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Three-body physics of Rydberg polaritons YIDAN WANG, Joint Quantum Institute, ALEXEY GORSHKOV, Joint Quantum Institute, Joint Center for Quantum Information and Computer Science, RAN QI, Renmin University of China, MICHAEL GULLANS, MOHAMMAD MAGHREBI, Joint Quantum Institute, Joint Center for Quantum Information and Computer Science — Under the conditions electromagnetically induced transparency in Rydberg media, slow-light polaritons interact strongly via Rydberg states. While two such polaritons can interact attractively and form two-body bound states, three polariton physics remains largely unexplored. We show that while exact three-polariton bound states do not exist, metastable ones do. The understanding of three-polariton physics will allow for the construction of more precise low energy many-body theories of Rydberg polaritons and may enable the realization of novel exotic equilibrium and out-of equilibrium phenomena with interacting light.

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