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Dimension 7 neutrino mass generation and its implications for the LHC and the dark matter

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Neutrino mass generation by the effective dimension seven operators leads to a different seesaw relation, m_nu ~ v^3 / M^2 compared to the usual seesaw one, m_nu ~ v^2 / M. The model [1] incorporating this has an isospin 3/2 scalar multiplet along with iso-triplet leptons, both of which can be at the TeV scale. The model can accommodate the neutrino masses and mixings, and both the direct and indirect mass hierarchy. The isospin 3/2 scalar contains triply charged scalar particles, and can be produced at the LHC via the Drell-Yan as well as photon fusion. Depending on the induced VEV of the isospin 3/2, the triply charged scalar can decay immediately, or produce displaced vertex. The final states give rise to same sign di-leptons, as well as tri-leptons, and can be observed at the LHC in the current or upcoming runs [2]. The model also has interesting implications for the dark matter detection experiments [3].

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2. Neutrino mass and scalar singlet dark matter, S. Bhattacharya, S. Jana, S. Nandi, e-Print arXiv: 1609.03274[hep-ph], Phys. Rev. D 95(2017) no5, 055003.

3. Neutrino mass generation at the TeV scale and new physics signatures from the charged Higgs for photon initiated processes, Kirtiman Ghosh, Sudip Jana and S. Nandi, e-Print: arXiv: 1705.01121[hep-ph].

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