

Master Thesis:

Hybrid External Cavity Laser using Photonic Wirebonds

External cavity lasers (ECLs) consist of a frequency selective feedback element external to the semiconductor gain chip. Because of their ability to provide single longitudinal mode operation, wide tunability, low phase noise and small linewidth, there is much interest in building integrated ECLs for applications such as optical communication and sensing.

Different approaches [1, 2] have been demonstrated, in order to connect (R)SOAs and ring resonator based integrated mirrors. In this work, 3D polymer waveguides structured by two-photon lithography, so called photonic wire bonds (PWBs) [3], shall be validated as intra cavity connecting elements.

- [1] X. Zheng *et al.*: "III-V/Si Hybrid Laser Arrays Using Back End of Line (BEOL) Integration," *IEEE J. Sel. Topics Quantum Electron.* 22 (6), 204-217 (2016).
[2] S. Srinivasan *et al.*: "Coupled-Ring-Resonator-Mirror-Based Heterogeneous III-V Silicon Tunable Laser," *IEEE Photon. J.*, vol. 7, no. 3, pp. 1-8, 2015
[3] N. Lindenmann *et al.*: "Photonic Wire Bonding: a Novel Concept for Chip-Scale Interconnects," *Opt. Express* 20, 17667-17677 (2012).

Your tasks may include:

- Characterization of ring resonators and RSOAs
- Development of chip-specific machine vision code
- Design and Fabrication of PWBs
- Modelling and characterization of the laser

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