

Abstract Submitted
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Spin dynamics of individual neutral impurities coupled to a Bose-Einstein condensate DANIEL ADAM, FELIX SCHMIDT, DANIEL MAYER, QUENTIN BOUTON, TOBIAS LAUSCH, ARTUR WIDERA, Technische Universitaet Kaiserslautern — Individual spins immersed into a superfluid form a paradigm of quantum physics. It lies at the heart of many models exploiting the quantum nature of individual spin to understand quantum phenomena or to open novel routes to local probing and engineering of quantum many-body systems. We report on the controlled immersion of individual localized neutral Caesium (Cs) atoms having total spin $F = 3$ into a Rubidium Bose-Einstein condensate (BEC) with total spin $F = 1$. We observe inelastic spin exchange as well as coherent dynamics of the Cs impurity's quasi-spins interacting with the BEC with high position and time resolution. Our work paves the way for local quantum probing of superfluids, and thus might shed light on the local state of nonequilibrium or correlated quantum many-body systems.

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