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Search for single production of a vector-like T quark decaying into a Higgs boson and top quark with fully hadronic final states using the ATLAS detector

Monday, 6 June 2022 14:15 (15 minutes)

A search is made for a vector-like T quark decaying into a Higgs boson and a top quark in 13 TeV proton-proton collisions using the ATLAS detector at the Large Hadron Collider with a data sample corresponding to an integrated luminosity of 139 fb^{-1} .

The all-hadronic decay modes $H \rightarrow b\bar{b}$ and $t \rightarrow bW \rightarrow bq\bar{q}'$ are reconstructed as large-radius jets and identified using tagging algorithms.

Improvements in background estimation, signal discrimination, and a larger data sample, contribute to an improvement in sensitivity over previous all-hadronic searches.

No significant excess is observed above the background, so limits are set on the production cross-section of a singlet T quark at 95% confidence level, depending on the mass, m_T , and coupling, κ_T , of the vector-like T quark to Standard Model particles.

This search targets a mass range between 1.0 to 2.3 TeV, and a coupling value between 0.1 to 1.6, expanding the phase space of previous searches.

In the considered mass range, the upper limit on the allowed coupling values increases with m_T from a minimum value of 0.35 for $1.07 < m_T < 1.4 \text{ TeV}$ up to 1.6 for $m_T = 2.3 \text{ TeV}$.

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