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# Beta Decay Asymmetry Measurements with Trapped Atoms

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Nuclear $\beta$ decay's long history of shaping and testing the Standard Model of particle physics continues to this day with elegant, ultra-precise low-energy nuclear measurements. Experiments observing the angular correlations between the electron, neutrino and recoil momenta following beta decay can be used to search for exotic currents contributing to the dominant (V-A) structure of the weak interaction. Precision measurements of the correlation parameters to <0.1% would be sensitive to (or meaningfully constrain) new physics, complementing other searches at large-scale facilities like the LHC.

Atom traps provide an ideal source of very cold, short-lived isotopes in an extremely clean and open environment. As such, they are invaluable tools for precision measurements of beta-decay parameters. The TRIUMF Neutral Atom Trap (TRINAT) collaboration utilizes neutral atom-trapping techniques with optical pumping methods to highly polarize (>99%) $^{37}$K atoms. Recently, we determined the beta asymmetry parameter to 0.3%, which is comparable to or better than any other nuclear measurement, including the neutron. In terms of minimal left-right symmetric models, this implies a limit of >351 GeV for the mass of a possible right-handed $W$. Alternatively, one may interpret the result as a 4.4$\times$ better measurement of $V_{ud}$ from $^{37}$K.

This talk will discuss using atom traps as a test of the electroweak interaction with particular emphasis on TRINAT's $^{37}$K program.

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## Collaboration name

TRINAT

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