

Abstract Submitted
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Observation of Cavity Rydberg Polaritons ALEXANDROS GEORGAKOPOULOS, NINGYUAN JIA, ALBERT RYOU, NATHAN SCHINE, MICHAEL CERVIA, TAHOE SCHRADER, ARIEL SOMMER, JONATHAN SIMON, University of Chicago — We demonstrate hybridization of optical cavity photons with atomic Rydberg excitations using electromagnetically induced transparency (EIT). The resulting dark state Rydberg polaritons exhibit a compressed frequency spectrum and enhanced lifetime indicating strong light-matter mixing. We study the coherence properties of cavity Rydberg polaritons and identify the generalized EIT linewidth for optical cavities. Strong collective coupling suppresses polariton losses due to inhomogeneous broadening, which we demonstrate by using different Rydberg levels with a range of polarizabilities. Our results point the way towards using cavity Rydberg polaritons as a platform for creating photonic quantum materials.

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