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Exploring Uncharted Soft Displaced Vertices in Open Data

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We study a challenging signature in collider physics, that the final state contains soft and displaced tracks, with the help of the CMS Open Data. This signature is of particular interest since it corresponds to a well-motivated dark matter coannihilation regime. We propose to search for signals in monojet plus missing energy events, exploiting displaced vertices reconstructed from soft tracks. We perform such a search in the 8 TeV CMS Open Data events with a luminosity of 11.6 fb^{-1} and obtain 95\% confidence level limit on the plane of top squark mass $m_{\tilde{t}}$ and lightest neutralino mass m_{χ^0}. In the region $m_{\tilde{t}} - m_{\chi^0} \approx 15 - 30$ GeV, we exclude $m_{\tilde{t}} < 350$ GeV, which is more stringent than the ATLAS and CMS results using 8 TeV data with about 20 fb^{-1} luminosity. Our study shows that the CMS Open Data can be a powerful tool to help theorists study efficiencies and backgrounds of non-conventional new physics searches.

Summary

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