

Higgs mediated Neutralino pair production in the Next-to-Minimal Supersymmetric Standard model

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The Next-to-Minimal supersymmetric Standard Model (NMSSM) is a phenomenologically motivated supersymmetric model that includes a gauge-singlet superfield, two $SU(2)$ Higgs doublets and a set of five neutrally charged fermions (neutralinos). Thus, NMSSM can be used to study the properties of extended Higgs sectors and dark matter candidates. We target the union of these two and compute the cross section for Higgs mediated neutralino pair production in proton-proton collisions, to the leading order in the Yukawa coupling and with $\mathcal{O}(\alpha_s)$ Standard Model corrections in the QCD coupling. We assume all Higgs sector parameters to be real and evaluate the resulting cross section in the cNMSSM.1 benchmark scenario in which the lightest neutralino is stable, gauge-singlet-like and with feeble Yukawa couplings to the Higgs bosons. In addition, the lightest Higgs bosons have small decay widths which provides significant resonance enhancement if they are included in the kinematic domain. Our results explore the phenomenological implications of cNMSSM.1 and the prospects of observability of the neutralinos at the Large Hadron Collider.

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