# EFFECTS OF MESON-NUCLEON DYNAMICS IN A RELATIVISTIC APPROACH TO MEDIUM-MASS NUCLEI

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Recent developments and applications of self-consistent nuclear structure models based on quantum hadrodynamics (QHD) have shown that they represent a successful strategy toward a universal and precise description of low-energy nuclear dynamics. Driven by astrophysics, experimental studies of exotic nuclei and synthesis of new elements, such theories have achieved a level of sophistication, which permits a very good description of a wide range of properties for arbitrarily heavy nuclei including those at neutron and proton drip lines.

The approach based on QHD meson-nucleon Lagrangian and relativistic field theory connects consistently the high-energy scale of heavy mesons, medium-energy range of pion and the low-energy domain of emergent collective vibrations (phonons). Mesons and phonons build up the effective interaction in various channels, in particular, the phonon-exchange part takes care of the retardation effects, which are of great importance for the fragmentation of single-particle states, spreading of collective giant resonances and soft modes, quenching and beta-decay rates with significant consequences for astrophysics and theory of weak processes in nuclei.

In this framework, nuclear response formalism was recently extended beyond the existing formulation to include higher-order correlations, first of all, 3-body ones, aiming at a unified description of high-frequency oscillations and low-energy spectroscopy. Recent progress on the response theory in the isovector channel has allowed a very good description of spin-isospin-flip excitations, which are formed predominantly by pions coupled to proton-neutron configurations in nuclear medium. Based on these developments, a clear separation of the pion degrees of freedom has become possible and their effects on the nuclear shell structure of $^{100,132}$Sn were studied. Thereby, dynamical contributions of pion exchange are included in the theory beyond Hartree-Fock approximation, in particular, an underlying mechanism for proton-neutron pairing is proposed.