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Probing quark-lepton correlation in GUTs with high-precision neutrino measurements

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GUTs unify quarks and leptons into same representations and predict correlations between their masses and mixing. We take new data of JUNO and perform numerical scans to explore the flavor space compatible with data in SO(10) GUTs. The quark-lepton correlation shows the preference of normal ordering for light neutrino masses, predicts favored region of the CP-violating phase in neutrino oscillations, and classifies GUT models based on their testability in neutrinoless double beta decay experiments. The quark-lepton correlation predicts mass spectrum of right-handed neutrinos, pointing to the energy scale of baryon and lepton number violation and providing sources for baryogenesis. We emphasize that, as the high precision measurements of neutrino physics is coming, the quark-lepton correlation will provide increasingly important role in the testability of GUTs, complementary to the proton decay measurement.

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