LIF SPECTROSCOPY OF ThF AND THE PREPARATION OF ThF^+ FOR THE JILA eEDM EXPERIMENT

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ThF^+ is a promising candidate for a second-generation molecular ion-based measurement of the permanent electric dipole moment of the electron (eEDM). Compared to the current HfF^+ eEDM experiment, ThF^+ has several advantages: (i) the eEDM-sensitive $^3\Delta_1$ electronic state is the ground state, which facilitates a long measurement coherence time; (ii) its effective electric field (38 GV/cm) is 50% larger than that of HfF+, which promises a direct increase of the eEDM sensitivity; and (iii) the ionization energy of neutral ThF is lower than its dissociation energy, which introduces a greater flexibility for rotational state-selective photoionization via core-nonpenetrating Rydberg states. We use laser-induced fluorescence (LIF) spectroscopy to find suitable intermediate states required for the state selective ionization process. We present the results of our LIF spectroscopy of ThF, and our current progress on efficient ThF ionization and on ThF^+ dissociation.