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Complementary test of GUTs in neutrino and GW observatories

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Grand Unified Theories (GUTs) aim to unify all three fundamental interactions including electromagnetic, strong and weak interactions. A well-known phenomenological prediction of GUTs is proton decay, which sets a strong constraint to GUTs due to its null observation. On the other hand, masses and mixing of quarks and leptons are correlated since all fermions are arranged in the same representation of $SO(10)$. As the era of neutrino precision measurement is coming, experimental data in the fermion sector will become more and more important in the future study of GUTs. On the cosmological side, the breaking of $SO(10)$ to the Standard Model gauge groups generates cosmic strings, which radiates gravitational waves via string oscillation. In this talk, I will discuss all these phenomenological constraints, and show a GUT model consistent with all known experimental data. I will further mention how enough matter-antimatter asymmetry can be generated in the GUT model.

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