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Exploring Nuclear Beta Decay Through Nuclear Lattice Effective Field Theory

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We report the first exploratory study on nuclear β -decay through nuclear lattice effective field theory, including ${}^3\text{H}$ and ${}^6\text{He}$ β -decays. We employ nuclear forces and nuclear one-body and two-body axial currents consistently derived from chiral effective field theory to calculate the Gamow-Teller matrix element (GTME). We first combine the GTME of ${}^3\text{H}$ β -decay together with ${}^3\text{H}$'s binding energy to fix the low-energy constants c_D and c_E in the three-body nuclear force. We then carry out Monte Carlo calculation to predict the GTME of ${}^6\text{He}$ β -decay. New techniques are developed to make the calculation reliable and efficient. The result shows good agreement with the experiment.

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