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(G*) Observation of magnetic dipole M1 transition in francium: A key step towards measuring atomic parity violation

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Low-energy precision electro-weak physics tests are advocated as part of the search for physics beyond the Standard Model. We are working towards a measurement of atomic parity violation (APV) in francium (Z = 87), the heaviest alkali, in a magneto-optical trap (MOT) online to ISAC at TRIUMF. The transition of interest in Fr is between the 7S and 8S states, where the parity violating (PV) observable will be the interference between a parity-conserving "Stark-induced"E1 amplitude, created by applying a dc electric field to mix S and P states, and the vastly weaker PV amplitude. The presence of a M1 amplitude poses additional challenges as it also can interfere with the Stark-induced E1 and mimic a PV signal. Using a cavity with nearly 4000x power buildup, we observed the faint M1 transition, which is about 13 orders of magnitude weaker than an allowed E1 transition. To characterize it to higher precision, we are deploying a highly efficient detection scheme involving bursts of light from a cycling transition. I will report on these developments and review the M1 results obtained so far.

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Keyword-1

parity violation

Keyword-2

magnetic dipole transition

Keyword-3

francium

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