

Abstract Submitted
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Study of atomic dipole-dipole interactions via measurement of atom-pair kinetics NITHIWADEE THAICHAROEN, Univ of Michigan - Ann Arbor, LUÍS FELIPE GONÇALVES, Universidade de São Paulo, GEORG RAITHEL, Univ of Michigan - Ann Arbor — We observe atom-pair kinetics due to binary dipolar forces by direct imaging of the center-of-mass positions of the individual Rydberg atoms and pair-correlation analysis. To prepare a highly dipolar quantum state, Rydberg-atom ensembles are switched from a weakly- into a strongly-interacting regime via adiabatic state transformation. The transformed atoms exhibit a large permanent electric dipole moment that is locked to the direction of an applied electric field. The resultant electric dipole-dipole forces reveal dumbbell-shaped pair correlation images that demonstrate the anisotropy of the binary dipolar force. The dipole-dipole interaction coefficient C_3 , derived from the time dependence of the images, agrees with the value calculated from the known permanent electric-dipole moment of the atoms. The observations also show the dynamics reminiscent of disorder-induced heating in strongly coupled particle systems.

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