

# Master's thesis in photonics at IBM Research – Zurich

## Project description

We are seeking a highly motivated candidate for a master's thesis in the Quantum Technologies group at IBM Research for development of a high-Q optical resonator based on barium titanate ( $\text{BaTiO}_3$ ) directly integrated on silicon.

$\text{BaTiO}_3$  is a non-linear material with one of the largest Pockels coefficients and retains its strong non-linear behavior at cryogenic temperatures. It is an ideal choice for efficient, high-speed electro-optic modulation, with applications ranging from telecommunication to computing to sensing.  $\text{BaTiO}_3$  is also a promising material for use in devices operating at the single-photon level for the purpose of quantum coherent transduction of microwave qubits to optical qubits. Such devices could enable networking of quantum computers.

The project will be carried out in collaboration with Lumiphase, a start-up company established by former IBM employees. Lumiphase is world-leading in the development of  $\text{BaTiO}_3$  photonic technologies.

This highly interdisciplinary master's thesis will involve device fabrication, optical characterization measurements, and numerical simulations. The devices will be fabricated by the student in the Binnig and Rohrer Nanotechnology Center (BRNC), an advanced cleanroom facility located at the IBM laboratory in Rüschlikon, Switzerland. IBM Research provides a collaborative research environment comprising regular research staff as well as other master's and Ph.D. students.

## Requirements:

- Interest in cleanroom fabrication and process development. Previous experience with process technology would be advantageous.
- Interest in photonics and optical characterization.
- Current enrollment in a master's program in materials science, physics, micro- and nanoengineering, or electrical engineering, with permission to begin the master's thesis.
- A superior academic record.
- Good communication skills.

## Duration:

The duration of the master's project will be determined in accordance with the regulations of the candidate's university.

## Diversity:

IBM is committed to diversity in the workplace. We offer an open, multicultural environment. Flexible working arrangements enable both women and men to strike the desired balance between their professional development and their personal lives.

## How to apply:

Please send a single PDF file containing a cover letter, curriculum vitae, and transcripts of grades (master and bachelor level) to Ms. Csilla Bohnhoff ([csb@zurich.ibm.com](mailto:csb@zurich.ibm.com)), preferably before February 15, 2021.