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A Search for Fully Hadronic Final State Vector-Like Quark Pair Production in 13 TeV pp Collisions using CMS Data

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We describe a search for the production of a pair of vector-like quarks (VLQ's) with masses greater than 1000 GeV/c² each decaying into a *b* quark and a Higgs Boson using data from proton-proton collisions at center-of-mass energy of 13 TeV recorded by the CMS Experiment. Since the predominant decay mode of the Higgs boson is to a $b\bar{b}$ pair, the analysis focuses on a final state consisting of jets resulting from the $b(\bar{b})$ quarks produced in the VLQ decays. Requiring that the jets are consistent with production of a pair of Higgs, that the reconstructed VLQ's have equal masses and that several of the jets are tagged as originating from $b(\bar{b})$ quarks, greatly reduces the background from Standard Model processes. We use a χ^2 procedure based on the Higgs masses and the equality of the two VLQ masses to select the correct combinations of jets. Since for highly boosted Higgs, the two jets resulting from the daughter $b(\bar{b})$ quarks might be merged to a single jet, we carry out three independent analyses depending on the number of observed jets. We present the expected exclusion limits from the three combined analyses corresponding to 138 fb⁻¹ of integrated luminosity collected by CMS during the 2016, 2017 and 2018 run period.

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