Frequency comb injection locking of mode locked lasers

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Abstract:

I will show that injection locking of a mode locked laser to an external pulse train is a two-frequency synchronization problem, where the source and target frequency combs are distinguished by the spacing and offset frequency mismatches. Injection-locked steady states are characterized by a fixed source-target time and phase shifts. The solution of the synchronization problem in the weak injection regime will be presented in the form of locking diagrams where the region of stable injection locking is identified and mapped by the curves of constant source-target time shifts and phase shifts. While the analysis suggests that in application to mode locked fiber lasers active offset mismatch stabilization will be needed to injection lock source and target frequency combs, the synchronization properties are significantly improved with shorter pulses and stronger dispersion.

References:

1. D. Kielpinski and O. Gat, 'Phase-coherent repetition rate multiplication of a mode-locked laser from 40 MHz to 1 GHz by injection locking,' Optics Express, **20**, 2717–2724 (2012).
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