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Inert doublet dark matter and mirror/extra families in view of Xenon 100

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It was shown recently that mirror fermions, naturally present in a number of directions for new physics, seem to require an inert scalar doublet in order to pass the electroweak precision tests. This provides a further motivation for considering the inert doublet as a dark matter candidate. Moreover, the presence of extra families enhances the Standard Model Higgs-nucleon coupling, which has crucial impact on the Higgs and dark matter searches. We study the limits on the inert dark matter mass in view of recent Xenon100 data. We find that the mass of the inert dark matter must lie in a very narrow window 74-76 GeV while the Higgs must weigh more than 400 GeV. For the sake of completeness we discuss the cases with fewer extra families, where the possibility of a light Higgs boson opens up, enlarging the dark matter mass window to $m_h/2$ -76 GeV. We find that Xenon100 constrains the DM-Higgs interaction, which in turn implies a lower bound on the monochromatic gamma-ray flux from DM annihilation in the galactic halo. For the mirror case, the predicted annihilation cross section lies a factor of 4-5 below the current limit set by Fermi LAT, thus providing a promising indirect detection signal.

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