

Dynamical Electroweak Symmetry Breaking with a Fourth Generation

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Abstract content

Adding a fourth generation to the Standard Model and assuming it to be valid up to some cutoff Λ , we show that Yukawa couplings for the fourth generation are strong enough to drive electroweak symmetry breaking. Proposing a Coleman-Weinberg mechanism of electroweak symmetry breaking without self-interactions for the Higgs field at classical level, we show that the masses for the fourth generation consistent with electroweak precision data (including the $B \rightarrow K\pi$ CP asymmetries) imply a Higgs mass as low as ~ 350 and a cutoff Λ around 1-2 TeV. Similar results are obtained for the minimal supersymmetric extension of the standard model with four generations, which predicts soft breaking terms for masses of the fourth generation squarks of order 1 TeV. In both cases, the relation between Higgs mass and the masses of the new quarks is simple, implying that effects of physics beyond the Standard Model should be measurable at the LHC.

Summary

Primary author(s) : VAQUERA, Carlos (Departamento de Física de la Universidad de Guanajuato)

Co-author(s) : Dr. MAURO, Napsuciale (Departamento de Física de la Universidad de Guanajuato); Dr. DELEPINE, David (Universidad of Guanajuato)

Presenter(s) : VAQUERA, Carlos (Departamento de Física de la Universidad de Guanajuato)

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