Contribution ID: **8** Type: **Oral**

From the nuclear EoS straight to nuclear collective motion

Our understanding of nuclear giant and pygmy resonances translates into an understanding of the nuclear equation of state (EoS) and vice-versa: the incompressibility of nuclear matter determines the energy of the giant monopole resonance (GMR), the symmetry energy and its slope are gleaned from the dipole spectrum, and so on. The most widely used theoretical tool for analyzing such connections is the energy-density functional (EDF), exemplified in particular by the Skyrme model, which provides usefully analytical expressions for the EoS.

After decades of work and hundreds of EDF models, open issues abound: the "fluffiness" of Sn isotopes; the nature of pygmy resonances, let alone their relation to the EoS; the model dependence of the correlation between the dipole polarizability and the symmetry-energy slope. Furthermore, traditional EDF models are plagued by artificial correlations which obscure physical ones. Finally, most available models fail to reproduce reasonably constrained EoS properties.

We have developed a method for extracting a generalized, Skyrme-type EDF for nuclei starting from any given, immutable EoS of homogeneous matter, i.e., with no fine tuning of the latter [1,2]. The scheme takes advantage of a natural Ansatz for homogeneous nuclear matter dubbed KIDS (Korea: IBS-Daegu-SKKU) and basic EDF theory tenets. The parameters which cannot be constrained from homogeneous matter (those encoding the explicit momentum dependence and the spin-orbit force) are fitted to the ground-state energies and charge radii of only 40Ca, 48Ca, and 208Pb, but reproduce the properties of nuclei throughout the nuclear chart successfully, given a realistic EoS. For the first time we find that the above bulk and static nuclear properties do not depend on the effective mass: the model is free of related artificial correlations.
The scheme thus validated can be used to systematically examine the dependence of giant and pygmy resonances on specific EoS parameters. As first applications to report we consider 1) the simultaneous description of the GMR of 120Sn and 208Pb and 2) effects of the symmetry energy parameters on the nuclear response.

[1] P. Papakonstantinou et al., Phys.Rev.C97(2018)014312
[2] H. Gil et al., New Physics: Sae Mulli 67(2017)456; and in preparation.

Primary author: PAPAKONSTANTINOU, Panagiota

Co-authors: Ms GIL, Hana (KNU); Prof. HYUN, Chang Ho (Daegu University); Prof. OH, Yongseok (KNU)

Presenter: PAPAKONSTANTINOU, Panagiota

Track Classification: Track B