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Quantum-classical transition of synchronization of two coupled cavities TONY LEE, ITAMP / Harvard, MICHAEL CROSS, Caltech — Synchronization is a phenomenon that appears throughout physics, biology, and chemistry. There has been much work on how synchronization arises in the classical regime. Motivated by current interest in quantum dissipative systems, we investigate whether synchronization can exist in the quantum regime. We consider a pair of cavities with second harmonic generation. In the classical limit, each cavity has a limit cycle solution, in which the photon number oscillates periodically in time. Coupling between the cavities leads to synchronization of the limit cycles. We follow what happens to the synchronization as the system becomes more quantum, by decreasing the photon number. We find that temporal correlations between the cavities survive deep in the quantum limit when there is much less than one photon in each cavity, because classical correlations are replaced by quantum correlations. Our results can be extended to optomechanics and Jaynes-Cummings cavities.

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