Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Blockade involving high-n, $n \sim 300$, strontium Rydberg atoms[1]
SHUHEI YOSHIDA, JOACHIM BURGDÖRFER, Institute for Theoretical Physics, Vienna University of Technology, XINYUE ZHANG, F.BARRY DUNNING, Department of Physics and Astronomy, Rice University — The blockade of high-n strontium n^1F_3 Rydberg states contained in a hot atomic beam is investigated both theoretically and experimentally. One difficulty in such experiments is that, once created, Rydberg atoms move out of the excitation volume reducing blockade effects. While the effects of such motion are apparent, the data provide strong evidence of blockade, consistent with theoretical predictions. Because of their relatively high angular momentum ($L = 3$), a pair of n^1F_3 Rydberg atoms have many degenerate states whose degeneracy is removed by Rydberg-Rydberg interactions yielding a high density of states near the target energy. To evaluate the effect of blockade not only the energy shifts but also the modification of the oscillator strengths for excitation have to be taken into account. The n-scaling of the interactions and the importance of high-order multipoles will also be discussed.

[1]Research supported by the NSF and Robert A. Welch Foundation

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Date submitted: 25 Jan 2016 Electronic form version 1.4