Contribution ID: **124** Type: **not specified**

Observable proton decay in Flipped SU(5)

Tuesday 10 May 2022 14:30 (15 minutes)

We explore proton decay in a class of realistic supersymmetric flipped $SU(5)$ models supplemented by a $U(1)_R$ symmetry which plays an essential role in implementing hybrid inflation. Two distinct neutrino mass models, based on inverse seesaw and type I seesaw, are identified, with the latter arising from the breaking of $U(1)_R$ by nonrenormalizable superpotential terms. Depending on the neutrino mass model an appropriate set of intermediate scale color triplets from the Higgs superfields play a key role in proton decay channels that include $p^+ \to (e^+, \mu^+)\,\pi^0$, $p^+ \to (e^+, \mu^+)\,K^0$, $p^+ \to \overline{\nu}\,\pi^+$, and $p^+ \to \overline{\nu}\,K^+$. We identify regions of the parameter space that yield proton lifetime estimates which are testable at Hyper-Kamiokande and other next generation experiments. We discuss how gauge coupling unification in the presence of intermediate scale particles is realized, and a Z_4 symmetry is utilized to show how such intermediate scales can arise in flipped SU(5). Finally, we compare our predictions for proton decay with previous work based on SU(5) and flipped SU(5).

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Session Classification: BSM III