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A request for a study of beta-decays and the ENIGMA project

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Neutrinos remain the most mysterious fundamental particles despite the enormous success accomplished in neutrino physics over the past two decades. The subjects of primary interest are several undeniably basic questions concerning the nature, absolute mass scale, hierarchy, and CP properties of neutrinos and the possible existence of additional sterile neutrinos. The atomic nuclei, probes for studying neutrino fundamental properties and interactions, can uncover neutrino physics tasks in non-trivial ways. The experimental and theoretical study of the beta-decay, double-beta decay, and other nuclear processes can solve many of them. A request to study allowed and forbidden single-beta decay and EC processes is presented by addressing the issues of the neutrino mass, electron exchange effect, and the value of the axial-vector coupling constant. Subjects of interest are beta-transitions known as background processes in underground experiments and those relevant for determining the spectra of reactor antineutrinos. Further, the ENIGMA project is presented, whose primary objective is to approve the concept of an innovative prototype of the reactor antineutrino detector and verify its basic functionality. The detector prototype will utilize scintillation detectors with a Li6F-based scintillator interlayer.

Author: SIMKOVIC, Fedor (Comenius University and IAEP CTU)

Presenter: SIMKOVIC, Fedor (Comenius University and IAEP CTU)

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