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## Searches for the FCNC couplings from tH associated production signal with diphton channel at the LHC

In this paper, we study the observability of the top-Higgs flavor changing neutral current (FCNC)  $tqh$  coupling through the process  $pp \rightarrow qg \rightarrow t(\rightarrow \ell^+ b \nu) h(\rightarrow \gamma\gamma)$  at the Large Hadron Collider (LHC), where  $\ell = e, \mu$ . Our numerical results show that, in some parameter regions, the LHC may observe the above signals at the  $5\sigma$  level. Otherwise, the branching ratios  $Br(t \rightarrow uh)$  and  $Br(t \rightarrow ch)$  can be respectively probed to 0.036% and 0.13% at  $3\sigma$  level at 14 TeV LHC with the high integrated luminosity of  $3000 \text{ fb}^{-1}$ . On the other hand, studying the charge ratio for the lepton in top quark decay can be not only used to discriminate between signal and backgrounds, but also used to discriminate between  $tuh$  and  $tch$  couplings, for which anomalous single top production comes from the up initiated channel and charm initiated channel.

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