

Title: Synchronization of Microresonator Frequency Combs

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Abstract: Synchronization phenomena is ubiquitous in nature and can occur when multiple oscillators with distinct resonant frequencies are nonlinearly coupled. In photonics such synchronization behavior is with coupled lasers or optomechanical structures. Here we demonstrate a wide variety of synchronization behavior in a system of two photonic-coupled microresonator (i.e., Kerr) frequency combs. We show subharmonic, harmonic, and harmonic-ratio synchronization and reveal their dynamics in the form of Arnold tongues, structures that are an integral part of nonlinear dynamical systems. This ability to achieve synchronization of Kerr combs across a wide range of comb spacings and could find applications in time and frequency metrology, spectroscopy, microwave photonics, optical communications, and astronomy.