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Interactions between cold rubidium Rydberg atoms with external control J.E. JOHNSON, S.L. ROLSTON, Joint Quantum Institute, University of Maryland College Park — We explore the interactions in an ensemble of ^{87}Rb atoms at temperatures 500 μK excited to the $50S_{1/2}$ Rydberg state. The atoms interact with an externally-controlled static electric field, producing a Stark-shifted energy level and an induced electric dipole moment. Changes in this induced dipole moment give rise to increased interactions between the atoms, as evidenced by a suppression of the excitation to the Rydberg state. We model this excitation suppression with a simple Monte Carlo simulation and show that the suppression of excitation is fully explained by a dipole-dipole interaction between the induced dipoles along with the van der Waals interaction. Additionally, we investigate a perturbative approach to calculate the full interactions by using Stark-perturbed wavefunctions in a calculation of the van der Waals interaction through Forster processes.

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