

Nonlinear Physics and Signatures of Criticality in a Perovskite Cavity

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Optical nonlinearities and birefringent media have enabled the exploration of fascinating many-body states of light and spin-orbit coupling phenomena in optics, respectively. However, to date, the combination of a strong continuous-wave nonlinearity and birefringence has remained elusive. Here we present experiments demonstrating strong continuous-wave nonlinearity and birefringence in a CsPbBr₃ perovskite cavity. Our perovskite cavity exhibits bistability when probing a single mode, and signatures of tristability when probing nonlinearly coupled orthogonally-polarized modes. Our experiments reveal intriguing physics emerging from the interplay of polarization and nonlinearity in this system. We furthermore explore the temperature dependent optical hysteresis of our cavity, and we discover a surprising boost of the nonlinearity at a specific temperature. We suspect that the perovskite semiconductor we study undergoes a phase transition at that temperature, thereby opening up fascinating perspectives for exploring strongly correlated states of light in this system.