

# Alkali Earth Ion Spectroscopy in Preparation of a Weinberg Angle Measurement

*Tuesday, 12 September 2017 18:00 (1 hour)*

Through precision spectroscopy on Ba<sup>+</sup> ions we determine precisely the  $6s2S_{1/2} - 6p2P_{1/2}$ ,  $6p2P_{1/2} - 5d2D_{3/2}$ ,  $6s2S_{1/2} - 5d2D_{3/2}$  transition frequencies. In these experiments we employ laser-cooled single trapped ions. The optical frequencies are controlled by a frequency comb and I2 line locked laser system. We have achieved more than 2 orders of magnitude improved values, i.e. we have reached 10–11 relative accuracy. In a further measurement we have determined precisely the lifetime of the lifetime of the  $5d2D_{5/2}$  state. Our experiment is aimed at precisely testing the available atomic calculations and in particular atomic wave functions the knowledge of which is needed for interpreting a precise measurement of atomic parity violation in heavy alkaline earth atoms through light shifts in the narrow optical  $6s2S_{1/2} - 5d2D_{3/2}$  single photon transition. The weak mixing angle can be determined precisely from the weak interaction contributions between primarily the nuclear neutrons and the atomic valence electron to the atomic binding.

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