International Nuclear Physics Conference INPC2013: 2-7 June 2013, Firenze, Italy

Three-Nucleon Forces in Exotic Open-Shell Isotopes

C. Barbieri[1], A. Cipollone[1,2,3], V. Somà[5,6], T. Duguet[7,8] and P. Navrátil[9]

[1] *Department of Physics, University of Surrey, Guildford GU2 7XH, UK*
[2] *Dipartimento di Fisica, Università "Sapienza", I-00185 Roma, Italy*
[3] *INFN, Sezione di Roma, Piazzale Aldo Moro 2, I-00185 Roma, Italy*
[4] *Institut für Kernphysik, Technische Universität Darmstadt, 64289 Darmstadt, Germany*
[5] *EMMI, GSI Helmholtzzentrum für Schwerionenforschung GmbH, 64291 Darmstadt, Germany*
[6] *CEA-Saclay, IRFU/Service de Physique Nucléaire, F-91191 Gif-sur-Yvette, France*
[7] *NSCL and Department of Physics and Astronomy, Michigan State University, East Lansing, MI 48824, USA*
[8] *TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia, V6T 2A3, Canada*

Contact email: *c.barbieri@surrey.ac.uk*

As ab-initio calculations of atomic nuclei enter the A=40-100 mass range, a great challenge is how to provide accurate predictions for the vast majority of open-shell (degenerate) isotopes. Here we discuss advances in ab-initio calculations based on self-consistent Green's function theory. The method allows first principle calculations of truly open shell, semi-magic, nuclei and has been applied successfully up to ^{74}Ni with soft low-momenutm interactions [1,2]. By add realistic three-nucleon interactions to the state of the art Green's function theory we find that physics of neutron driplines is reproduced with very good quality, see e.g. Fig 1 for the oxygen chain [3].

The Gorkov approach presented here substantially extends the scope of ab-initio theory in the medium mass region from a few tens of closed shells cases to hundreds of open shell isotopes. The main output of the formalism is the single-particle spectral function which describes processes involving the addition or knonkout of a nucleon [2] and provides a theoretical optical potential for elastic scattering [4]. The talk will give examples of applications and discuss first results regarding the implication of three-nucleon forces on the evolution of correlations with proton-neutron asymmetry, with particular emphasis on neutron rich pf-shell isotopes.

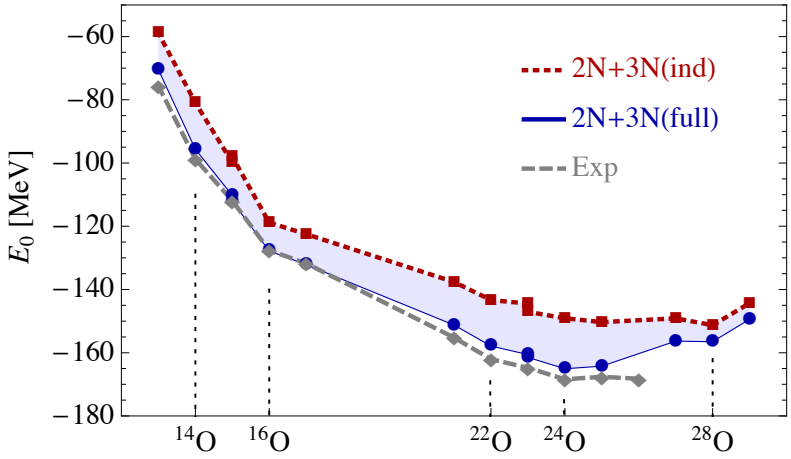

Figure 1: *Binding energies of oxygen isotopes predicted by SRG interactions evolved from chiral NN and 3NF [4].*

[1] V. Somà, T. Duguet, and C. Barbieri, Phys. Rev. C84, 064317 (2011).
[2] V. Somà, C. Barbieri, and T. Duguet, arXiv:1208.2472 [nucl-th], Phys. Rev. C(R) 2013, in print.
[3] C. Barbieri, A. Cipollone, V. Somà, and T. Duguet, and P. Navrátil, arXiv:1208.2472 [nucl-th].
[4] S. Waldecker, C. Barbieri, and W. Dickhoff, Phys. Rev. C84, 034616 (2011).