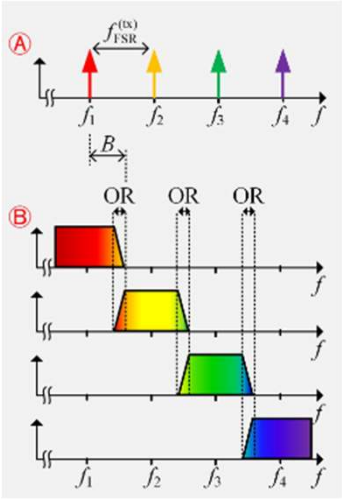
Bachelor/ Master Thesis:

Design and Analysis of Electro-Optical Comb Source Architectures

Karlsruhe Institute of Technology

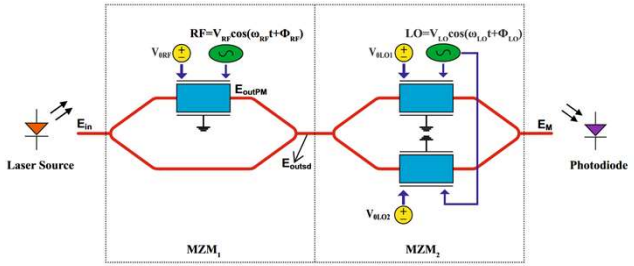
The generation of broadband arbitrary waveforms is currently limited by state-of-the-art analogue-to-digital converters (DAC). By combining multiple spectral slices in the optical domain, these limitations can be overcome. This is done by modulating several frequencies, generated for example by an electro-optical (EO) comb source. EO comb sources can be implemented by modulating a continuous-wave laser with a phase modulator driven by a sinusoidal voltage source. However, when using only a phase modulator, the power of the generated optical sidebands decays rapidly. The goal of this thesis is to investigate alternative architectures generating flat frequency combs and experimentally validate the theoretical simulations. Another goal would be designing photonic integrated circuits (PICs) that could generate such combs.



[1] Drayss et al., arxiv 2412.09580 (2024)

Your tasks:

- Literature review of different architectures for electro-optical comb generation
- Simulation of different architectures (e.g. cascaded phase modulators)
- Characterization of existing PICs & designing the next generation
- Experimental verification and demonstration



[2] Darabi et al., Journal of Optics 0974-6900 (2024)

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