Contribution ID: **139** Type: **Parallel Session Talk**

New mechanism for neutrino mass generation and triply charged Higgs bosons at the LHC

Saturday, 24 July 2010 12:15 (12 minutes)

We propose a new mechanism for generating small neutrino masses which predicts the relation m_neu *v4/M3, where v is the electroweak scale, rather than the conventional seesaw formula m_neu*v2/M. Such a mass relation is obtained via effective dimension seven operators LLHH(H†H)/M3, which arise when an isospin 3/2 Higgs multiplet PHI is introduced along with iso-triplet leptons. The masses of these particles are naturally in the TeV scale. The neutral member of PHI acquires an induced vacuum expectation value and generates neutrino masses, while its triply charged partner provides the smoking gun signal of this scenario. These triply charged bosons can be pair produced at the LHC and the Tevatron, with PHI^+++ decaying into W+ℓ+ℓ+ or W+W+W+, possibly with displaced vertices. The leptonic decays of PHI^+++ will help discriminate between normal and inverted hierarchies of neutrino masses. This scenario also allows for raising the standard Higgs boson mass to values in excess of 500 GeV. I will also briefly review the other mechanisms for generatng neutrino masses.

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Session Classification: 07 - Neutrinos

Track Classification: 07 - Neutrinos