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# POS-24 - Periodic Squeezing in a Polariton Josephson Junction

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Microcavity polaritons are a hybrid photonic system arising from the strong coupling of cavity photons to quantum-well excitons. The light-matter nature of polaritons introduces a Kerr-like nonlinearity while still being easily accessible by standard optical means. The ability to engineer confinement potentials in microcavities makes polaritons a convenient system to study spatially localized bosonic populations, which have great potential for the creation of novel photonic devices.

In this work, we present a polariton Josephson junction which consists of two localized polariton populations coupled via tunneling. Careful engineering of this system was predicted to induce Gaussian squeezing, a phenomenon that lies at a heart of the unconventional photon blockade associated with single photon emission. The squeezing operator originates from the interplay between two entities: the polariton nonlinearity and the coupling strength of the two polariton states. The Josephson oscillations induce dynamics in the population imbalance and relative phase, which therefore varies the squeezing parameters over a wide range of values.

Here, we reveal a manifestation of the predicted squeezing by measuring the ultrafast time-dependent second-order correlation function $g^{(2)}(0)$ by means of a streak-camera acting as a single photon detector [1]. The light emitted by the microcavity oscillates between Poissonian and super-Poissonian in phase with the Josephson dynamics. We model this behaviour using quantum simulations, which predict a dynamical evolution of the squeezing parameters. We show that a crucial prerequisite for squeezing is presence of a weak, but non-zero nonlinearity [2]. Our results [3] open the way towards generation of nonclassical light in solid-state systems possessing a single particle nonlinearity like microwave Josephson junctions or silicon-on-chip resonators.

References

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