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CDF-II W boson mass in the Dirac Scotogenic model

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The Dirac scotogenic model provides an elegant mechanism which explains small Dirac neutrino masses and neutrino mixing, with a single symmetry simultaneously protecting the “Diracness” of the neutrinos and the stability of the dark matter candidate. Here we explore the phenomenological implications of the recent CDF-II measurement of the W boson mass in the Dirac scotogenic framework. We show that, in the scenario where the dark matter is mainly a $SU(2)_L$ scalar doublet, it cannot concurrently satisfy: (a) the dark matter relic density (b) the m_W anomaly and (c) the direct detection constraints. However, unlike the Majorana scotogenic model, the Dirac version also has a “dark sector” $SU(2)_L$ singlet scalar. We show that if the singlet scalar is the lightest dark sector particle i.e. the dark matter, then all neutrino physics and dark matter constraints along with the constraints from oblique S , T and U parameters can be concurrently satisfied for W boson mass in CDF-II mass range.

Session

Beyond the Standard Model

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