Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Effective Lagrangians for Higgs Physics

By

Tyler Corbett

The Large Hadron Collider has found an exciting excess at around 125 GeV. This excess appeared early on to behave as the long sought Higgs boson responsible for the mass of the fundamental particles of the Standard Model and with the full 7 and 8 TeV data sets this behavior has been further tested. As the data continued to converge to the Standard Model predictions it became important to try and classify possible small deviations from the expected behavior. A manner of doing so, consistent with the symmetries of the Standard Model, is the use of effective field theories. Effective field theories are able to constrain the presence of new physics without directly probing the new physics energy scale. They are valid both for scenarios with new fundamental physics such as supersymmetry or new gauge sectors, as well as new strongly interacting scenarios where the degrees of freedom may present as pseudo Goldstone bosons of some new global symmetry such as composite Higgs models.

In this dissertation we work in the effective field theory framework and, using the available experimental data, we place bounds on the coefficients of the relevant effective operators for Higgs physics. We consider two complementary realizations of the effective field theory: the linear realization, appropriate for a fundamental Higgs and new fundamental particles such as those predicted by supersymmetry, and the chiral or nonlinear realization, appropriate for composite Higgs scenarios. Additionally, by considering the effects of the new operators on other sectors, like triple gauge coupling data and electroweak precision data, we are able to further test the framework and devise signatures with potential to discriminate between the realizations.

Date: April 30, 2015
Time: 11:00 am
Place: Math Tower, 6125

Program: Physics
Dissertation Advisor: M.C. Gonzalez-Garcia