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Precision Measurement of Muon Capture on the Deuteron

abstract: Solar neutrino experiments have directed considerable theoretical attention towards the electro-weak interaction of deuterons with leptonic currents. Effective field theory (EFT) showed that up to NNLO, all low-energy weak interaction deuteron breakup processes depend on a common isovector axial two-body current,parametrized by L_1,A. This description links the neutrino reactions observed by the Sudbury Neutrino Observatory, pp-fusion, solar hep-processes and triton beta-decay to nuclear muon capture: mu- + d --> n + n + mu_neutrino. Among the two-nucleon reactions, a 1% measurement of the muon capture rate from the deuteron doublet state promises the by far highest accuracy in the determination of L_1,A. Such a dramatic increase in precision appears possible by the new technique developed for the MuCAP experiment. Our collaboration is planning a precision measurement of the mu+d capture rate via the lifetime method. It promises to have one order of magnitude high!
er accuracy than previous experiments on any weak process in the two nucleon system and thus establish a new benchmark in this field. MuCAP Collaboration: PNPI - PSI - UC Berkeley - UI Urbana-Champaign - UC de Louvain - Boston University - UK Lexington