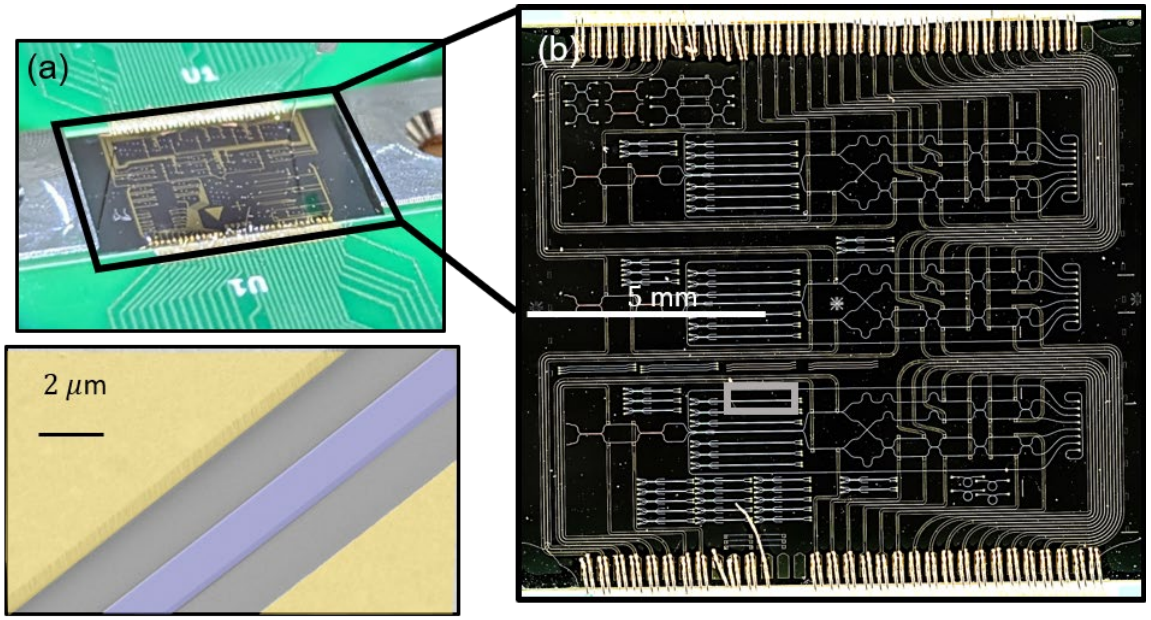
Time-bin encoded photonic circuits

As a non-centrosymmetric crystal lithium niobate (LN) supports nonlinear 3-Wave-mixing processes due to its $\chi^{(2)}$ nonlinearity and high-speed electro optic switching. Whereas traditional photonic circuits used for application such as machine learning and quantum computing used spatial encoding, this is challenging to scale to large devices for real applications. Instead, we aim to do time-bin encoded photonic circuits using high speed LNOI devices.



SEM image of a high speed LNOI electro optic modulator, and microscope image of a full chip.

In this project we aim to develop a programmable LNOI photonic circuit using high speed electro optic phase shifters. This will include developing new photonic integrated circuits, programming control electronics, and performing optical experiments.

A student working on this project will work on:

- Simulate and design LNOI photonic integrated circuits for time-bin encoding
- Write Python code to control a high-speed arbitrary waveform generator
- Perform optical measurements to analyze the device performance.
- Analyze data, document code, and write a thesis to summarize the project

If you are interested in this area of research and would like to join our team for a Master's project, or if you have any further questions, feel free to reach out to us.

Interested students, please contact: rchapman@phys.ethz.ch