

A Few Points in the WIMP studies in SUSY models

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- We have been discussing pure Wino / pure Higgsino type of dark matter in SUSY model (with their own advantages and disadvantages).
- Disappearing charge tracks / displaced vertices searches etc. are also included.
- The MSSM Lagrangian is usually claimed to include \rightarrow all possible “soft supersymmetry breaking” terms. In a most general framework, it has been shown that certain class of non-holomorphic (NH) couplings also qualify as soft terms and a bilinear higgsino soft term ($\mu' \tilde{h}_u \cdot \tilde{h}_d$) is one of them.
- μ' helps to achieve a good Higgsino DM candidate without the need of μ to be large. Hence, the Higgs potential, EW fine-tuning, naturalness argument \rightarrow all remain safe.
- In the Gauge Mediated Supersymmetry Breaking (GMSB) models, we mostly have gravitino LSP from a Bino type neutralino NLSP. In GMSB, with NH terms, one can have the freedom of a Higgsino NLSP and then a gravitino which can also be a DM candidate solving various astrophysical and cosmological problems.
- $U(1)$ extended EW-ino spectrum may have richer spectrum. If we add NH terms in these extended models then the mixed Bino - Higgsino / Wino - Higgsino may give non-trivial signatures.
- We may study how light a Higgsino or Wino DM can become in a compressed scenario.
- Compressed spectra analysis (small mass splittings between NLSP and LSP) often lead to long-lived particles.

It would be actually interesting if I get an opportunity to work
with some of these ideas and if anyone is willing
I would be happy to join the collaboration !!

