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Control of Rydberg atom blockade by dc electric field orientation in a quasi-one-dimensional sample[1] LUÍS FELIPE GONCALVES, LUIS GUSTAVO MARCASSA, University of Sao Paulo — Rydberg atoms posse a strong atom-atom interaction, which limits its density in an atomic sample. Such effect is known as Rydberg atom blockade. Here, we present a novel way to control such effect by direct orienting the induced atomic dipole moment using a dc external electrical field. To demonstrate it, we excite the $50S_{1/2}$ Rb atomic state in a quasi-one-dimensional sample held in a quasi-electrostatic trap. A pure nS state holds only van der Waals interaction at long range, but in the presence of an external electric field the state mixing leads to strong dipole-dipole interactions. We have measured the Rydberg atom population as a function of ground state atoms density for several angles between the electric field and the main axis of the unidimensional sample. The results indicate that the limit on the final Rydberg density can be controlled by electric field orientation. Besides, we have characterized the sample by using direct spatial ion imaging, demonstrating that it does behave as an unidimensional sample.

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