**Objectives**

- Address the long-standing puzzle of why computations of $\beta$-decay rates in atomic nuclei are faster than what’s expected from the $\beta$-decay of the free neutron
- Utilize state-of-the-art interactions from chiral effective-field-theory and computational methods to address the puzzle
- Explore the role of the coupling of the weak force to two nucleons and of strong correlations in the nucleus

**Impact**

- $\beta$-decay is the dominant decay mode of atomic nuclei
- $\beta$-decay rates enter models of heavy element synthesis in neutron star mergers and supernovae explosions
- Understanding $\beta$-decay relevant for neutrino-less double-$\beta$-decay, to reduce the uncertainty in extracting the neutrino mass scale

**Accomplishments**

- Resolved the long-standing discrepancy between experimental and theoretical $\beta$-decay rates from first principles.
- The coupling of the weak force to two nucleons and a proper treatment of strong correlations in the nucleus are necessary to correctly describe $\beta$-decay rates from light nuclei to the heavy nucleus $^{100}$Sn

*Caption:* Gamow–Teller strength in $^{100}$Sn. Comparison of the Gamow–Teller strength $|M_{GT}|^2$ for the $\beta$-decay of $^{100}$Sn calculated in this work compared to experiment (Expt), and other models. Open symbols represent results obtained with the standard Gamow–Teller operator, filled symbols include two-body currents (2BCs) and partially filled symbols show values following from the multiplication of the computed Gamow–Teller strength by a phenomenological quenching factor.


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