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Isospin Symmetry: nuclear charge radii and low- ℓ orbits

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The role of low- ℓ orbits is particularly important in determining nuclear properties such as the nuclear radius. This is reflected into mirror energy differences that have been studied systematically in the sd- and fp-shells using existing data as well as new measurements for $T=1/2$ and $T=3/2$ mirror nuclei. Low- ℓ orbits contribute differently to mirror energy differences depending on their occupation numbers. Such effect has been explained considering that the addition of a nucleon induces opposite changes in the potential wells of protons and neutrons and that tends to equalize proton and neutron radii [1]. This agrees with recent experimental results [2] and results in a unified description of nuclear charge radii deduced from mirror energy differences and nuclear charge radii measured directly in experiment.

References

- [1] J. Bonnard, S.M. Lenzi, and A. P. Zuker, Physical Review Letters 116 (2016) 212501
- [2] M. Enciu, et al. Physical Review Letters, 129 (2022) 262501

Primary author: RECCHIA, Francesco (University and INFN Padova)

Presenter: RECCHIA, Francesco (University and INFN Padova)

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