Contribution ID: **21** Type: **Oral presentation**

Description of Double Beta Decay within EMPM and STDA

Thursday, June 26, 2025 11:15 AM (30 minutes)

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 distuinguish 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 our contribution we discuss Equation of Motion Phonon Method (EMPM), and additionally also Second Tamm Dancoff Approximation (STDA). Comparison of both methods, EMPM and STDA, was recently studied in more detail [1]. While in the paper [1] we described electromagnetic nuclear excitations, in this conference contribution we show that the generalization of STDA and EMPM, in which we apply the particle-hole configurations which change type of nucleon, is suitable for calculations of DBD in Calcium-48.

References

[1] F. Knapp, P. Papakonstantinou, P. Veselý, G. De Gregorio, J. Herko, and N. Lo Iudice, Phys. Rev. C 107 (2023) 014305.

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Session Classification: Theory

Track Classification: Theory