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Towards Atomic Parity Violation in Francium

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Low-energy precision tests of electro-weak physics keep playing an essential role in the search for new physics beyond the Standard Model. Atomic parity violation (APV) measures the strength of highly forbidden atomic transitions induced by the parity violating (PV) exchange of Z bosons between electrons and quarks in heavy atoms. APV is sensitive to additional interactions such as leptoquarks, and is complementary to other approaches such as PV electron scattering. Our group is working towards the measurement in francium (Z=87), the heaviest alkali, at TRIUMF where we capture Fr atoms in a magneto-optical trap (MOT) online to ISAC. The APV signal in Fr is ≈18 x larger than in Cs. Working on the atomic 7S-8S transition, the PV observable will be the interference between a parity-conserving amplitude, a "Stark induced" E1 amplitude created by applying a dc electric field to mix S and P states, and the vastly weaker PV amplitude. In preparation, we now explore the Stark amplitude, in particular the ratio of its scalar to vector components. After a review of recent progress, I will discuss our plans for a precision determination of this ratio, including the challenge of producing spin-polarized Fr in a MOT environment.

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Please select: Experiment or Theory

Experiment

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