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Search for phenomena beyond the Standard Model in events with large b-jet multiplicity using the ATLAS detector at the LHC

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Events with a large number of high- p_T b-jets are rare in the Standard Model (SM); an excess of events with such topology would be a signal of phenomena beyond the SM. One phenomenon where a large excess is expected is a variant of supersymmetry in which R-parity is violated, allowing baryon number violating decays of the super partners of the SM particles.

This analysis presents the search for physics beyond the SM in events with at least eight jets and at least six b-jets. It was performed using Run 2 data collected by ATLAS detector corresponding to an integrated luminosity of 139 fb⁻¹ of pp collisions at a center-of-mass energy of 13 TeV. We consider specifically the production of a pair of heavy scalar top quarks which decay to a b-quark and a chargino, which in turn decays into bb quarks via a virtual stop.

The most dominant source of background is multijet production, which is estimated using a data-driven technique called the Tag-Rate-Function multijet method, which is based on the probability of identifying jets from b-quarks. This method is extensively validated using data and MC simulation. The analysis strategy is based on counting the number of events with high jet and b-tagged jet multiplicities, which are categorized into eight analysis regions. A fit is performed to estimate the expected sensitivity of the signal strength. Expected and observed 95% CL upper limits are set based on the stop and chargino masses.

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