Contribution ID: **84** Type: **not specified**

Raising the Higgs Mass with t-t' Mixing

Monday, 5 May 2014 15:30 (15 minutes)

We show that the addition of a fourth generation with vector-like quarks to the minimal supersymmetric standard model (MSSM) can raise the predicted value of the physical Higgs mass by mixing with the top sector, a point not previously emphasized in the literature. In the presence of mixing, for A-terms and soft masses around 900 GeV, the Landau pole for the top Yukawa can be pushed above the GUT scale while retaining perturbativity of the gauge couplings, generating a Higgs mass of 125 GeV and evading constraints from electroweak precision measurements (EWPM) and recent LHC searches. Smaller soft terms ($\sim$ 600 GeV) can be accommodated if new physics appears at $\sim 10^{10}$ GeV or perturbative unification is sacrificed. The model predicts new quarks and squarks discoverable at the LHC.

Summary

We show that the addition of a fourth generation with vector-like quarks to the minimal supersymmetric standard model (MSSM) can raise the predicted value of the physical Higgs mass by mixing with the top sector. The mixing requires a larger top quark Yukawa coupling (by up to $\sim 6\%$) to produce the same top mass. Since loop corrections to m_h go as y_{top}^4, this will in turn increase the predicted value of the physical Higgs mass, a point not previously emphasized in the literature. In the presence of mixing, for A-terms and soft masses around 900 GeV, the Landau pole for the top Yukawa can be pushed above the GUT scale while retaining perturbativity of the gauge couplings, generating a Higgs mass of 125 GeV and evading constraints from electroweak precision measurements (EWPM) and recent LHC searches. Soft terms can be as low as 600 GeV in parts of parameter space with a Landau pole at $\sim 10^{10}$ GeV. However, the Landau pole can still be pushed above the GUT scale if one sacrifices perturbativity at the unification scale by adding fields in a **5**+**5** representation. The model predicts new quarks and squarks with masses $\sim$ 800 GeV. We briefly discuss potential paths for discovery or exclusion at the LHC.

Primary authors: Mr FAROUGHY, Cyrus (Johns Hopkins); Mr GRIZZARD, Kevin (Johns Hopkins)

Co-author: KAPLAN, David (Johns Hopkins University)

Presenter: Mr GRIZZARD, Kevin (Johns Hopkins)

Session Classification: BSM Higgs I