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High Resolution Rotational Spectroscopy of Zeeman & Hyperfine Effects in PbF & YbF[1] RICHARD MAWHORTER, ALEX BAUM, BENJAMIN MURPHY, Pomona College, TREVOR SEARS, Brookhaven National Laboratory, N.E. SHAFER-RAY, University of Oklahoma, LUKAS ALPHEI, JENS-UWE GRABOW, Leibnitz-Universitaet — Motivated by the ongoing search for the CP-violating electron electric dipole moment (e-EDM), rotational spectra of the radicals^{207}Pb^{19}F and ^{208}Pb^{19}F were measured using a supersonic jet Fourier transform microwave spectrometer. Zeeman splitting was examined for 10 ^{207}PbF and 9 ^{208}PbF J = $^1/_2$ and J = $^3/_2$ transitions using Helmholtz coils and magnetic fields up to ∼4 Gauss. Transitions were observed with 0.5 kHz accuracy and 6 kHz pair resolution over a range of 2 – 26.5 GHz. The observation of these field dependent spectra allowed for the determination of the two body fixed g-factors, $G_{\|}$ and $G_{\perp}$, of the electronic wave function. This is an important step in a possible future e-EDM experiment using either the ^{207}PbF or ^{208}PbF molecule, and our results compare reasonably well with recently calculated values. Observing the nuclear quadrupole hyperfine structure can also help characterize the critical electric field at the heavy atom nucleus in unstable but long-lived ^{205}PbF as well as ^{173}YbF. Energy level predictions based on our detailed studies of the 4 stable PbF isotopologues as well as previous optical and microwave spectra of YbF will facilitate upcoming experimental studies and may also uncover nearby states of opposite parity which could also greatly benefit the eEDM search.

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Richard Mawhorter
Pomona College

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