Joint seminar of the NPI of the CAS

15. 5. 2025

prof. RNDr. Jan Kvasil, DrSc. (Institute of Particle and Nuclear Physics, FMP Charles University):
Toroidal, compressional, scissor, breathing and other collective excitations in nuclei

Abstract:

In the last decade we can observe an increased interest in internal excitations with special behavior of nucleon densities and currents – e.g. the toroidal dipole resonance (TDR), compressional dipole resonance (CDR), scissor and spin-flip M1 resonances, breathing E0 resonance, etc. For example, (a) the toroidal TDR resonance is located in the spectrum in the energy region typical for well-known pygmy E1 resonance (PDR) and it can give a new interpretation of PDR; (b) in light nuclei with large prolong deformation TDR exists as a vortex ring or vortex-antivortex pair; (c) the shape of the electric monopole E0 resonance is influenced by its coupling with the quadrupole resonance; (d) scissor M1 resonance can only be present in the spectrum in deformed nuclei; etc. In the present talk, a recent progress in the theoretical description of such excitations is discussed.