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Atomic Parity Violation in single trapped Ba+ and Ra+ ions.

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Atomic Parity Violation (APV) opens the path to improved determination of electroweak parameters. This can be done by measuring light shifts, which permit the mapping of weak interaction effects on the energy splitting of the magnetic substates in a single trapped Ra+ ion. A particular experimental requirement for a light shift measurement is the localization of the ion within a fraction of an optical wavelength in presence of two orthogonal light fields of known polarization.

Alkaline earth metal ions are well suited for such an experiment, because atomic structure calculations are possible to the required level of precision. The sensitivity of APV grows faster than the third power of the atomic number Z. Thus, the heaviest alkaline earth element Radium (Z=88) and the high precision of optical frequency metrology possible with single trapped ions are key ingredients for such a precision measurement.

The radium isotopes in such experiments are produced at the TRImP facility at the KVI, University of Groningen. We have measured the hyperfine structure of the 6d2D3/2 states and the isotope shift of the 6d 2D3/2 - 7p2P1/2 transition in 209-214 Ra+ isotopes. We present an improved lifetime measurements of the 5d2D5/2 state on a single trapped Ba+ ion. We will also present absolute frequency measurements of the 6s2S1/2-6p2P1/2 and 5d2D3/2-6p2P1/2 transitions with an order of magnitude improved precision. The experiment progresses towards measuring light shifts in Ba+. This is a precursor experiment on the way to more precise determination of weak interaction parameters i.e. the Weinberg angle in a single trapped Ra+ ion.

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