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Hyperfine structure of OH molecules in electric and magnetic fields[1] KENJI MAEDA, Colorado School of Mines, MICHAEL L. WALL, JILA, University of Colorado, Boulder, LINCOLN D. CARR, Colorado School of Mines — Ultracold polar molecules offer a unique opportunity in table-top experiments to study quantum phenomena originating from strong dipole-dipole interactions and incorporating internal degrees of freedom controllable by external electric and magnetic fields. Recently, a gas of OH molecules was evaporatively cooled at JILA to milliKelvin temperatures. However, in the presence of electric and magnetic fields, the energy spectra of OH were calculated only to energy scales of mK, far from the sub-microKelvin temperatures at which OH molecules will become quantum degenerate. We investigate single-particle energy spectra of the OH radical in the lowest rovibrational and electric ground states under combined electric and magnetic fields. In addition to the fine-structure interactions, the hyperfine interactions and centrifugal distortion effects are taken into account, yielding the zero-field spectrum of the lowest $^2\Pi_{3/2}$ manifold to an accuracy of less than 2kHz$\sim$100nK. We also examine level crossings and repulsions in hyperfine structures induced by applied electric and magnetic fields. We will mention many-body applications of ultracold OH molecules to simulate quantum dipolar systems.

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