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Spectroscopic measurements of Ba+ JOSEPH PIRTLE, RYAN BOWLER, SANGHOON CHONG, Undergrad, MATT DIETRICH, GARY HOWELL, ADAM KLECZEWSKI, NATHAN KURZ, Grad, VIKI MIRGON, PHIL NELSEN, JOANNA SALACKA, Undergrad, GANG SHU, LI WANG, Grad, BORIS BLINOV, PI — Our goal is to measure the atomic structure of Ba^+ to a new degree of accuracy. We confine and laser-cool a single barium ion in an RF quadrupole. We intend on measuring the branching ratios for the $6P_{3/2}$ - $5D_{5/2}$ and the $6P_{3/2}$ - $5D_{3/2}$ decays in Ba^+. The measurement is achieved by first exiting the ion to the $6P_{3/2}$ state with a short duration of a 455 nm shelving laser. We then allow the ion to decay, which will result in one of three states: $5D_{5/2}$, $5D_{3/2}$, and $6S1_{/2}$. Next we use a 650 nm laser to re-pump the ion out of the $5D_{3/2}$ into the $6P_{1/2}$ and another 493nm to transition from $6S_{1/2}$ to $6P_{1/2}$. If the ion fluoresces in this $6S_{1/2}$ - $6P_{1/2}$ - $5D_{3/2}$ cycle then we know the original decay out of $6P_{3/2}$ was into either $5D_{3/2}$ or $6S_{1/2}$. By incrementally increasing the duration of the 455 nm excitation the probability of decay into the $6S_{1/2}$ is exponentially decreased. With enough data points we can extrapolate the saturation between the probabilities of fluorescent and non- fluorescent cycles. The branching ratio between the decays into the $5D_{5/2}$ and $5D_{3/2}$states is the ratio of these probabilities in this limit. Our future experiments include the precision RF spectroscopy of the $5D_{5/2}$ state in $^{137}Ba^+$ and the measurement of the $5D_{5/2}$ state lifetime.

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