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An Inclusive Search for Supersymmetry in the CMS Experiment: Challenges and Methods for the All-Hadronic Jets + MET Final State

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We present results from a generic search for strongly-produced supersymmetric particles in pp collisions in the multijet + missing transverse momentum final state. The data sample corresponds to 2.3 fb^{-1} recorded by the CMS experiment at $\sqrt{s} = 13$ TeV. This search is highly motivated by both theoretical and experimental considerations. In supersymmetry (SUSY) theories disfavoring fine-tuning of the Higgs mass, strongly-produced SUSY particles, including the gluino and top squark, are predicted to have masses on the order of a TeV. These particles also have some of the highest production cross sections in SUSY and give rise to final states with distinct, high jet multiplicity event signatures. To make the analysis sensitive to a wide range of such final states, events are classified by the number of jets, the scalar sum of the transverse momenta of the jets, the vector sum of the transverse momenta of the jets, and the number of b-tagged jets. The tails of the distributions of these variables make up a region of extreme kinematics for the significant standard model (SM) backgrounds. As these distributions are difficult to model in simulation, we model them using dedicated techniques and control regions in data for each background process. No significant excess is observed beyond the SM expectation. The results are interpreted as limits on simplified SUSY models. In these models, gluinos with masses as high as 1600 GeV are excluded at 95% CL for scenarios with low $\tilde{\chi}_1^0$ mass, exceeding the limits set in Run I by more than 200 GeV.

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