CHARACTERIZING MOLECULAR IONS FOR LASER CONTROL

SRUTHI VENKATARAMANABABU, *Physics, Northwestern University, Evanston, Illinois, USA*; PATRICK R STOLLENWERK, IVAN ANTONOV, BRIAN C. ODOM, *Department of Physics and Astronomy, Northwestern University, Evanston, IL, USA*.

Variation of fundamental constants would indicate physics beyond the Standard Model. Astronomical evidence and proposed theoretical models suggest a possible variation in the proton to electron mass ratio (μ). Detection of μ variation will require high precision measurements. Historically, the highest precision measurements have been performed on ultracold atoms. Atomic transitions, however, have limited sensitivity to μ compared to what is found in molecules. Unfortunately, the additional motional degrees of freedom in molecules that give them this sensitivity also lead to more complex internal structure, making it difficult to control them using powerful techniques such as optical pumping. To achieve laser control of the molecular degrees of freedom we need an accurate knowledge of transition energies, state lifetimes and radiative branching ratios. In addition, we need a method to reliably produce molecular ions. In this talk, I will discuss spectroscopic techniques developed in our lab to probe molecular ions.