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Three-body interactions between slow light Rydberg polaritons KRZYSZTOF JACHYMSKI, PRZEMYSLAW BIENIAS, HANS PETER BÜCHLER, Univ Stuttgart — Rydberg polaritons have recently emerged as a promising platform for nonlinear optics and photonic quantum simulation. They are created in an atomic medium using electromagnetically induced transparency (EIT) scheme involving a Rydberg excitation. Cavity photons can be used in this context to create long-lived, coherent samples consisting of several polaritons. We show that in addition to effective two-body interaction potential inherited from the Rydberg states, the polaritons also exhibit effective three-body interactions. For attractive two-body forces, the three-body term induces short-range repulsion. We analyze the impact of this interaction on the three-body photonic bound states in one-dimensional geometry and discuss the prospects for engineering novel quantum states.

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