



Contribution ID: 169

Type: **not specified**

Contributed Talk: Ab Initio Nuclear Calculations for Dark Matter-Nucleus and Neutrino- Nucleus Scattering

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Abstract: Over the past decades, ab initio nuclear calculations have made dramatic progress, especially reaching heavy mass nuclei such as ^{208}Pb [1]. This means that it becomes possible to obtain first-principles computation (with quantified uncertainties) of quantities that even reside in the heavy-mass region. The quantities include these relevant for astrophysics and searches for physics beyond the Standard Model. In this talk, I will present a conceptual introduction to modern ab initio nuclear theory. Then, I will focus on recent advances in ab initio calculations of nuclear responses for dark matter-nucleus [2] and neutrino-nucleus elastic and inelastic scattering. Finally, I will present our recent investigation of the ATOMKI anomaly using ongoing proton beam dump neutrino experiments [3].

[1]. Ab initio predictions link the neutron skin of ^{208}Pb to nuclear forces. B.S. Hu, et al. Nat. Phys. 18, 1196 (2022). arXiv:2112.01125v1 (2021).

[2]. Ab initio structure factors for spin-dependent dark matter direct detection. B.S. Hu, et al. Phys. Rev. Lett. 128, 072502 (2022). arXiv:2109.00193.

[3]. A novel investigation of the ATOMKI anomaly. B. Dutta, W.C. Huang, B.S. Hu, R.G. Van de Water. arXiv:2410.17968.

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Session Classification: PPC Presentations