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Spectroscopy of even-even open-shell nuclei via self-consistent Gorkov-Green's function calculations

In the last decade, the *ab-initio* self-consistent Gorkov Green's function (SCGGF) [1,2] approach has marked a step forward in the knowledge of bulk nuclear properties of even-even open-shell nuclei, such as the ones lying along the Ar-Cr isotopic chains [3,4]. The access to the one-particle propagator has allowed the study of ground and excited states of neighbouring odd-A isotopes [5-7].

Nevertheless, the prediction of excited energy levels and reduced electric and magnetic multipole transition probabilities calls for the introduction of the polarization propagator, previously not embedded in the $\mathrm{U}(1)_Z \times \mathrm{U}(1)_N$ symmetry breaking formalism.

In quantum chemistry, present-day approaches for the description of the spectrum of medium-sized organic molecules [8,9] are based on diagrammatic many-body Green's function theory applied to the polarization propagator at third order in the *algebraic diagrammatic construction* (ADC) approach [10-13]. The implementation of the ADC formalism to Gokov's polarization propagator is currently in progress and takes advantage from the output of the recently developed automated implementation of Wick's theorem (AIWT) code [14].

Another return of this is study will be provided by the prediction of new shell closures in neutron-rich even-even nuclei, identified through the local maxima in the energy of the 2_1^+ state and in the related electric quadrupole transition probability, $B(E2, 0_1^+ \rightarrow 2_1^+)$ [15].

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