

Label	No. of classes		Main requirements
	7 TeV	8 TeV	
t $\bar{t}$ H lepton tag	*	1	$p_T^{\gamma^1} > m_{\gamma\gamma}/2$ 1 b-tagged jet + 1 electron or muon
VH tight $\ell$ tag	1	1	$p_T^{\gamma^1} > 3m_{\gamma\gamma}/8$ [e or $\mu$ , $p_T > 20$ GeV, and $E_T^{\text{miss}} > 45$ GeV] or [2e or $2\mu$ , $p_T^\ell > 10$ GeV; $70 < m_{\ell\ell} < 110$ GeV]
VH loose $\ell$ tag	1	1	$p_T^{\gamma^1} > 3m_{\gamma\gamma}/8$ e or $\mu$ , $p_T > 20$ GeV
VBF dijet tag 0-2	2	3	$p_T^{\gamma^1} > m_{\gamma\gamma}/2$ 2 jets; classified using combined diphoton-dijet BDT
VH $E_T^{\text{miss}}$ tag	1	1	$p_T^{\gamma^1} > 3m_{\gamma\gamma}/8$ $E_T^{\text{miss}} > 70$ GeV
t $\bar{t}$ H multijet tag	*	1	$p_T^{\gamma^1} > m_{\gamma\gamma}/2$ 1 b-tagged jet + 4 more jets
VH dijet tag	1	1	$p_T^{\gamma^1} > m_{\gamma\gamma}/2$ jet pair, $p_T^j > 40$ GeV and $60 < m_{jj} < 120$ GeV
Untagged 0-4	4	5	The remaining events, classified using diphoton BDT

\* For the 7 TeV dataset, events in the t $\bar{t}$ H lepton tag and multijet tag classes are selected first, and combined to form a single event class.