Contribution ID: **254** Type: **Parallel**

Nuclear Anapole Moments

Saturday, 2 June 2018 17:50 (20 minutes)

Purely hadronic weak interactions inside a nucleus produce a toroidal current distribution around the axis of nuclear spin. This distribution, known as the nuclear anapole moment, produces a local magnetic field that couples to the spin of a penetrating electron. This in turn gives rise to a nuclear spin-dependent parity-violating (NSD-PV) electron-nucleus interaction. We study NSD-PV effects using diatomic molecules, where the signal can be dramatically amplified due to near-degeneracies of opposite parity hyperfine/rotation levels. We recently demonstrated unprecedented experimental sensitivity to NSD-PV interactions in the test system ^{138}Ba^{19}F, where the effect is known to be vanishingly small. Our results indicate control over systematic errors at a level below the statistical uncertainty. We discuss plans to measure NSD-PV using ^{137}BaF at similar sensitivity. This will yield the first measurement of a nuclear anapole moment for an odd-neutron nucleus, and provide novel information on hadronic PV interactions. Anticipated future improvements should enable measurements of anapole moments of light nuclei, where the nuclear structure calculations needed to interpret anapole moments in terms of hadronic weak interaction parameters are increasingly reliable.

E-mail

sidney.cahn@yale.edu

Funding source

NSF

Primary author: Dr CAHN, Sidney (Yale University)

Co-authors: Prof. DEMILLE, David (Yale University); Dr ALTUNTAS, Emine (NIST Gaithersburg); Dr AMMON, Jeffrey (MIT Lincoln Laboratory)

Presenter: Dr CAHN, Sidney (Yale University)

Session Classification: Tests of Symmetries and the Electroweak Interaction

Track Classification: TSEI