

Title: Prospects of Using Pear-Shaped Nuclei in Cryogenic Solids for Tests of Time-Reversal Symmetry

Abstract:

It is believed that new sources of charge-parity (CP)-violation may be needed to explain the apparent scarcity of antimatter in the observable universe. A particularly sensitive and unambiguous signature of both time-reversal- (T) and CP-violation would be the existence of an electric dipole moment (EDM). The current generation of EDM searches in a variety of complimentary systems have unprecedented sensitivity to physics beyond the Standard Model. My talk will focus on certain rare isotopes such Ra-225 and Pa-229, which will be produced in abundance at the Facility for Rare Isotope Beams at Michigan State University, which have pear-shaped nuclei. This uncommon nuclear structure significantly amplifies the observable effect of T, P, & CP-violation originating within the nuclear medium when compared to isotopes with nearly spherical nuclei such as Xe-129 and Hg-199. One way to efficiently probe the small quantities of these rare isotopes is to implant them in cryogenic solids, where they would be subsequently manipulated using lasers. I will report on our progress developing this technique in the hadronic sector.