

Abstract Submitted
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Mesoscopic Rydberg-blockaded ensembles in the superatom regime and beyond TORSTEN MANTHEY, TOBIAS MASSIMO WEBER, MICHAEL HÖNING, THOMAS NIEDERPRÜM, OLIVER THOMAS, VERA GUARRERA, GIOVANNI BARONTINI, MICHAEL FLEISCHHAUER, HERWIG OTT, University of Kaiserslautern — We report on the controlled creation and characterization of an isolated mesoscopic superatom by means of accurate density engineering and excitation to Rydberg P-states.¹ By monitoring continuous laser-induced ionization we are able to determine the $g^2(\tau)$ correlation function and observe anti bunching for resonant excitation, as well as bunching for off resonant coupling. We further investigate the transition from a strongly confined effective two-level to an extended many body system by manipulation of the spatial dimension of the atomic sample with the help of a focused electron beam. The observed amplitudes and timescales can be described with an effective rate-equation model.

¹T.M. Weber, M. Höning, T. Niederprüm, T. Manthey, O. Thomas, M. Fleischhauer, G. Barontini and H. Ott, **Nature Physics** Mesoscopic Rydberg-blockaded ensembles in the superatom regime and beyond, doi:10.1038/nphys3214

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