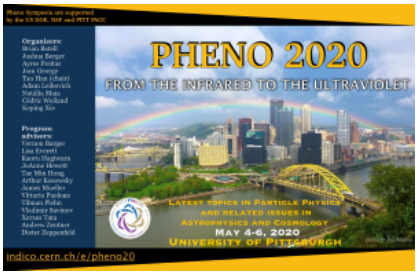

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Collider probes of real triplet scalar dark matter

Monday 4 May 2020 14:45 (15 minutes)

We study discovery prospects for a real triplet extension of the Standard Model scalar sector at the LHC and a possible future 100 TeV pp collider. We focus on the scenario in which the neutral triplet scalar is our dark matter candidate. When produced in pp collisions, the charged triplet scalar decays to the neutral component plus a soft pion or soft lepton pair, yielding a disappearing charged track in the detector. We recast current 13 TeV LHC searches for disappearing tracks, and find that the LHC presently excludes a real triplet scalar lighter than 287 GeV with $\mathcal{L} = 36\,\text{fb}^{-1}$. The reach will extend to 608 GeV and 761 GeV with the collection of $\mathcal{L} = 300\,\text{fb}^{-1}$ and $3000\,\text{fb}^{-1}$ respectively. We extrapolate the 13 TeV analysis to a prospective 100 TeV pp collider, and find that a ~ 3 TeV triplet scalar could be discoverable with $\mathcal{L} = 30\ \text{ab}^{-1}$, depending on the degree to which pile up effects are under control. We also investigate the dark matter candidate in our model and corresponding present and prospective constraints from dark matter direct detection. We find that currently XENON1T can exclude a real triplet dark matter lighter than ~ 3 TeV for a Higgs portal coupling of order one or larger, and the future XENON20T will cover almost the entire dark matter viable parameter space except for vanishingly small portal coupling.

Summary

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