Nuclear spectroscopy for neutrino and DM studies in nuclei

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Abstract

Fundamental properties of neutrinos, astro-neutrino nuclear interactions, and cold dark matter (WIMP) are studied by measuring neutrino-less double beta decays ($0\nu\beta\beta$) in nuclei, solar and supernova neutrino nuclear interactions, and WIMP nuclear interactions. Here nuclei are used as femto (10^{-15} m) laboratories for studying neutrinos, WIMPs and their interactions . Spectroscopic studies of β–γ and charged particles associated with neutrino and WIMP interactions are useful for identifying the interaction mechanisms involved in the reactions and for selecting the true signals relevant to the interactions. Brief remarks are made on (1) angular and energy correlation studies of $\beta\beta$ rays from $0\nu\beta\beta$ to identify the $0\nu\beta\beta$ mechanism, and time correlation studies of α β γ rays to separate true $0\nu\beta\beta$ and WIMP signals from BG ones [1,2], (2) spectroscopic studies of charged particle, photon and μ–ν induced reactions to study weak/neutrino nuclear responses and FSQP(Fermi Surface Quasi Particle Model) for $2\nu\beta\beta$ matrix elements [1,2.3,4,5,], and (3) X and γ ray correlations with WIMP nuclear recoils to select SID and SD WIMP signals [6].

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