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Computational Studies of Many-Body Interactions in Ultracold Rydberg Atoms in a Crossed Beam Geometry THOMAS CARROLL, CHRISTOPHER DANIEL, Ursinus College, MICHAEL NOEL, Bryn Mawr College — Ultra-cold highly-excited atoms in a magneto-optical trap are strongly coupled by the dipole-dipole interaction. We have developed a computational model of these systems in order to explore the importance of many-body effects, time dependence, and the geometry of the sample. The model simulates the time evolution of groups of Rydberg atoms in different geometric arrangements. Parallel computing techniques are used to simulate large numbers of atoms directly. Simulation results are presented for two perpendicular, roughly cylindrical, intersecting volumes. The atoms in each cylinder are able to interact with the atoms in the other cylinder, but not within their own cylinder. Results are interpreted in the context of potential experimental parameters.

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