Abstract Submitted
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Synthetic partial waves in ultracold atomic collisions ROSS WILLIAMS, LINDSAY LEBLANC, KARINA JIMENEZ-GARCIA, MATTHEW BEELER, ABIGAIL PERRY, BILL PHILLIPS, IAN SPIELMAN, Joint Quantum Institute, NIST and University of Maryland — Interactions between particles can be strongly modified by their environment. We describe an experimental technique for modifying interactions between ultracold atoms by screening the native interaction with light, significantly increasing the range of the interaction and allowing coupling of states of higher angular momentum. 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. Collisions between bosons at the low temperatures associated with quantum degeneracy are usually well-described by a purely isotropic (s-wave) interaction. In contrast we observed effective higher order (beyond s-wave) partial wave interactions between colliding BECs in the ground Raman dressed state 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.

Ross Williams
Joint Quantum Institute, NIST and University of Maryland

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