Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Angular Dependence of Rydberg Atom Pair Interactions in a Blockaded Rb Gas[1] AKBAR JAHANGIRI JOZANI, Homer L. Dodge Department of Physics and Astronomy, The University of Oklahoma, 440 W. Brooks St. Norman, OK 73019, USA, LUIS FELIPE GONÇALVES, LUIS G. MARCASSA, Instituto de Física de São Carlos, Universidade de São Paulo, Caixa Postal 369, 13560-970, São Carlos, São Paulo, Brazil, JAMES P. SHAFFER, Homer L. Dodge Department of Physics and Astronomy, The University of Oklahoma, 440 W. Brooks St. Norman, OK 73019, USA — We present our work on the angular dependence of Rydberg blockade in an external electric field. Experimental work is compared to detailed Rydberg atom pair interaction calculations. The interaction between 50S Rb atoms effectively trapped in 1-dimension is investigated in an electric field. The electric field polarizes the atoms so that an angularly dependent dipole-dipole interaction as well as a Van der Waals-like force determine the Rydberg blockade. In the experiments, an external electric field is tilted with respect to the trapping axis. Our calculations show that the effective interaction potential, V_{eff}, for electric fields of ∼1-3 V/cm and internuclear distances around the blockade radius R_{bl}, leads to a dipole-dipole interaction parameter, C_3, approximately 7 times stronger than the free atom dipole moments in the electric field would suggest, which is in excellent agreement with experiment. The stronger effective dipole moments leading to a larger C_3 coefficient are the result of mixing of the asymptotic molecular states with high angular momentum molecular states induced by the static electric field around R_{bl}.

[1]This work supported by the NSF and AFOSR

Akbar Jahangiri Jozani
Homer L. Dodge Dept. of Phys. and Astronomy, The Univ. of Oklahoma

Date submitted: 07 Feb 2018 Electronic form version 1.4