Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Higgs Physics in Supersymmetric Models

By

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Standard Model (SM) successfully describes the particle spectrum of the nature and the interaction between between these particles using gauge symmetries. However, in order to give masses to these particles, the electroweak gauge symmetry must be broken. In the SM, this is achieved through Higgs mechanism where a scalar Higgs field acquires a vacuum expectation value. It is well known that the presence of a scalar field in SM leads to hierarchy problem, and therefore the SM by itself can not be the fundamental theory of nature. A well-motivated extension of the SM which addresses this problem is the Minimal Supersymmetric Standard Model (MSSM).

The Higgs sector in the MSSM has a rich phenomenology and its predictions can be tested at colliders. In this talk, I will describe three examples in supersymmetric models where the Higgs phenomenology is significantly different from that in SM. The first example is the MSSM with large tanβ where the Higgs coupling to the bottom quarks receives large radiative supersymmetric QCD corrections. As a consequence, $b\,g \rightarrow b\,h$ can be a dominant Higgs production mode in certain parameter space of the MSSM. A second example is an extension of MSSM by adding a fourth generation of chiral fermions. I will show that Higgs boson in such models can be as heavy as 500 GeV. Finally, as a third example, MSSM with one of the stops lighter than the top quark is considered. Such a scenario is required to generate sufficient baryon asymmetry in the universe. Using the latest LHC data on Higgs searches, I will show that electroweak baryogenesis in the MSSM is excluded for a large parameter space by using the correlations between the Higgs production and decay rates.

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