Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Coupling a single electron to a BEC ROBERT LÖW, JONATHAN BALEWSKI, ALEXANDER KRUPP, ANITA GAJ, DAVID PETER, HANS-PETER BÜCHLER, SEBASTIAN HOFFERBERTH, TILMAN PFAU, University of Stuttgart — For highly excited Rydberg atoms with principal quantum numbers n $\sim$ 40, single ground state atoms can be trapped in the potential created by the Rydberg electron, leading to so called trilobite Rydberg molecules. At even higher Rydberg states the depth of the interaction potential decreases, whereas the spatial extent of the Rydberg atom increases. For n in the range of 100-200 the electron orbit reaches the physical size of a Bose-Einstein condensate. At typical BEC densities, up to several ten thousand ground state atoms are now located inside one Rydberg atom, leading to a density dependent energy shift of the Rydberg state. This allows, together with the strong van-der-Waals blockade, to excite only one single Rydberg atom at a time in a condensate. We study the life time of this aggregates and the mechanical effect on the BEC. In the future we might be able to trap a full condensate inside one Rydberg atom or to image the Rydberg electron's wavefunction by its impact onto the superfluid. Nature 502, 664 (2013)

Robert Löw
University of Stuttgart

Date submitted: 31 Jan 2014 Electronic form version 1.4