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Novel kinematics from a custodially protected diphoton resonance

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I will describe a simple, well-motivated model based on a custodial symmetry which describes the tree-level production of a 750 GeV diphoton resonance from a decay of a singly produced vector-like quark. The model has several novel features. The identification of the resonance as an $SU(2)_R$ triplet provides a symmetry explanation for suppression of its decays to hh , WW , and gg . Moreover, the ratio of the 13 TeV to 8 TeV cross sections can be larger than single production of a 750 GeV resonance, reaching ratios of up to 7 for TeV scale vector-like quark masses. This eliminates any tension between the results from Run I and Run II diphoton searches. The kinematic distributions from this new production mechanism are consistent with available experimental distributions in large regions of parameter space but, depending on the mass of the new vector-like quarks, can be differentiated from the background with more statistics.

Summary

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