Single Ion Spectroscopy for Atomic Parity Violation

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A single trapped ion opens a promising path for a measurement of atomic parity violation (APV). The experiments promise the best measurement of electroweak constants at the lowest accessible energies in atoms. They provide tests of the Standard Model complementary to those ongoing and possible at the highest energies at accelerators Since the sensitivity of the APV grows faster than the third power of the atomic number Z, a single Ra ion is an excellent candidate for such a measurement. One requirement is the localization of the ion within a fraction of an optical wavelength. Current experiments are focused on trapping and laser cooling of few Ba^+ ions as a precursor for Ra^+. Ba ions are trapped and laser cooled in a precision hyperbolic Paul trap. The measurement cycle for APV will be discussed for this system.

Recent online laser spectroscopy of $^{209\text{-}214}Ra^+$ isotopes in a linear Paul trap provided information on transitions wavelengths and hyperfine structure required for the interpretation of an APV measurement in Ra^+.