# MANY-BODY DYNAMICS IN A RELATIVISTIC FRAMEWORK: SPECTRAL PROPERTIES OF EXOTIC NUCLEI

E. Litvinova[1] and P. Ring[2]

[1] *ExtreMe Matter Institute EMMI and Research Division, GSI Helmholtzzentrum für Schwerionenforschung, Planckstraße 1, 64291 Darmstadt, Germany*

[2] *Fakultät für Physik, Technische Universität München, D-85748, Garching, Germany*

Aiming at a universal and precise approach to nuclear low-energy dynamics, many-body correlations beyond mean field are studied by self-consistent methods within a covariant framework. Recent developments based on Green's function techniques enable a parameter-free treatment of the correlations caused by the coupling of single-nucleon and vibrational degrees of freedom [1].

A set of self-consistent models going far beyond the simple mean field approach is developed and applied to the shell structure and to spectroscopic factors [2], to isovector and isoscalar giant and soft modes [3], and to Gamow-Teller and spin-dipole resonances [4] in ordinary and exotic nuclei. The recent application of the developed approach to superheavy nuclei [2] describes the evolution of the nuclear shells in Z = 120 isotopes, representing hypothetically an island of enhanced stability.

The microscopic nature, consistency and universality of these methods make them an ideal tool to describe and interpret experimental data and to provide the consistent nuclear physics input for astrophysical applications. It is shown how the comparison with experimental spectral data of high resolution constrains both the underlying covariant energy density functional and the implemented many-body coupling schemes.

## References

[1] E. Litvinova, P. Ring, and V. Tselyaev, Phys. Rev. Lett. **105**, 022502 (2010).

[2] E. Litvinova, Phys. Rev. C **85**, 021303(R) (2012).

[3] J. Endres, E. Litvinova, D. Savran P. A. Butler, M. N. Harakeh, S. Harissopulos, R.-D. Herzberg, R. Krücken, A. Lagoyannis, N. Pietralla, V. Yu. Ponomarev, L. Popescu, P. Ring, M. Scheck, K. Sonnabend, V. I. Stoica, H. J. Wörtche, and A. Zilges, Phys. Rev. Lett. **105**, 212503 (2010).

[4] T. Marketin, E. Litvinova, D. Vretenar, P. Ring, Phys. Lett. B **706**, 477 (2012).