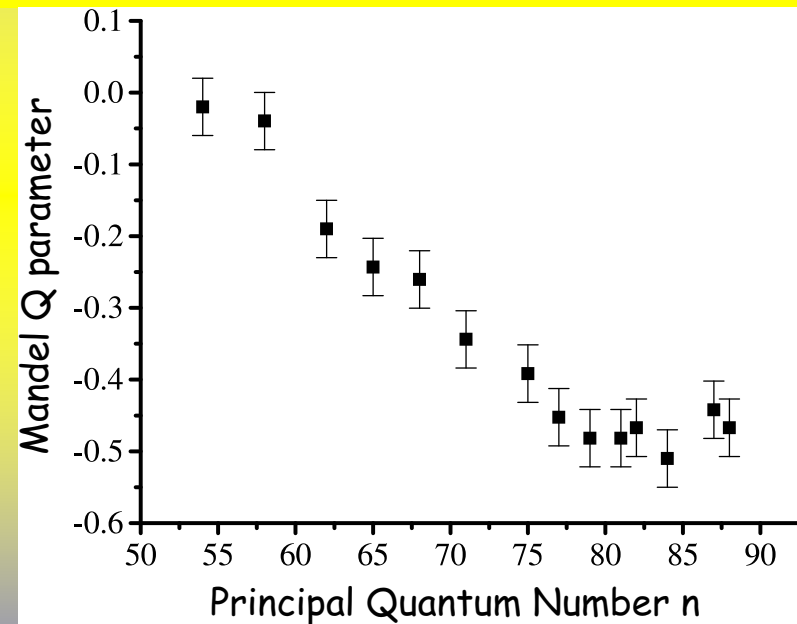
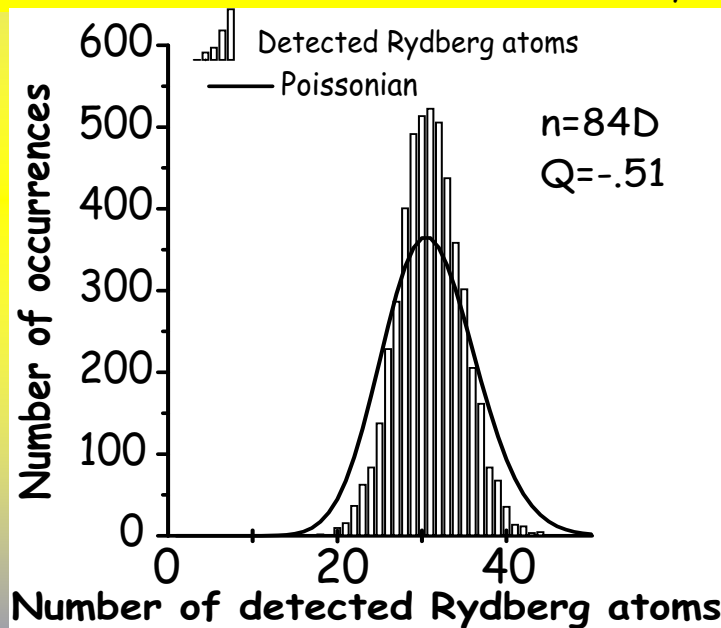


Atom Counting Statistics in Ensembles of Interacting Rydberg Atoms

Tara Cubel Liebisch, Aaron Reinhard, Paul Berman, Georg Raithel
University of Michigan

In this work, a blockade effect in the Rydberg-atom excitation in small atomic samples is demonstrated for the first time. This demonstration is an important first step towards using Rydberg atoms for quantum information processing (PRL 95 253002). The blockade occurs due to van der Waals and dipole-dipole interactions between Rydberg atoms, which scale as n^1/R^6 and n^4/R^3 , respectively. If these interactions are larger than the excitation laser's line width, the distribution of the number of Rydberg excitations becomes sub-Poissonian.



Left panel: Sub-poissonian distribution of the Rydberg-atom number, P , in a small atom sample. Right panel: Dependence of the Mandel Q -parameter of the distribution P on the principal quantum number n .



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