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Ground and dipole-excited states in neutron-rich ^8He

Light nuclei at the driplines exhibit fascinating phenomena, such as the formation of diluted structures where a tightly-bound core is surrounded by a halo of one or more weakly-bound nucleons. Among them, ^8He is the only four-neutron halo, and it is the most exotic nucleus on Earth, having the largest neutron-to-proton ratio in the nuclear chart ($N/Z = 3$). This makes it an interesting challenge for ab initio nuclear theory.

In this talk, I will present recent coupled-cluster calculations of ground and dipole-excited-state properties of ^8He [1], based on state-of-the-art chiral effective field theory interactions. In particular, I will discuss our predictions for the dipole polarizability, accompanied by an analysis of our theoretical uncertainty [2], and compare our results to new experimental data by the SAMURAI collaboration.

[1] F. Bonaiti, S. Bacca, G. Hagen, Ab-initio coupled-cluster calculations of ground and dipole excited states in ^8He , Phys. Rev. C 105, 034313 (2022).

[2] B. Acharya, S. Bacca, F. Bonaiti et al., Uncertainty quantification in electromagnetic observables of nuclei, Front. In Phys. 10:1066035 (2023).

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