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Two body and multibody interaction in a cold Rydberg gas[1] JIANING HAN, TOM GALLAGHER, University of Virginia — Cold Rydberg atoms trapped in a Magneto Optical Trap (MOT) are not isolated and they tend to bond through dipole-dipole and multiple-multiple interactions between Rydberg atoms. The dipole-dipole interaction and van der Waals interaction between two atoms have been intensively studied. However, the fact that the dipole-dipole interaction and van der Waals interaction show the same size of broadening, studied by Raithel's group, and there is transition between two molecular states, studied by Farooqi and Overstreet, can not be explained by the two atom picture. The purpose of this paper is to show the multibody nature of a dense cold Rydberg gas by studying the molecular state microwave spectrum. Specifically, single body, two body and three body interaction regions are separated. Moreover, the multibody energy levels for selected geometries are calculated. In addition, multibody blockade will be discussed.

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