



Contribution ID: 79

Type: **not specified**

Search for single-production of vector-like B quark decaying into a bottom quark and a Higgs in the $H \rightarrow b\bar{b}$ decay mode with the ATLAS experiment.

Wednesday 10 April 2019 12:00 (15 minutes)

A search is conducted for single-production of a vector-like B quark decaying into a Higgs boson and a b quark. Vector-like quarks are theorised to be highly massive colour triplet spin-1/2 fermions arising in models, such as the Little Higgs and Composite Higgs models, which tackle the hierarchy problem resulting from the measured value of the Standard Model Higgs boson mass. Vector-like quarks are predicted to mix prevalently with third generation Standard Model quarks through couplings with the weak Gauge Bosons or the Higgs Boson.

This search targets the $B \rightarrow bH$ decay mode in the fully hadronic channel defined by the $H \rightarrow b\bar{b}$ secondary decay. The Standard Model background to the search, consisting mainly of continuum multi-jet production, is estimated through a fully data driven procedure. The search is carried out on the entire Run II collision data with centre-mass energy of 13 TeV, collected between 2015 and 2018, amounting to a total of 140 fb⁻¹. Preliminary results are shown as mass-dependent 95% CL exclusion values for the production cross section of a vector-like b quark according to the benchmark model employed.

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Session Classification: Parallel stream 1