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Observation of Rydberg blockade effects at very high n, $n \sim 300$, using strontium n^1F_3 states[1] XINYUE ZHANG, F.B. DUNNING, Physics and Astronomy, Rice University, SHUHEI YOSHIDA, JOACHIM BURGDÖRFER, Institute for Theoretical Physics, Vienna University of Technology — Rydberg blockade at very high n, $n \sim 300$, is examined using strontium n^1F_3 Rydberg atoms excited in a small volume defined by two tightly-focused crossed laser beams. Measurements of the number distribution of Rydberg atoms created show deviations from a Poisson distribution revealing sizeable blockade effects. The statistics of the number distribution are studied using a Monte Carlo method in which the interaction between strontium Rydberg atoms is evaluated by solving the Schrödinger equation within a two-active-electron model. The strength of blockade is analyzed in detail with respect to the alignment of two atoms relative to the laser polarizations. With careful control of the experimental parameters the probability for creating one, and only one, Rydberg atom, $P(1)$, in the excitation volume can be sufficiently large, $P(1) > 0.6$, as to enable detailed studies of strongly-coupled Rydberg atom pairs.

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