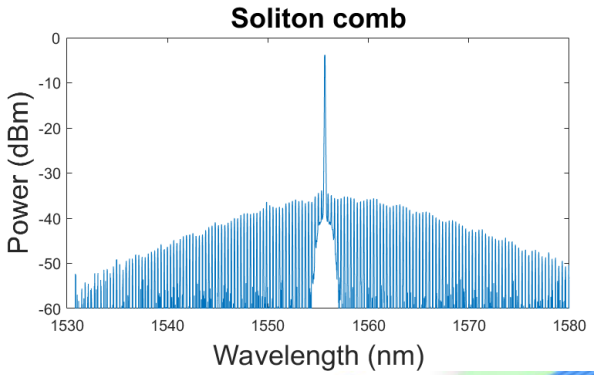
Master Thesis:

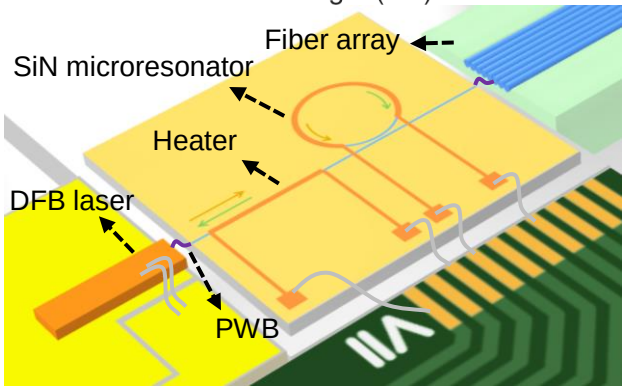
Integrated turn-key Kerr soliton comb generator based on self-injection-locking and photonic wire bonds

Introduction

Optical frequency comb has impacted various applications, such as spectroscopy, telecommunication, and distance metrology. Recently, the hybrid integration of semiconductor laser and optical microresonator attract significant attention owing to the potential of fully chip-based Kerr soliton comb, which provide the prospects of turnkey operation, small footprint, low cost, power efficient, against vibration, and high-volume production.

Here, we propose a hybrid integrated Kerr soliton comb generator that combines a DFB laser, a low-loss silicon-nitride (SiN) microresonator, and a fiber array. The lasing wavelength of the laser can be locked to the microresonator resonance via self-injection locking, facilitating the soliton comb generation through the Kerr effect. This microresonator acts as an external feedback circuit and a nonlinear optical microcavity, reducing the linewidth of the laser and generating a soliton comb, simultaneously. By using the concept of photonic wire bonding (PWB), the laser, the SiN chip, and the output fiber can be integrated in a fully automatic process, paving a path towards fully automated mass production.





Your tasks

- Design and build the integrated Kerr comb generator by photonic wire bonds
- Design the driving system and thermal control system for the soliton comb generator
- Characterize the packaged comb generator

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