



Contribution ID: 559

Type: Poster

## Search for a vector-like quark $T' \rightarrow tH$ in the diphoton decay mode of the Higgs boson in proton-proton collisions at $\sqrt{s} = 13$ TeV

Tuesday 13 December 2022 14:00 (1 hour)

A search for the production of a vector-like quark,  $T'$  will be presented based on proton-proton collision events at  $\sqrt{s} = 13$  TeV. The data sample corresponds to an integrated luminosity of  $138 \text{ fb}^{-1}$ , collected by the CMS during 2016-18 operations of the LHC. This search targets the electroweak production mechanism of  $T'$  in the mass range 600 – 1200 GeV, in a narrow width approximation. The  $T'$  quark decays to a top quark and a Higgs boson ( $T' \rightarrow tH$ ); with the Higgs boson subsequently decaying into a pair of photons ( $H \rightarrow \gamma\gamma$ ). This search is the first  $T'$  search to exploit the decay of the Higgs boson in the diphoton channel. The excellent diphoton invariant mass resolution of 1 – 2% results in an increased sensitivity compared to previous searches up to 1 TeV. No significant excess over the standard model background is observed, accordingly an upper limit on the  $T'$  production cross section is set and the  $T'$  masses up to 730 GeV are excluded at 95% confidence level.

### Session

Beyond the Standard Model

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**Session Classification:** Poster - 2