Master thesis project:
III-V-on-insulator waveguide design for single photon nonlinearities

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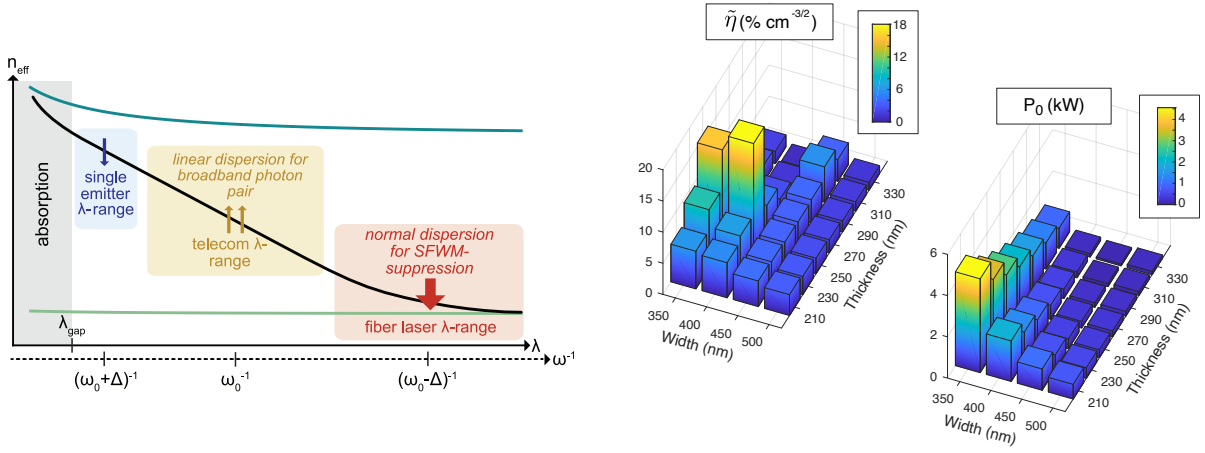
Given the unparalleled optical nonlinear susceptibility of highly confining III-V semiconductor waveguides, pump power requirements for efficient photon-photon interactions are much decreased compared to other nonlinear crystal media. Together with four-wave mixing induced effective second-order interactions, it may be possible to scale down conversion processes to occur already at single photon levels. Such processes could ideally produce two-photon entangling gates that still are a highly anticipated building block for optical quantum computing. Using the simulation tools and design principles for our AlGaAs-on-insulator waveguides [1], the parameter-space for such four-photon interaction schemes shall be explored and quantitatively analyzed. The corresponding interaction schemes should be designed with respect to the availability of pump lasers and the expected multi-photon loss coefficients at the wavelengths of choice.



[1] Placke, Marlon ; Ramelow, Sven: Engineering AlGaAs-on-insulator toward quantum optical applications. In: *Optics Letters* 45 (2020), Nr. 24, S. 6763–6766