Microwave shielding of ultracold polar molecules

TIJS KARMAN, ITAMP, Harvard - Smithsonian Center for Astrophysics, JEREMY HUTSON, Department of Chemistry, Durham University — We use microwaves to engineer repulsive long-range interactions between ultracold polar molecules. The resulting shielding suppresses various loss mechanisms and provides large elastic cross sections. Hyperfine interactions limit the shielding under realistic conditions, but a magnetic field allows suppression of the losses to below $10^{-14} \ cm^3 \ s^{-1}$. The mechanism and optimum conditions for shielding differ substantially from those proposed by Gorshkov et al. [Phys. Rev. Lett. 101, 073201 (2008)], and do not require cancellation of the long-range dipole-dipole interaction that is vital to many applications.