Contribution ID: **183** Type: **Talk (closed)**

Jet Observables and Stops at 100 TeV Collider

Thursday 26 July 2018 18:00 (20 minutes)

A future proton-proton collider with center of mass energy around 100 TeV will have a remarkable capacity to discover massive new particles and continue exploring weak scale naturalness. In this work we will study its sensitivity to two stop simplified models as further examples of its potential power: pair production of stops that decay to tops or bottoms and Higgsinos; and stops that are either pair produced or produced together with a gluino and then cascade down through gluinos to the lightest superpartner (LSP). In both simplified models, super-boosted tops or bottoms with transverse momentum of order TeV will be produced abundantly and call for new strategies to identify them. We will apply a set of simple jet observables, including track-based jet mass, N-subjettiness and mass-drop, to tag the boosted hadronic or leptonic decaying objects and suppress the standard model as well as possible supersymmetric (SUSY) backgrounds. Assuming 10% systematic uncertainties, the future 100 TeV collider can discover (exclude) stops with masses up to 6 (7) TeV with 3 inverse attobarn of integrated luminosity if the stops decay to Higgsinos. If the stops decay through gluinos to LSPs, due to additional SUSY backgrounds from gluino pair production, a higher luminosity of about 3 inverse attobarn is needed to discover stops up to 6 TeV. We will also discuss how to use jet observables to distinguish simplified models with different types of LSPs. The boosted top or bottom tagging strategies developed in this paper could also be used in other searches at a 100 TeV collider. For example, the strategy could help discover gluino pair production with gluino mass close to 11 TeV with 3 inverse attobarn of integrated luminosity.

Parallel Session

Supersymmetry: Models, Phenomenology and Experimental Results

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Session Classification: Supersymmetry: Models, Phenomenology and Experimental Results