Title: Numerical analysis of compact silicon nitride waveguide for high-repetition rate frequency comb generation

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Abastact: Optical Frequency Comb generation using channel waveguides has become a key enabler in integrated photonics. In this work, we report the numerical simulation of an Optical Frequency Comb generation in a 0.04m long Silicon Nitride waveguide with all-normal dispersion. The waveguide structure is optimized to support dual-frequency continuous-wave pumping near 1.55μm. A comb spanning 190nm with a 20dB bandwidth and approximately 25 lines is achieved, with a repetition rate of ∼1 THz. To the best of our knowledge, this single-stage, compact channel waveguide design achieves a broadband frequency comb that outperforms previous studies. The proposed architecture holds significant potential for applications in optical atomic clocks, optical rulers, wavelength-division multiplexing, and precision metrology.

Keywords: Optical frequency comb, channel waveguide, SiN waveguide, all-normal dispersion, dual-CW pumping

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