LASER-INDUCED FLUORESCENCE SPECTROSCOPY ON ROTATIONAL DISTRIBUTION OF HfF PHOTOIONS

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As a step towards measuring the electron electric dipole moment[a], we produce a sample of HfF^+ using a two-color excitation. We promote HfF from $X^2\Delta_{3/2}$ to an isotope and parity-selective intermediate state, and then to one of many highly perturbed Rydberg states from which it autoionizes to the vibrational ground state of HfF^+. We measure the population of the rotational states of HfF^+ using laser-induced fluorescence and find that only a small number of states are populated, with most of the population in $J < 4$. Additionally, we see a strong propensity for autoionization to preserve the parity of the molecule, with one parity populating even J levels and the other populating odd J. Using polarized light to prepare the Rydberg molecules in various orientations, and then probing the ion with LIF, we see that a polarization of m_J sublevels also survives autoionization.

[a] A. Leanhardt et al, arXiv:atom-ph/1008.2997v2 (2010).