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Higher Order Partial Waves in a Bose-Einstein Condensate R.A. WILLIAMS, L.J. LEBLANC, K. JIMENEZ GARCIA, M.C. BEELER, I.B. SPIELMAN, Joint Quantum Institute, NIST and University of Maryland — The interactions of bosons at the low temperatures associated with quantum degeneracy are usually well-described by a purely isotropic (s-wave) interaction. We study collisions between Bose-Einstein condensates dressed by counter-propagating Raman beams, where the eigenstates of the Raman-dressed system are spin-momentum superpositions. Higher order (beyond s-wave) partial wave interactions between colliding BECs in the ground Raman dressed state are observed at collision velocities orders of magnitude below those traditionally required to surpass the s-wave scattering regime. Furthermore we investigate scattering in excited Raman-dressed states and observe collision-induced decay to lower energy Raman-dressed states which can be p-wave or d-wave in character.

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