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Higgs mass and unified gauge coupling in the NMSSM with vector matter

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We consider the NMSSM extended to include one vector-like family of quarks and leptons. If (some of) these matter particles, as the Higgs doublets, become strongly coupled to the singlet at a common scale $\Lambda \sim$ 10-1000 TeV, this gives the correct enhancement of the tree level Higgs boson mass required to reach 125 GeV. It is conceivable that the Yukawa couplings to the singlet, although naively blowing up close to Λ, will not spoil gauge coupling unification. In such a case the unified coupling could be interestingly led to a value not far from unity, thus providing a possible explanation for the number of generations. The characteristic signal is an enhanced resonant production of neutral spin zero particles at LHC, that could even explain the putative diphoton resonance hinted by the recent LHC data at 750 GeV.

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