LASER ABLATION MOLECULAR SPECTROSCOPY OF NOVEL BARIUM MOLECULES

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Molecules that contain radium are promising candidates as probes of physics beyond the Standard Model. The large nuclear octupole deformation of the radium atom and large effective electric fields found within molecules could lead to extremely sensitive tests of fundamental symmetries. However, there exist little to no spectroscopic data on molecules of interest. In order to explore the electronic and vibrational states of these molecules we have developed a system to do a broad spectrum search with laser ablation molecular spectroscopy (LAMS). Targets containing the constituent atoms are ablated with a pulsed laser and light is collected from the resulting plasma plume where molecules are formed. The fluorescence is then analyzed looking for the new molecular transitions. Barium is used as a surrogate as a means to test target production and the sensitivity of the method to unknown molecular transitions from a small amount of material. The development of the experiment and progress towards the detection of novel barium molecules will be presented. This work is supported by the U.S. DOE, Office of Science, Office of Nuclear Physics, under contract DE-AC02-06CH11357.