



ID de Contribution: 67

Type: **Ordinary**

A Fourth Chiral Generation and SUSY Breaking

mardi 15 mars 2011 17:00 (15 minutes)

We revisit four generations within the context of supersymmetry. We compute the perturbativity limits for the fourth generation Yukawa couplings and show that if the masses of the fourth generation lie within reasonable limits of their present experimental lower bounds, it is possible to have perturbativity only up to scales around 1000 TeV. Such low scales are ideally suited to incorporate gauge mediated supersymmetry breaking, where the mediation scale can be as low as 10-20 TeV. The minimal messenger model, however, is highly constrained. While lack of electroweak symmetry breaking rules out a large part of the parameter space, a small region exists, where the fourth generation stau is tachyonic. General gauge mediation with its broader set of boundary conditions is better suited to accommodate the fourth generation.

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Classification de Session: Beyond the Standard Model

Classification de thématique: Theory