Searching for “New Physics” with laser trapped atoms

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Precision tests of fundamental symmetries and interactions at low energies (eV) complement searches for physics beyond the Standard Model at high-energy (TeV) facilities such as the LHC. In the low-energy regime, certain radioactive isotopes have unique properties that can isolate or enhance telltale signs of new physics. Preparing and manipulating these rare isotopes with laser light in neutral atom traps at millikelvin temperatures offers extraordinary control of the atoms external and internal degrees of freedom - ideal conditions for precision measurements. I will present experimental efforts using these techniques at the Physics Division at Argonne. They concern a search for a permanent electric dipole moment of the isotope ^{225}Ra that would indicate sources of time-reversal violation beyond the Standard Model, and a study of the beta-decay of ^{6}He to search for exotic tensor couplings in the weak interaction.