

Preparations for Stark-Interference Type Measurements in Francium

Saturday, 17 February 2024 10:45 (15 minutes)

At the Francium Trapping Facility located at TRIUMF our group uses laser cooling and atom trapping techniques to confine Fr and Rb atoms in a magneto-optical trap allowing us to investigate highly forbidden optical transitions in these atoms with precision laser spectroscopy. For Fr, these investigations are important precursors to future atomic parity-violating (APV) experiments. Atomic parity-violation arises from the parity-violating weak neutral interaction between an atom's electrons and nucleons. APV effects scale with nuclear charge roughly like Z^3 making Fr, the heaviest alkali, an ideal candidate for these types of experiments. The highly forbidden parity-violating $E1_{pv}$ transition between 7s and 8s states in Fr is a signature of APV but is too weak to observe directly. We rely on interference of the $E1_{pv}$ amplitude with a parity-conserving Stark-induced $E1_{stark}$ amplitude in the presence of an external electric field - the so-called Stark interference technique - to enhance the APV signal. We will measure the asymmetry of this signal under parity reversals. In this talk I will present theoretical aspects and experimental requirements for realizing an asymmetry measurement in the $E1_{stark}$ -M1 interference signal on the same 7s-8s transition in Fr. Measurement of this signal will lend critical experience in interference type measurements in preparation for future APV experiments.

This work is supported by NSERC and TRIUMF via NRC, and the Universities of Manitoba and Maryland.

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Session Classification: Morning 4 - Feb. 17, 2024