities[2,3], and are promising for ultrafast, integrated all-optical logic circuits[4]. This project offers you the chance to explore a new optical memory technology that is capable of supplying data at the rates required for integrated all-optical logic. Therefore, new optical materials will be deposited and assessed using various cleanroom tools and optical characterization techniques. As part of this project, you will learn SEM, AFM and transmission measurements of photonic devices, which are necessary to refine material growth and device processing parameters to enhance device performance.

Join our dynamic environment, where you will collaborate closely with leading experts in photonics and light-matter interactions dedicated for all-optical logic.

We invite you to embark on this exciting semester-long project.
Please note that this position is related to a Master's project and therefore, a financial compensation will be not provided.

Role Description

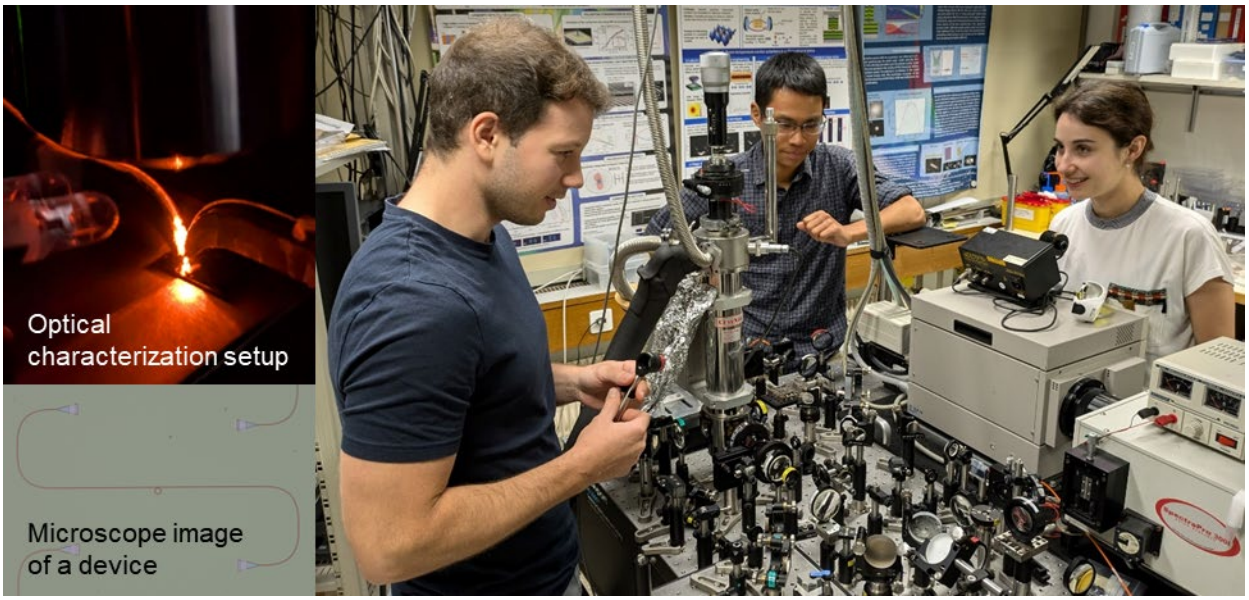
In the frame of this project, you will undertake pivotal tasks including the assessment of material film quality, integration with on-chip photonic devices and the characterization of the integrated photonic structures. You will have access to cutting-edge research facilities, including the ETH/IBM BRNC cleanroom, receive training on various nanofabrication and -characterization techniques and tools, and you will gain invaluable experience in experimental research and data analysis while collaborating with a diverse and innovative team.

Profile

- Enrolled in a Master's program in Electrical Engineering, Physics, Materials or related fields.
- Proficient in written and spoken English.
- Proficient in MATLAB and/or Python programming.
- Background in Optics, Material Science is advantageous.

This is your chance to contribute to cutting-edge research and be part of a team working on the future of computing.

Diversity
IBM is committed to diversity at the workplace. With us you will find an open, multicultural environment. Excellent flexible working arrangements enable all genders to strike the desired balance between their professional development and their personal lives.



How to apply
If you are interested to apply, please provide a short motivation letter and your CV to Dr. Darius Urbonas (dar@zurich.ibm.com) and Dr. Rainer F. Mahrt (rfm@zurich.ibm.com).

Please contact us if you have any question related to this position.

References
1. Miller, D. A. B. Are optical transistors the logical next step? *Nature Photon* **4**, 3–5 (2010).
2. Zasedatelev, A. V. *et al.* A room-temperature organic polariton transistor. *Nat. Photonics* **13**, 378–383 (2019).
3. Zasedatelev, A. V. *et al.* Single-photon nonlinearity at room temperature. *Nature* **597**, 493–497 (2021).
4. Tassan, P. *et al.* Integrated ultrafast all-optical polariton transistors. Preprint at http://arxiv.org/abs/2404.01868 (2024).