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Interaction between single neutral atoms and an ultracold atomic gas[1] MICHAEL BAUER, FARINA KINDERMANN, PHILIPP FRANZREB, BENJAMIN GÄNGER, JAN PHIELER, SHRABANA CHAKRABARTI, University of Kaiserslautern, NICOLAS SPETHMANN, UC Berkeley, DIETER MESCHEDE, University of Bonn, ARTUR WIDERA, University of Kaiserslautern — Recently hybrid systems immersing single atoms in a many body system have been a subject of intense interest. Here we present an example of controlled doping of an ultracold Rubidium cloud with single neutral Cesium impurity atoms. We observe thermalization of "hot" Cs atoms by elastic interaction with an ultracold Rb gas, employing different schemes of measuring the impurities' energy distribution. In addition we present a concept and review the current status of a new setup, which will be capable of breeding an all optical BEC in a few seconds. Our setup will feature mechanisms for independently manipulating and imaging both single atoms and the BEC, thereby providing an unrivaled level of control over impurities in a quantum gas. Possible research directions include the investigation of coherent impurity physics and the creation and characterization of polarons in a BEC.

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