

Bachelor/ Master Thesis:

Design and characterization of Electro-Optical Comb Source Architectures

The generation of broadband arbitrary waveforms is 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 coherent carriers, 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 source. However, when using only a phase modulator, the spectrum of the generated optical sidebands is generally not flat, which is a requirement for many applications. The goal of this thesis is to investigate architectures to generate flat frequency combs and experimentally validate the theoretical simulations. Another goal would be designing photonic integrated circuits (PICs) that could generate such combs based on different platforms, for example: Lithium tantalate-on-insulator (LTOI) and Silicon-organic-hybrid (SOH) platforms.

Your tasks:

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

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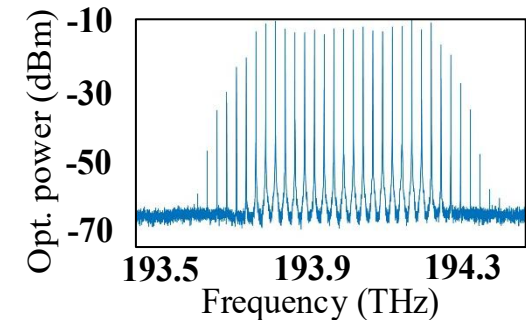
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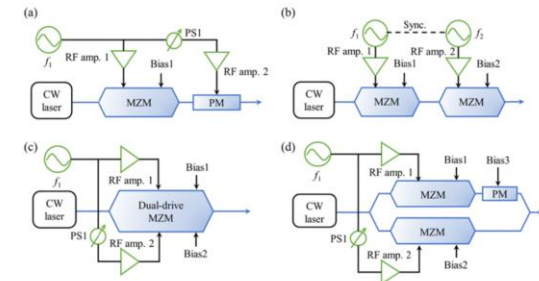
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Exemplary spectrum of a frequency comb



Electro-optic comb architectures.

Source: M. Xu et al. "Flat Optical Frequency Comb Generator Based on Integrated Lithium Niobate Modulators," in Journal of Lightwave Technology (2022).