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Collisions between cold molecules in a superconducting magnetic trap MICHAEL KARPOV, YAIR SEGEV, MARTIN PITZER, NITZAN AKERMAN, JULIA NAREVICIUS, EDVARDAS NAREVICIUS, Weizmann Institute of Science — We observe the first directly measured collisions between cold, trapped molecules, achieved without the need of laser cooling. Following deceleration using time-dependent magnetic fields, we capture molecular oxygen in a 0.8K•kB deep superconducting magnetic trap. The density-dependent, non-exponential decay in particle number provides a clear proof of molecule-molecule collisions within the trapped ensemble. Our detection scheme allows probing the density at different locations in the trap. The spatial distribution of the trapped molecules is found to change over time, allowing to set bounds on the ratio between the elastic and inelastic scattering rates, the key parameter determining the feasibility of evaporative cooling. We further co-trap lithium atoms together with molecular oxygen and identify collisions between atoms and molecules, paving the way to studies of cold interspecies collisions in a magnetic trap.

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