

Shonosuke Takeshita "W boson mass and grand unification via the type-II seesaw-like mechanism"

Thursday, 9 November 2023 11:05 (25 minutes)

We propose an $SU(5)$ GUT model extended with two additional pairs of 10 representation vector-like fermions. The CDF collaboration W boson mass anomaly is explained by using the VEV of a real $SU(2)_L$ triplet scalar coming from the 24 representation Higgs. The vector-like fermions are decomposed partly into vector-like quark doublets. Those vector-like quark doublets acquire mass from two sources; through the Yukawa interaction with the real $SU(2)_L$ triplet via a type-II seesaw-like mechanism. And, they acquire mass from the 24 representation Higgs. We assume that the mass for the vector-like quark doublets is expressed in terms of the real triplets mass. By combining the constraints on the vector-like quark masses with those on the heavy Higgs boson masses, we can obtain the narrow allowed mass ranges for the vector-like quark doublet and the real triplet. Therefore, our model can be tested in searches for these particles in the near future. In addition, the two additional pairs of vector-like fermions allow the SM gauge couplings to unify successfully at $M_{GUT} \approx 5.1 \times 10^{15}$ GeV. Our model is also testable by the future Hyper-Kamiokande experiment via the proton decay lifetime $\tau_p(p \rightarrow \pi^0 e^+) < 1.0 \times 10^{35}$ years.

Session Classification: Short talks