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SELF-CONSISTENT STUDY OF NUCLEAR CHARGE RADII WITHIN THE FAYANS FUNCTIONAL

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Fully self-consistent calculation of the Odd-Even Staggering (OES) of the charge radii in the long isotopic chains is presented. The nuclei around the neutron shells at N=20, 28, 50 including non-magic ones with pairing in both neutron and proton sectors are treated in the Density Functional Theory. Well-established Fayans functional DF3-a developed in [1] is used. A comparison with its new options Fy(stand) [2] and more recent Fy(Δr,HFB) [3] is performed. The performance and flexibility of the DF3-a are demonstrated. Namely, it describes better the unexpected OES reduction which was observed in the CERN-ISOLDE experiments on the charge radii of the 58-78Cu isotopes approaching the N=50 shell [3] (Fig.1). Also, the DF3-a allows one to simultaneously describe the total beta-decay energies. The latter (presented as the 3-point OES parameters in Fig.2) are more sensitive "markers"than the binding energies used in [3]. Still, the problem of the charge radii OES needs a more detailed study. A rather strong dependence of the pairing on the density gradient is needed in order to comply with the experimental data on nuclear radii [3]. Supported in part by the grant of Russian Scientific Foundation (RSF 16-12-10161).

Fig. 1. The "liquid drop"charge radii of 58-78Cu compared to the data [3] and calculation within the DF3-a functional for a few different strengths of the gradient paring term.
Fig. 2. The 3-point OES parameters Δ(3)=1/2(QA+1 -2 QA+ QA-1) for the measured total beta-decay energies Qβ and ones calculated with DF3-a for the Cu isotopic chain.

[1]. E.E. Saperstein, S. V. Tolokonnikov, Physics of Atomic Nuclei 74, 1277 (2011).
[2]. P.-G. Reinhard, W. Nazarewicz., Physical Review C95, 064328 (2017).
[3]. R.P. de Groote et.al. arXiv:1911.08765v1 (2019).

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