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One Step Closer to Atomic Parity Violation in Francium: First Observation of the Highly Forbidden Magnetic Dipole (M1) 7S –8S Transition in Francium

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Precise tests of fundamental symmetries at low energy are an important tool for testing 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. We are working towards measuring this effect in the heaviest alkali, francium, where the effect is predicted to be 18x larger than in cesium. Using the 7s-8s transition, we intend to measure the interference between the PV-induced E1 amplitude and a much larger Stark E1 amplitude from an externally applied electric field. Reversal of the latter will change the sign of the interference term. The Stark transition will be of comparable strength to a relativity and hyperfine-induced M1 transition which is about 13 orders of magnitude weaker than allowed atomic transitions. Its presence causes the leading systematic effects for APV and motivates its characterization. In this talk I will present our first measurement of M1 using our francium laser trap at TRIUMF's ISAC facility, and will give an outlook on our future plans towards APV.

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Please select: Experiment or Theory

Experiment

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