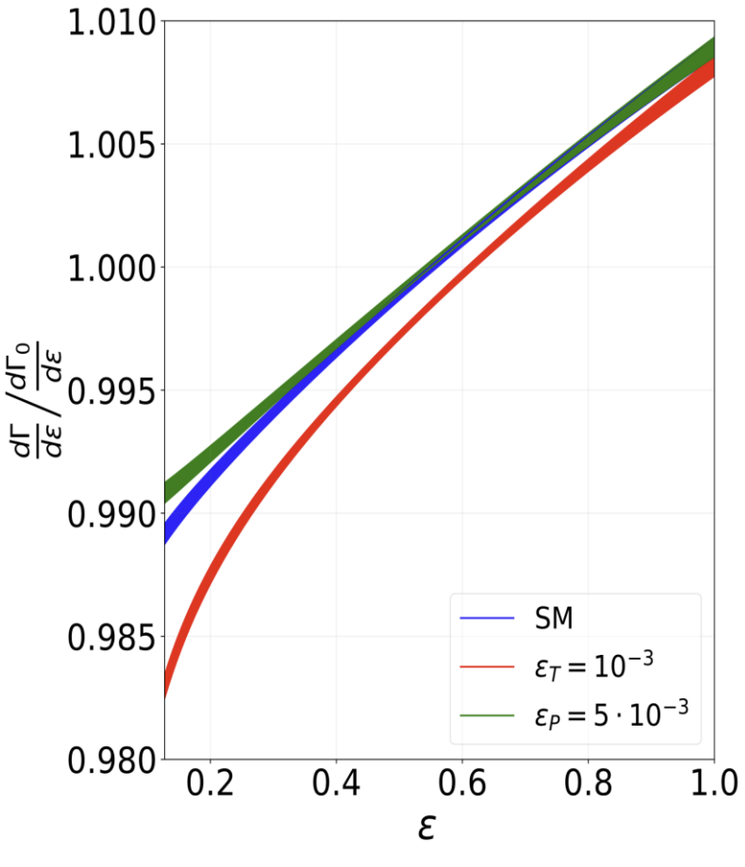
Ab initio calculation of the ^{6}He beta-decay spectrum

U.S. DEPARTMENT OF ENERGY | Office of Science

NUCLEI Nuclear Computational Low-Energy Initiative

Objectives

- Planned and on-going experiments measuring the ^{6}He beta decay spectrum look for deviations from the Standard Model to constrain new physics
- Using quantum Monte Carlo many-body methods, we predict the standard model spectrum and investigate new physics scenarios



Prediction of the ^{6}He beta-decay spectrum in the standard model (blue) and with non-standard tensor (red) and pseudoscalar (green) contributions allowed by present analyses. Within the theory uncertainty, we may distinguish new physics signatures in the spectrum.

Impact

- By fully including two-body current effects and assessing the uncertainty of the nuclear interaction, we provide a theory uncertainty well below the required 0.1% to constrain new physics
- Using Standard Model effective field theory approaches we investigated new physics effects signatures
- With our theory uncertainty, it will be possible to further constrain charge-changing weak tensor and pseudoscalar current contributions or to identify new physics arising from them in next generation experiments
- This sensitivity is equivalent with probing TeV scales on the energy frontier

Accomplishments

- G. B. King, A. Baroni, V. Cirigliano, S. Gandolfi, L. Hayen, E. Mereghetti, S. Pastore, and M. Piarulli, Phys. Rev. C 107, 015503 (2023).
- Editors' suggestion