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Implication of a 750 GeV Diphoton Resonance for Heavy Quark Searches

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The hinted diphoton excess at a mass of 750 GeV suggests the existence of heavy quarks that mediated the resonance production via gluon fusion. The decay of the heavy quark into Sq, with q being a SM quark, could provide a new search channel for heavy quarks.
We consider the case of a singlet vector-like partner of the top quark and show that it can be searched for at the 13 TeV LHC through its decay into a scalar resonance in the 2\gamma+\ell final state, especially if the diphoton branching ratio of the scalar S is further enhanced by the contribution of non coloured particles. We further show that conventional heavy quark searches can be sensitive to this new decay pattern also when S decays into jets by slightly tightening the current selection cuts. Finally we comment about the possibility of disentangling the heavy quark decay to St from other standard decay patterns by scrutinising appropriate kinematic distributions.

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