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Cold collisions of magnetically oriented YbF molecules in an electric field T.V. TSCHERBUL, Dept. of Chemistry, University of British Columbia, Vancouver, Canada, J. KLOS, Dept. of Chemistry and Biochemistry, University of Maryland, College Park, MD, L. RAJCHEL, Dept. of Chemistry, Oakland University, Rochester, MI, R.V. KREMS, Dept. of Chemistry, University of British Columbia, Vancouver, Canada — The sensitivity of spectroscopic experiments to measure the electric dipole moment of the electron can be greatly enhanced by employing dense cold ensembles of heavy polar molecules such as YbF [1]. In order to elucidate the collisional stability of Zeeman states of heavy polar molecules, we have performed a rigourous quantum study of YbF–He collisions in the presence of superimposed electric and magnetic fields. It is shown that the interaction between the ground $N = 0$ and the second excited $N = 2$ rotational levels is responsible for simultaneous collisional depolarization of electronic and nuclear spins. The nuclear spin-conserving electronic spin relaxation occurs by a two-step mechanism, via the coupling with the $N = 1$ rotationally excited state. Both processes are influenced by Feshbach resonances whose positions and lifetimes can be manipulated by varying external electric and magnetic fields. Our results suggest that buffer gas cooling of heavy polar molecules in a magnetic trap may be easier than was previously expected. J.J. Hudson *et al.*, Phys. Rev. Lett. 89, 023003 (2002).

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