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Virtual Higgs portal to new particles in a natural scenario with supersymmetry and non-supersymmetric WIMPs

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Here we continue predictions for detection of new neutral and charged particles in a model which contains both supersymmetry and new non-supersymmetric particles from an extended Higgs sector [1-3]. The lowest energy of the new particles, which also have an R-parity of -1 [1], is an ideal dark matter WIMP with a mass $\leq 125 \text{ GeV}/c^2$ [2]. All the new non-susy particles couple to standard model particles via the Higgs [3], with a strength that is comparable to that of mixed higgsino-bino neutralinos [4]. They are therefore viable candidates for observation in direct, indirect, and collider detection. In particular, it would be interesting (if possible) to extend the collider search for real Higgs \rightarrow pair of WIMPs (with a limit of 60 GeV for the possible WIMP mass) to analyses based on virtual Higgs \rightarrow WIMP pair (to explore the range up to 125 GeV for the WIMP proposed here and in Refs. 1-3). With dark matter explained by the present non-susy candidate, the tension between the LHC limits and natural susy models [5] is relieved. In addition, there is a plethora of new predicted neutral and charged particles, as well as the well-known superpartners.

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Primary author: Prof. ALLEN, Roland (Texas A&M University)

Presenter: Prof. ALLEN, Roland (Texas A&M University)

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