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Search for Supersymmetry with a Highly Compressed Mass Spectrum in the Single Soft Lepton Channel with the CMS Experiment at the LHC

Models with compressed mass spectra target a very interesting region of the SUSY parameter space and are very well motivated by theoretical considerations, such as dark matter constraints and naturalness. The presented analysis focuses on signal events containing a single low-momentum lepton and moderate missing transverse energy. The search targets a simplified model in which the signal consists of stop (supersymmetric partner of the top quark) pair-production, followed by 4-body decays into a lepton-neutrino (quark-antiquark) pair, a b-quark and a neutralino, which is considered the lightest supersymmetric particle (LSP), and with a mass gap between the stop and the LSP that is smaller than the W-boson mass. The LSPs and the neutrino escape the detector, leading to a missing transverse energy signature. Compressed regions are challenging to study, as the visible decay products have low momentum and generally do not pass detector acceptance thresholds. This difficulty can be mitigated by requiring the presence of an initial-state radiation jet, which boosts the system. The results are based on data from Run II of the Large Hadron Collider, recorded with the CMS detector at a centre-of-mass energy of 13 TeV.

Experimental Collaboration

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