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Search for pair production of vector-like T and B quarks in single-lepton final states using boosted jet substructure in proton-proton collisions at root s=13 TeV

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Abstract

A search for pair production of massive vector-like T and B quarks in proton-proton collisions at root s = 13 TeV is presented. The data set was collected in 2015 by the CMS experiment at the LHC and corresponds to an integrated luminosity of up to 2.6 fb⁻¹. The T and B quarks are assumed to decay through three possible channels into a heavy boson (either a W, Z or Higgs boson) and a third generation quark. This search is performed in final states with one charged lepton and several jets, exploiting techniques to identify W or Higgs bosons decaying hadronically with large transverse momenta. No excess over the predicted standard model background is observed. Upper limits at 95% confidence level on the T quark pair production cross section are set that exclude T quark masses below 860 GeV in the singlet, and below 830 GeV in the doublet branching fraction scenario. For other branching fraction combinations with $B(T \rightarrow tH) + B(T \rightarrow bW) \geq 0.4$, lower limits on the T quark range from 790 to 940 GeV. Limits are also set on pair production of singlet vector-like B quarks, which can be excluded up to a mass of 730 GeV. The techniques showcased here for understanding highly-boosted final states are important as the sensitivity to new particles is extended to higher masses.

Keywords

Author Keywords: [Hadron-Hadron scattering \(experiments\)](#); [Heavy quark production](#); [vector-like quarks](#)KeyWords Plus: [HADRON COLLIDERS](#); [CROSS-SECTION](#); [PP COLLISIONS](#); [PLUS PLUS](#); [BOSON](#); [ENERGIES](#); [FERMION](#); [MODELS](#); [LHC](#)

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