Joint seminar of the NPI of the CAS

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Mgr. Petr Veselý, Ph.D., (DTP NPI): ***Description of double beta decay within beyond mean-field nuclear methods***

Abstract:

Double beta decay (DBD) is a phenomenon which provides us unique window to physics beyond Standard Model and which lies at the intersection of particle, nuclear and atomic physics. It is of crucial importance to distinguish whether DBD occurs solely in two-neutrino or also neutrino-less variant. Possible discovery of neutrino-less or other exotic mode of DBD would have big consequences in next development of particle physics as well as cosmology. One of challenges in theoretical description of DBD is to provide precise nuclear matrix elements (NME) which enter to calculations of DBD's half-life.

In this seminar I will discuss two beyond-mean field nuclear methods - Equation of Motion Phonon Method (EMPM), and Second Tamm Dancoff Approximation (STDA) - which I apply to compute NME and DBD half-life of Calcium-48. In order to obtain reasonable values of DBD half-life, it is necessary to introduce a phenomenological quenching of the weak coupling constant g_A. I will also discuss whether the beyond mean-field configurations could, at least to some extent, provide explanation of this quenching.