Contribution ID: **66** Type: **Talk**

Single Trapped Ions for Atomic Parity Violation Measurements

Tuesday, June 12, 2018 5:20 PM (30 minutes)

Searches for violations of the fundamental discrete symmetries parity (P), time reversal (T) and charge conjugation (C) provide guidelines for model building beyond the Standard Model of the electroweak interactions (SM).
Measurements of atomic parity violation (APV) provide a test the electroweak interactions at low energies, while other experiments like searches for permanent electric dipole moments look for physics not yet described in the SM.

Symmetry violating effects are strongly enhanced in heavy atomic systems and become measurable in precision atomic physics experiment. In particular, technology of single ion trapping for optical clocks and alkaline earth ions such as Ba^+ or Ra^+ open the pathway to a new determination of atomic parity violation. Understanding of the precision of such an experiment as well as the extraction of atomic structure is the most challenging task. Along this way experimental input for the determination of atomic wavefunctions is indispensable. We will discuss the determination of metastable state lifetime in Ba^+ [1], absolute transition frequency determination [2] and modeling of the observed lineshapes in an APV experiment. With these steps a precision determination of the weak charge suitable for extracting the weak mixing angle (Weinberg angle) with five-fold improvement over best existing experiment on with neutral ceasium becomes feasible.

[1] E.A. Dijck et al., Lifetime of the 5d $^2D_{5/2}$ level of $^{138}Ba^+$ from quantum jumps with single and multiple Ba^+ ions. Physical Review A97, 32508 (2018).

[2] E.A. Dijck et al., Determination of transition frequencies in a single $^{138}Ba^+$ ion. Physical Review A91, 060501 (2015).

Primary author: WILLMANN, Lorenz (University of Groningen/ NL)

Presenter: WILLMANN, Lorenz (University of Groningen/ NL)

Session Classification: parity violation/weak interaction