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Atomic parity non-conservation; the francium project.

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Atomic parity non-conservation (PNC) experiments provide unique precision tests of the electroweak sector of the standard model at very low energies. Precision measurements of spin-dependent atomic PNC can determine nuclear anapole moments and probe the weak interaction within the nucleus. Among current efforts on PNC are ongoing experiments in a chain of Ytterbium and Dysprosium isotopes at Berkeley and Radium ions at KVA, Barium ions at Seattle, BaF molecules at Yale, and Francium at TRIUMF.

Fr is an excellent candidate for precision measurements of atomic PNC due to its simple electronic structure and enhanced parity violation: Both the optical PNC and anapole moment signals are expected to be over an order of magnitude larger than in cesium. The FrPNC collaboration* is commissioning the Francium Trapping Facility (FTF) in the ISAC hall at TRIUMF for laser cooling and trapping of francium atoms. Experiments should start within the next year with plans to measure the weak mixing angle from an optical PNC measurement of the parity forbidden E1 transition amplitude for the 7s-8s transition, originally pioneered by Wieman and co-workers in cesium. The anapole moment can be measured through microwave spectroscopy of forbidden E1 transitions between hyperfine ground states or through the dependence of the optical PNC method on the hyperfine states.

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