

Search for Higgsinos Decaying into Semi-Long-Lived Charged Particles in the ATLAS Detector with LHC Run 2 Data

Thursday 17 March 2022 18:20 (20 minutes)

Higgsinos with compressed mass spectra and masses near the electroweak scale are highly motivated by naturalness considerations and consistent with cosmological evidence, yet still poorly constrained by the LHC. This search will focus on the neutralino mass splitting $m = m_{\tilde{\chi}_2^0} - m_{\tilde{\chi}_1^0}$, in the region of 0.3~2 GeV, which has not been covered by ATLAS analyses to date. The current limit set by LEP only excludes up to $m_{\tilde{\chi}_1^\pm} \sim 95$ GeV. We plan to probe higher masses by identifying the track corresponding to a soft charged pion from the slightly long-lived (with $c\tau \sim 1$ mm) higgsino decay. The analysis will look for the associated production of higgsino-like chargino ($\tilde{\chi}_1^\pm$) and neutralino ($\tilde{\chi}_2^0$) in LHC pp collisions using the ATLAS Run-2 dataset. The event signature includes a high momentum jet from initial state radiation, and a displaced pion $^\pm$ from $\tilde{\chi}_1^\pm/\tilde{\chi}_2^0$ decay aligned with significant missing energy in the transverse plane. Using Monte Carlo simulation, I will present a preliminary sensitivity estimate for $m_{\tilde{\chi}_1^\pm} \sim 150$ GeV, and suppression strategy against backgrounds from semi-long-lived particles using track energy loss and secondary vertex reconstruction.

Career stage

Graduate student

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Session Classification: SUSY