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Electric field excitation suppression in cold atoms JIANING HAN, JULIET MITCHELL, MORGAN UMSTEAD, University of South Alabama — In this article, the atom excitation suppression is studied in two ways. The first way of exploring the excitation suppression is by a DC electric field. Second, we study the excitation suppression caused by Coulomb forces. The Coulomb forces are created by ions through ionizing atoms by a UV laser, and we then watch the cold atom population change. This can be also called Coulomb blockade. The theory shows that the interaction, which causes the suppression, is primarily caused by ion-dipole interactions. Here the ion is created by exciting neutral cold atoms to ionized states, and the dipole is an atom. In this experiment, we use ^{85}Rb atoms. The valence electron and the ion core are the two poles of an electric dipole. The interaction potential energy between the ion and the atom is proportional to $\frac{1}{R^2}$, and the frequency shift caused by this interaction is proportional to $\frac{1}{R^4}$, where R is the distance between the ion and the dipole considered. By comparing the theory and experiment, it has been shown that the polarization of the atoms plays an important role in excitation suppression. This research can be used for quantum information storage, remote control, creating hot plasmas using cold atoms, as well as electronic devices.

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