



Contribution ID: 100

Type: talk

Linking Natural Supersymmetry to Flavour Physics

Thursday 19 September 2013 15:00 (40 minutes)

With the aim of linking natural supersymmetry to flavour physics, a model is proposed based on a family symmetry $G \times U(1)$, where G is a discrete nonabelian subgroup of $SU(2)$, with both F-term and (abelian) D-term supersymmetry breaking. A good fit to the fermion masses and mixing is obtained with the same $U(1)$ charges for the left- and right-handed quarks of the first two families and the right-handed bottom quark, and with zero charge for the left-handed top-bottom doublet and the right-handed top. The model shows an interesting indirect correlation between the correct prediction for the V_{ub}/V_{cb} ratio and large right-handed rotations in the (s, b) sector, required to diagonalise the Yukawa matrix. For the squarks, one obtains almost degenerate first two generations. The main source of the FCNC and CP violation effects is the splitting between the first two families and the right-handed sbottom determined by the relative size of F-term and D-term supersymmetry breaking. The presence of the large right-handed rotation implies that the bounds on the masses of the first two families of squarks and the right-handed sbottom are in a few to a few tens TeV range. The picture that emerges is light stops and left-handed sbottom and much heavier other squarks.

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Session Classification: Working Group 1

Track Classification: Working Group 1