

Study on tch with photons

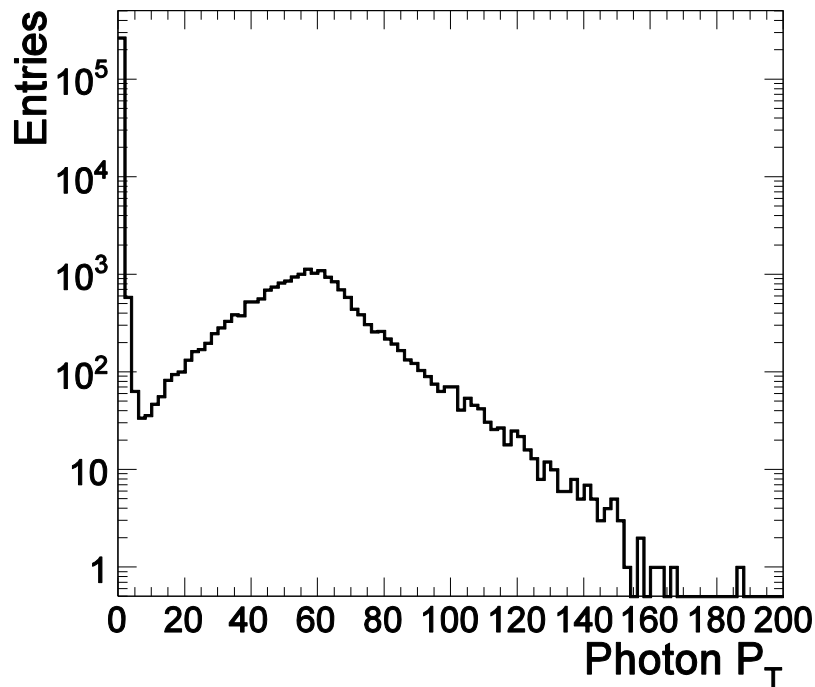
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Samples

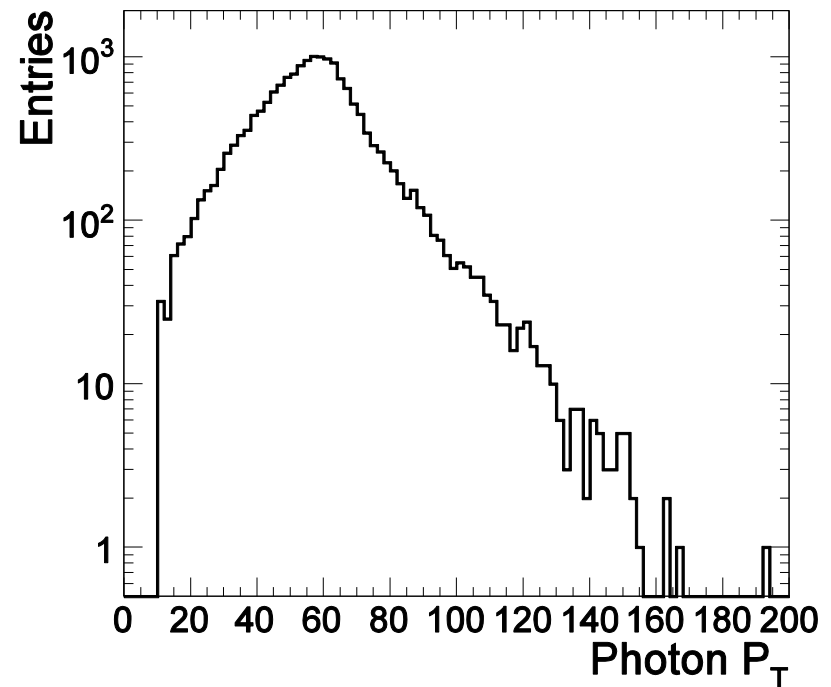
- aMC@NLO (v2_1_2)
- Signal $t (\rightarrow ch(\gamma\gamma)) \bar{t} (\rightarrow Wb)$
 - Model : AnoTopCouplingsFull
 - $p p \rightarrow t \bar{t}, (t > c h, h > a a)$ with pythia6
- Background for $H \rightarrow \gamma\gamma$
 - Model : AnoTopCouplingsFull
 - $p p \rightarrow h \rightarrow a a$ with pythi6
- Background for $t \bar{t}$
 - Model : sm
 - $p p \rightarrow t \bar{t}$ with pythia6
- Event simulation with CMS detector
 - Delphes-3.1.2

Efficiency in Delphes

- Each 10000 events generated at 13 TeV
- Requiring one photon with 20 GeV ($H \rightarrow \gamma\gamma$)
 - 9932 events with 100% assumption
 - 9759 events with CMS delphes setting



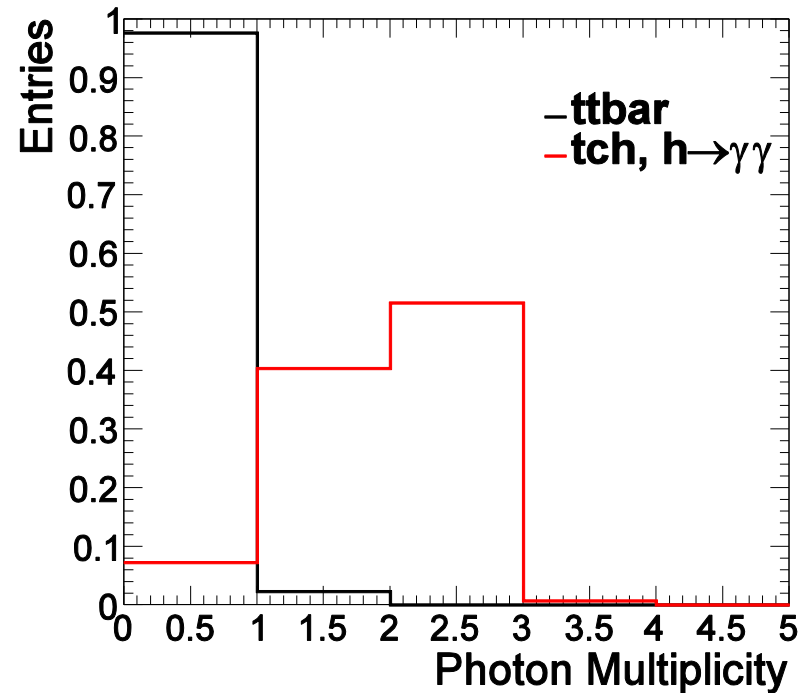
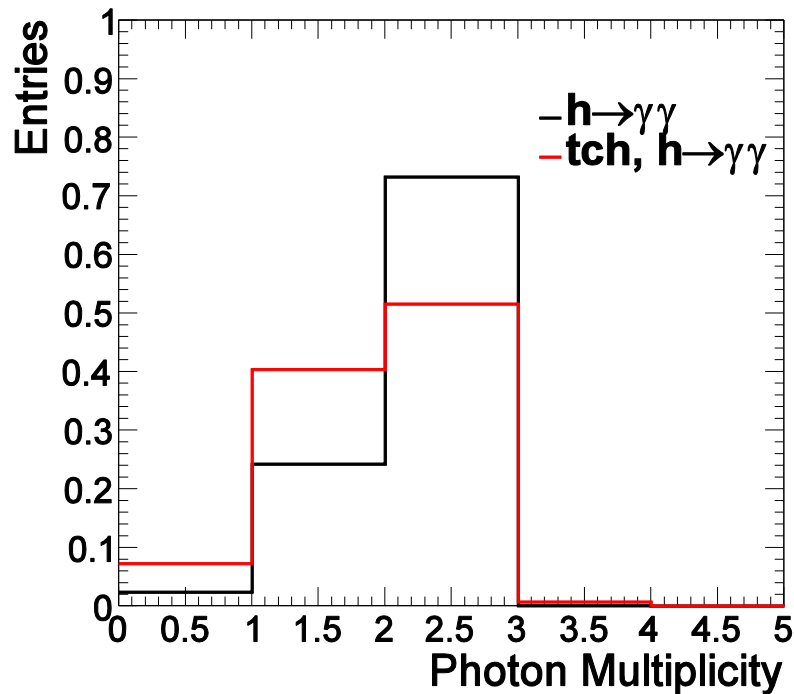
100% Efficiency



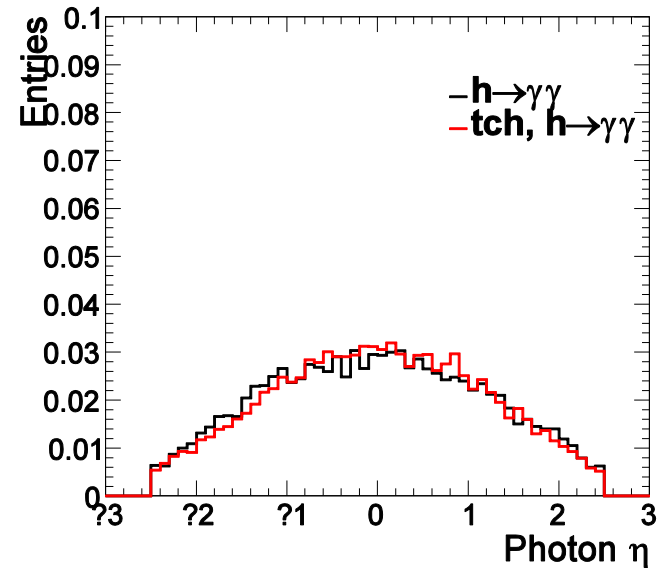
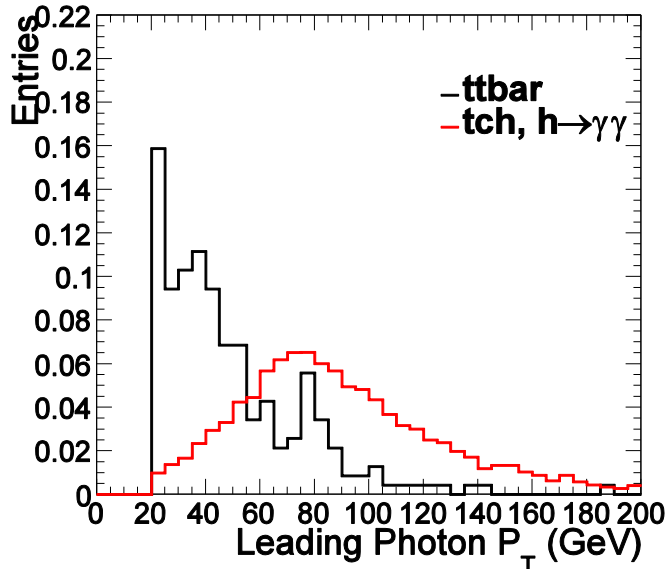
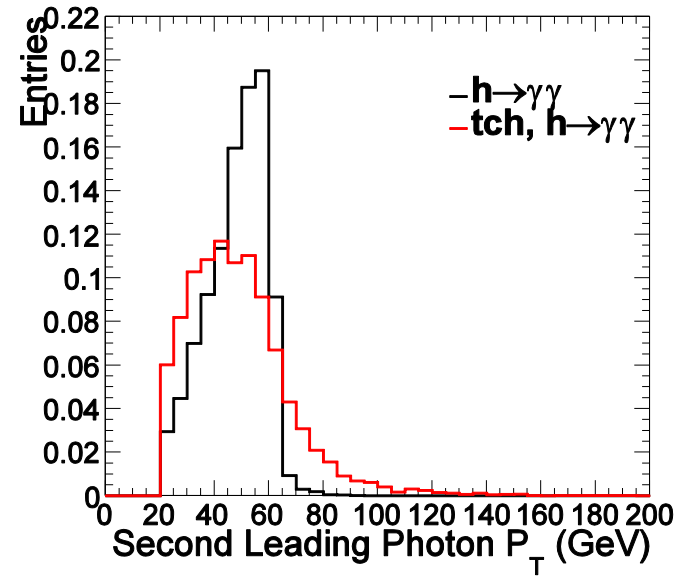
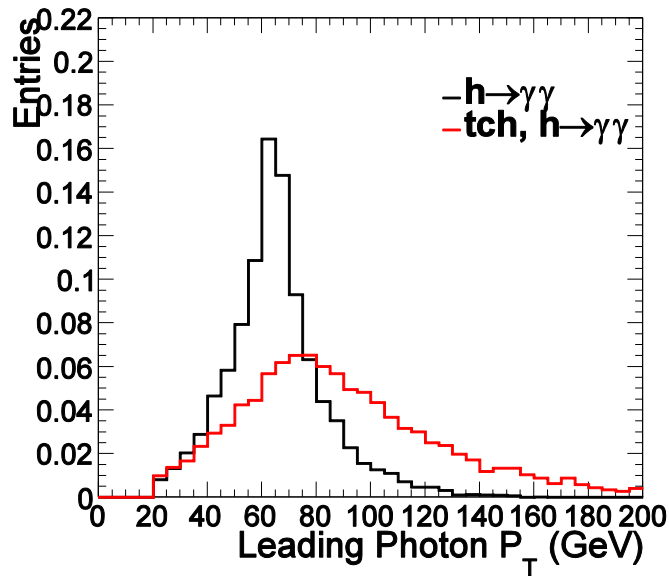
CMS delphes setting

$tch (h \rightarrow \gamma\gamma)$ vs SM background

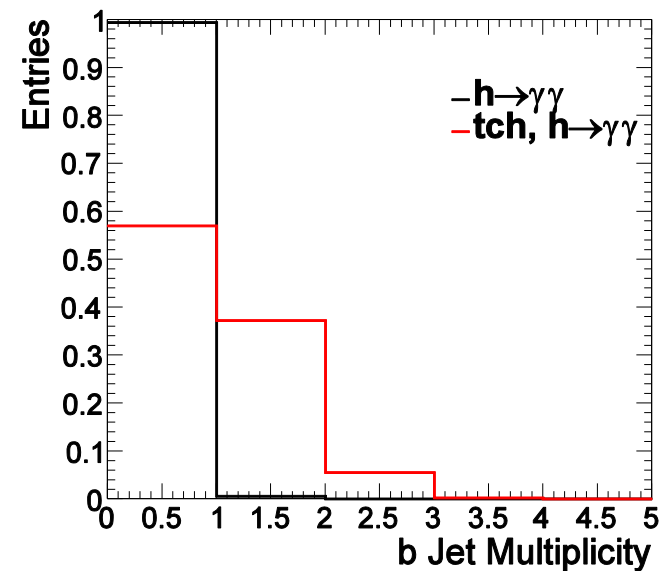
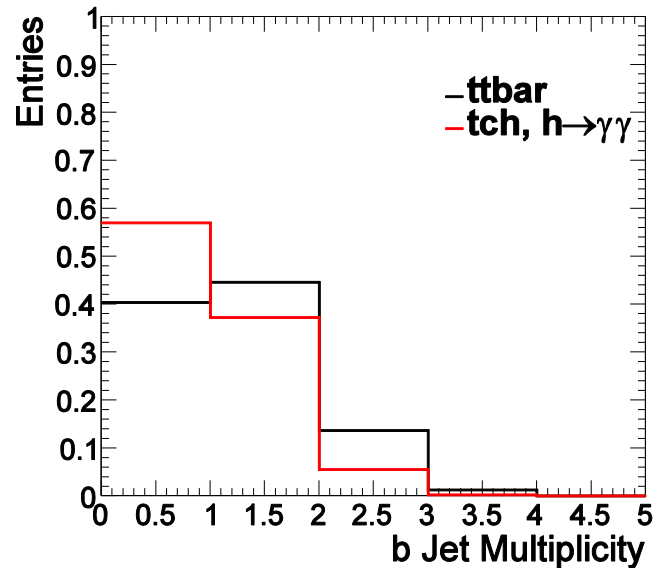
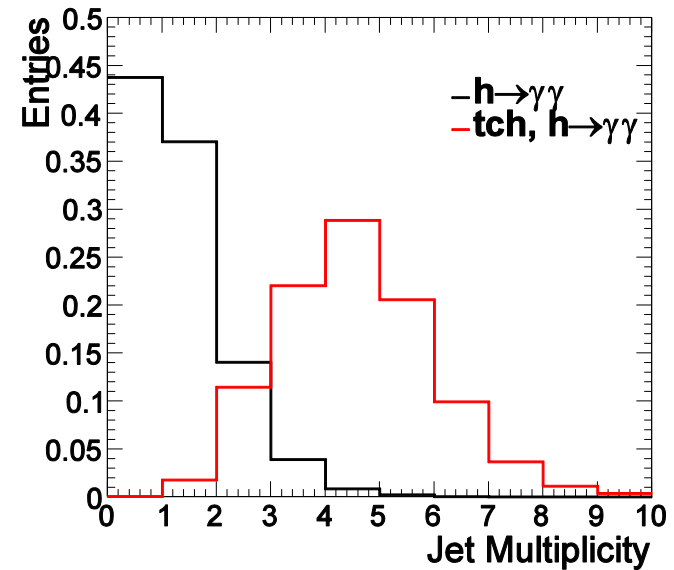
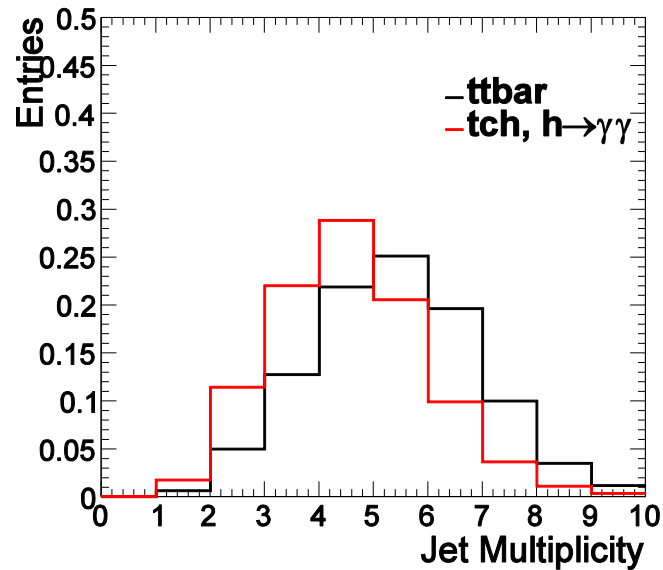
- Photon $p_T > 20$ GeV, $|\eta| < 2.4$



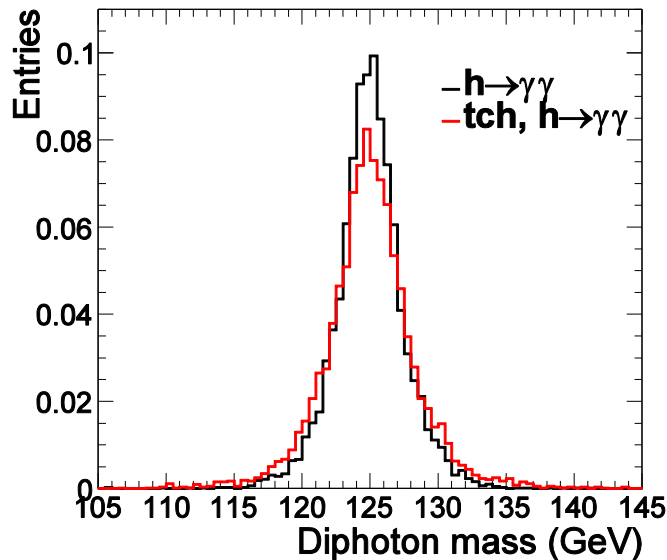
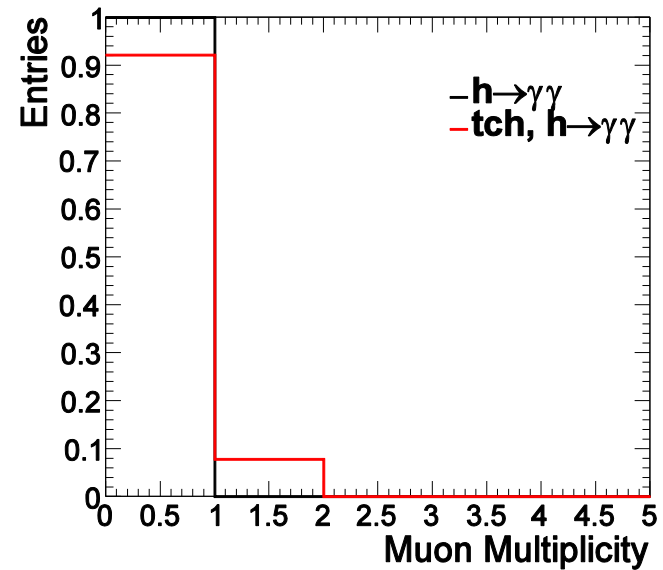
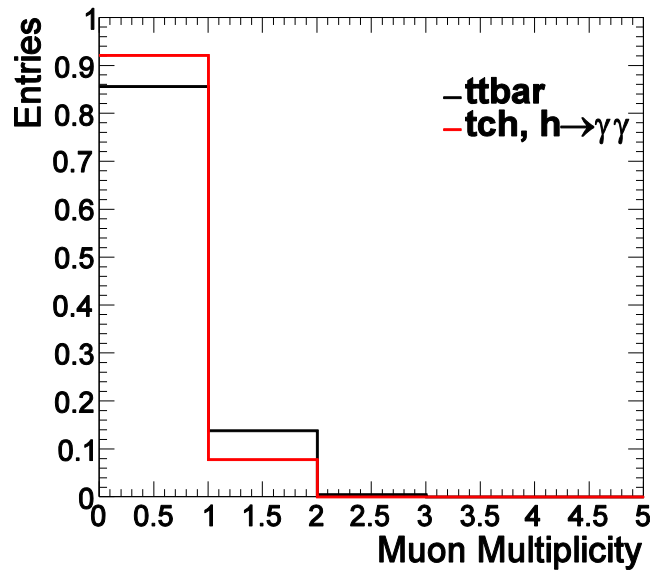
$tch (h \rightarrow \gamma\gamma)$ vs SM background



$tch (h \rightarrow \gamma\gamma)$ vs SM background



$tch (h \rightarrow \gamma\gamma)$ vs SM background



- Two Photons : $p_T > 20$ GeV, $|\eta| < 2.4$
 - 7330 events survived
 - Event selection efficiency : 73.3%

Conclusions

- Photon efficiency seems to be more or less higher than CMS public result but it is lower than expected when requiring two photons.
 - But looking at medium working point in CMS, two photon event selection efficiency seems consistent with delphes
(<https://twiki.cern.ch/twiki/bin/view/CMSPublic/EGMPhotonsSpring2013>)
- Need to use patched version Delphes
- Need QCD diphoton: requiring one lepton, this might be negligible in delphes.