

$h(125) \rightarrow aa \rightarrow \gamma\gamma\gamma\gamma$

Higgs to 4 Gamma Update

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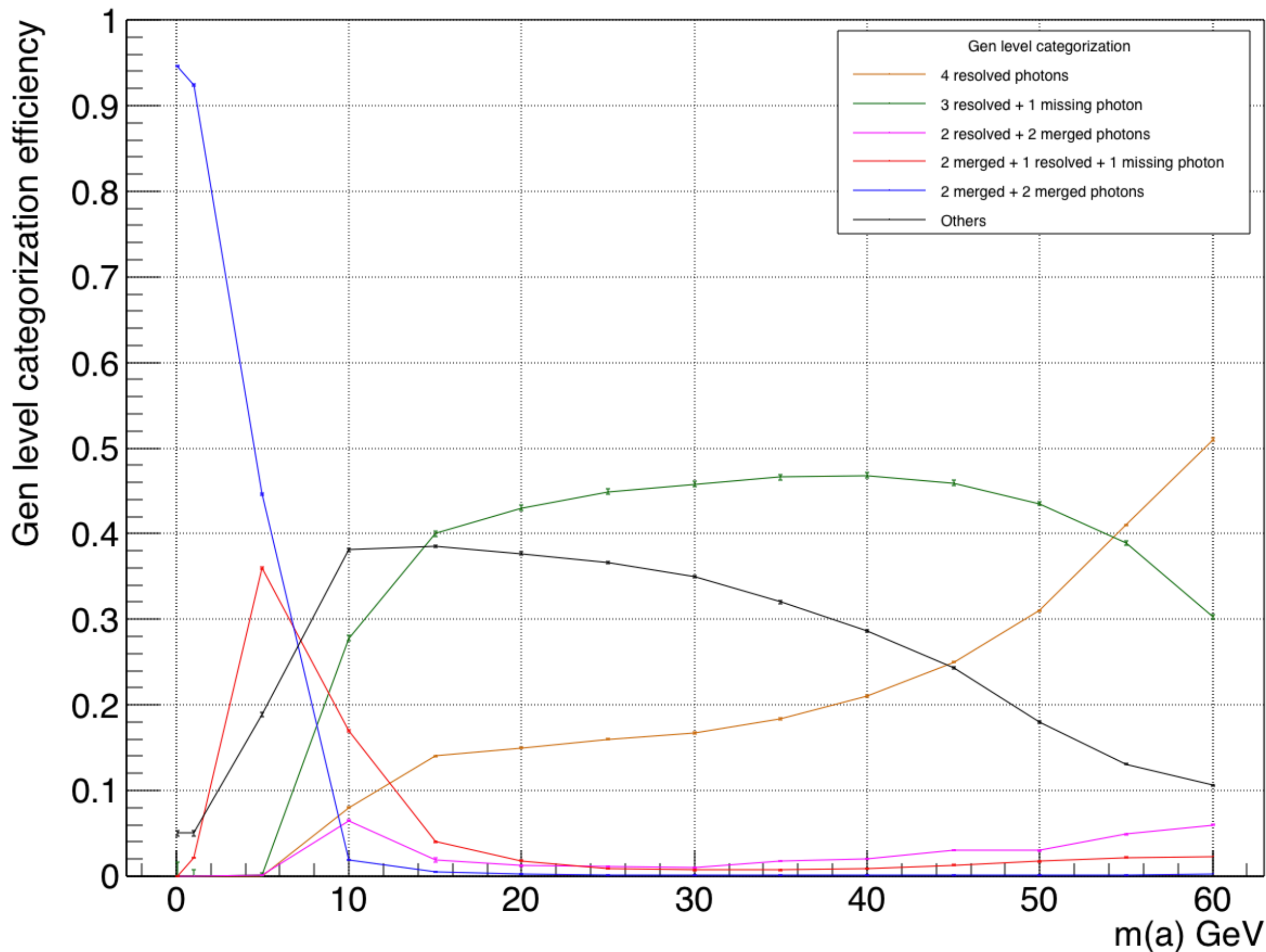
¹Northeastern University

²INFN Milano-Bicocca

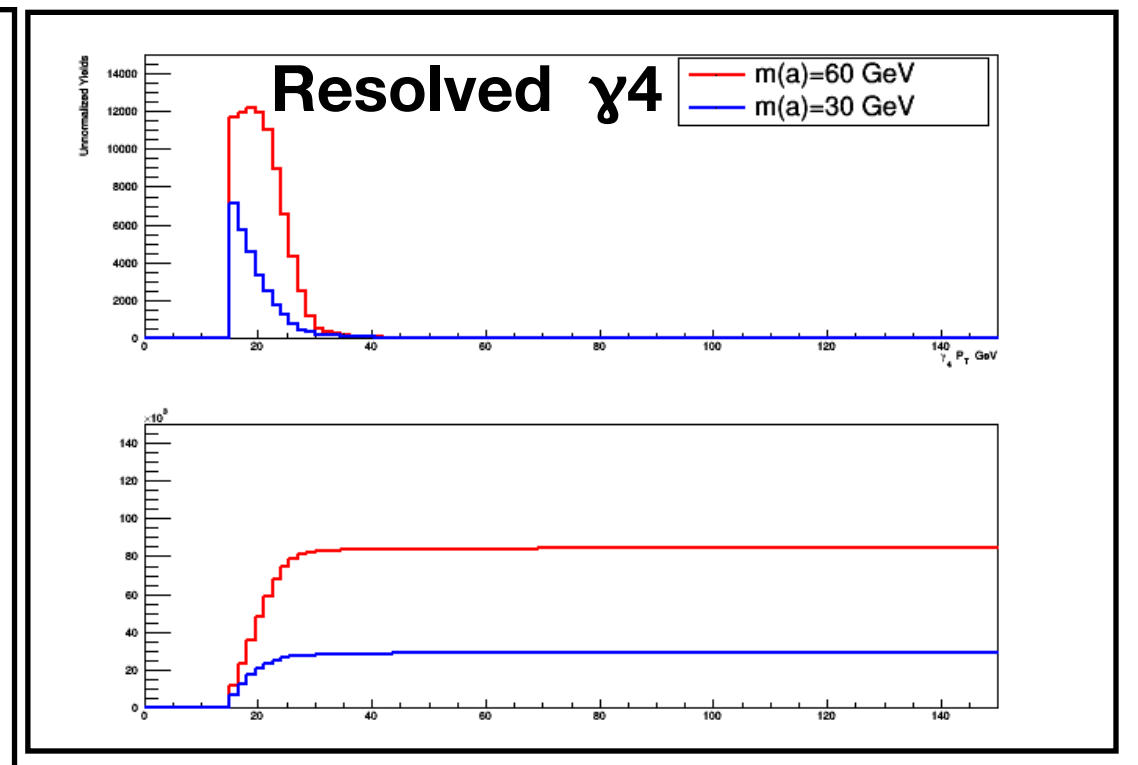
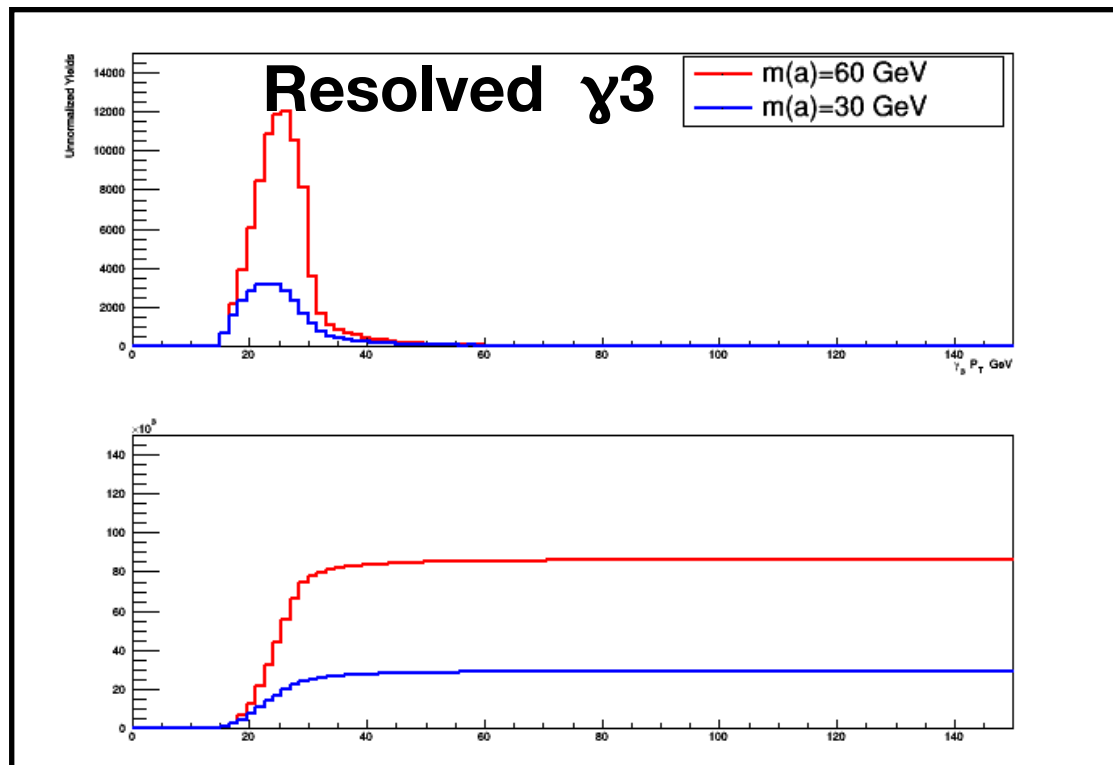
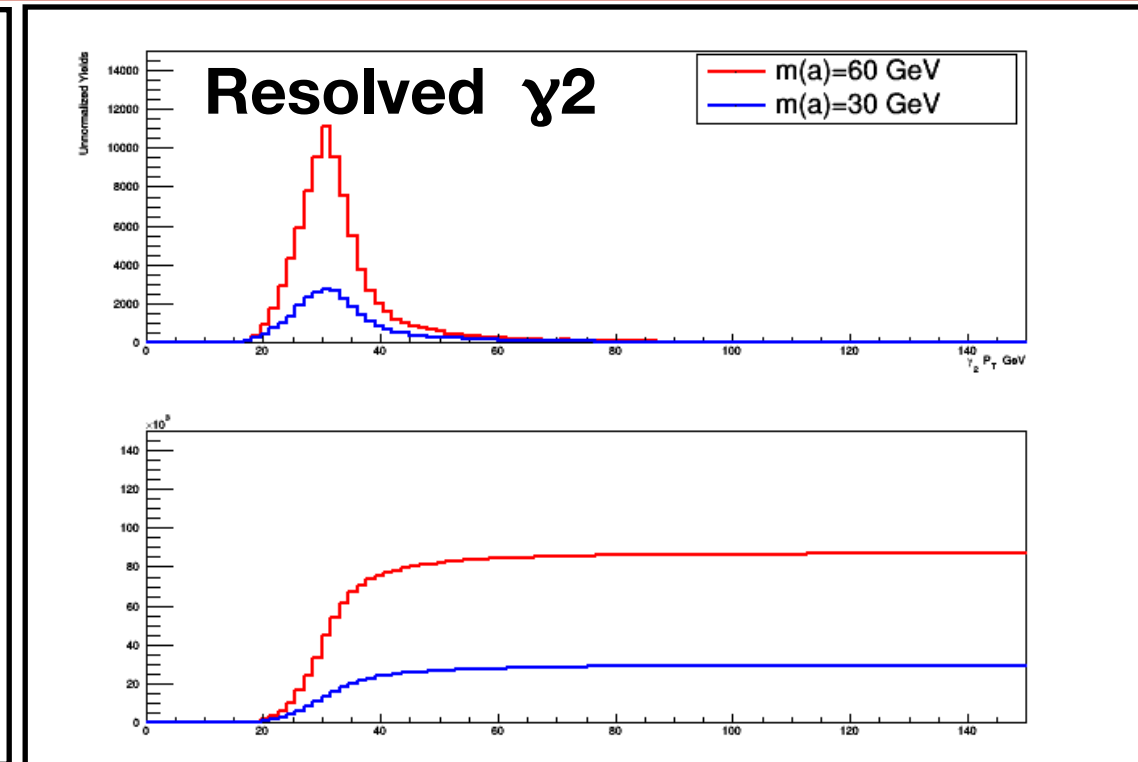
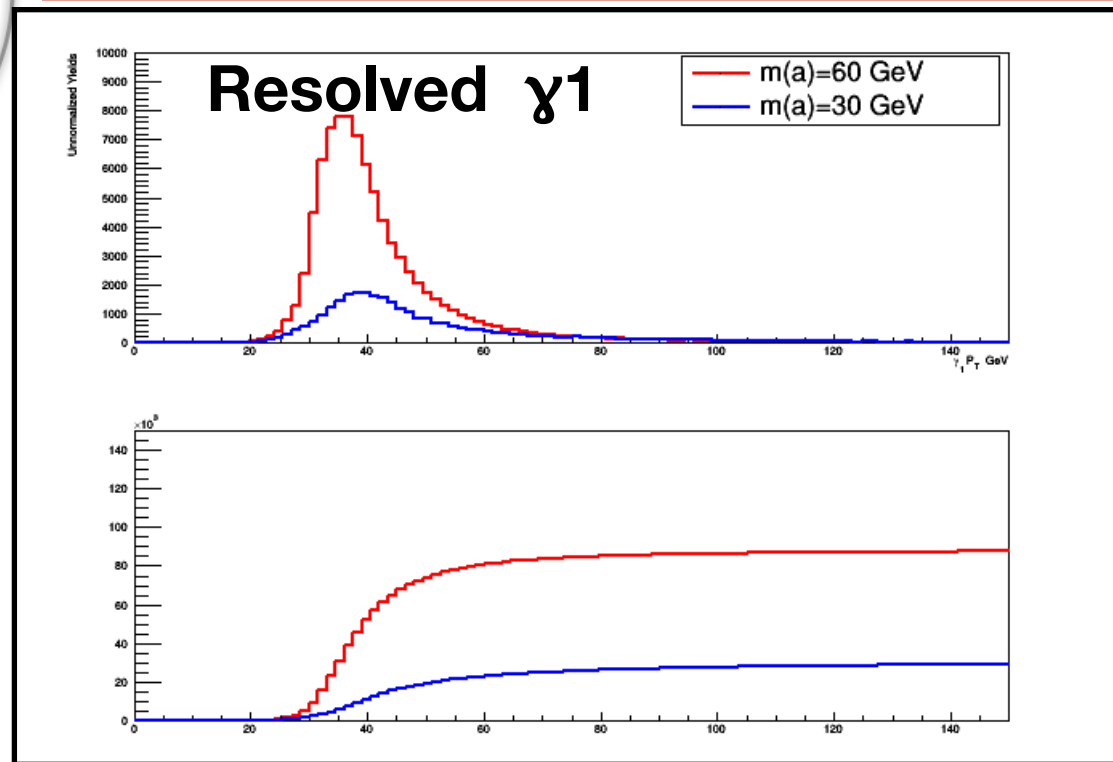
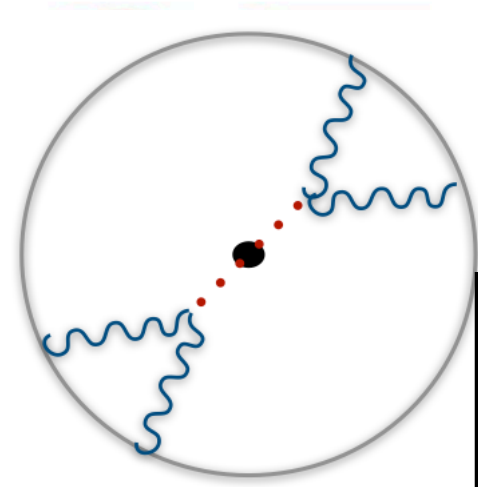
H4G chat
20 March 2018



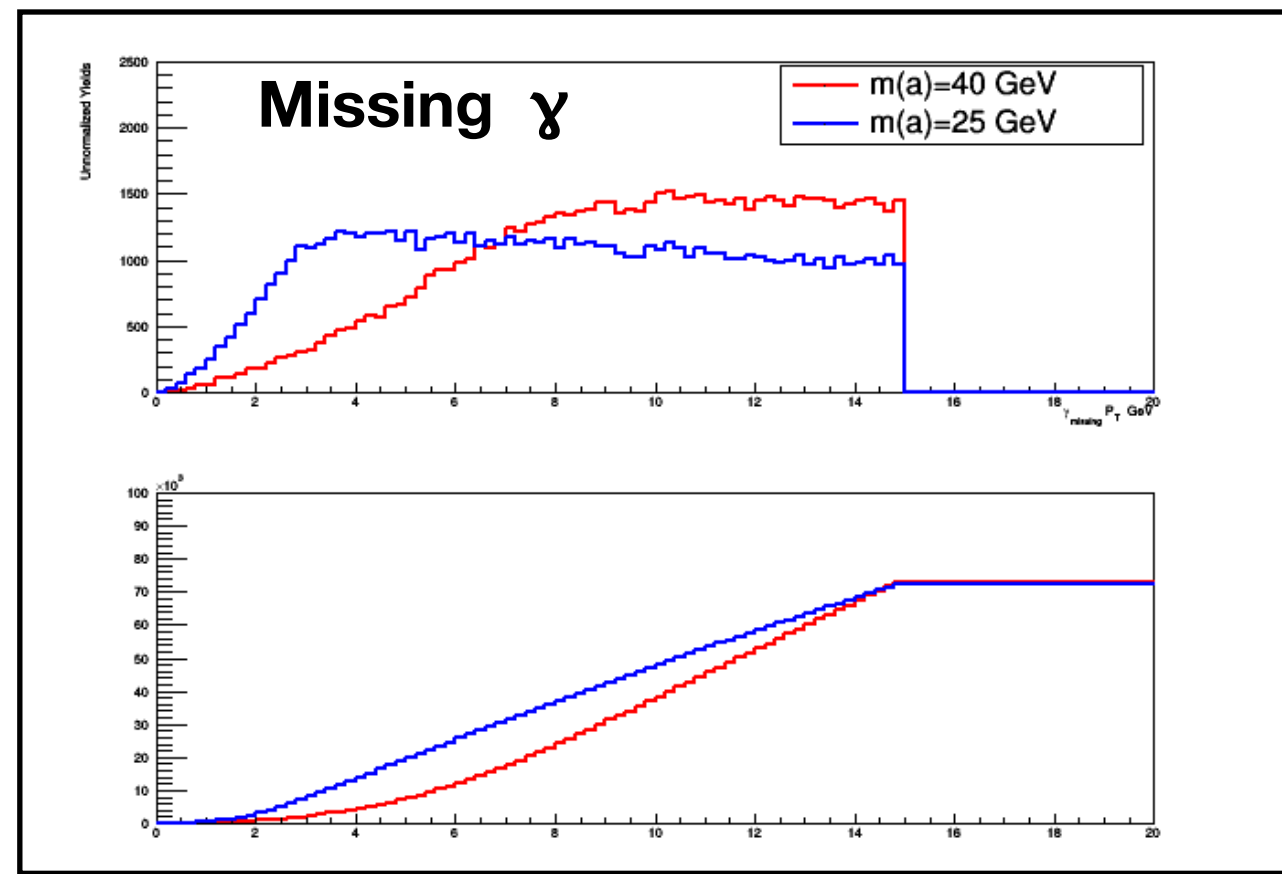
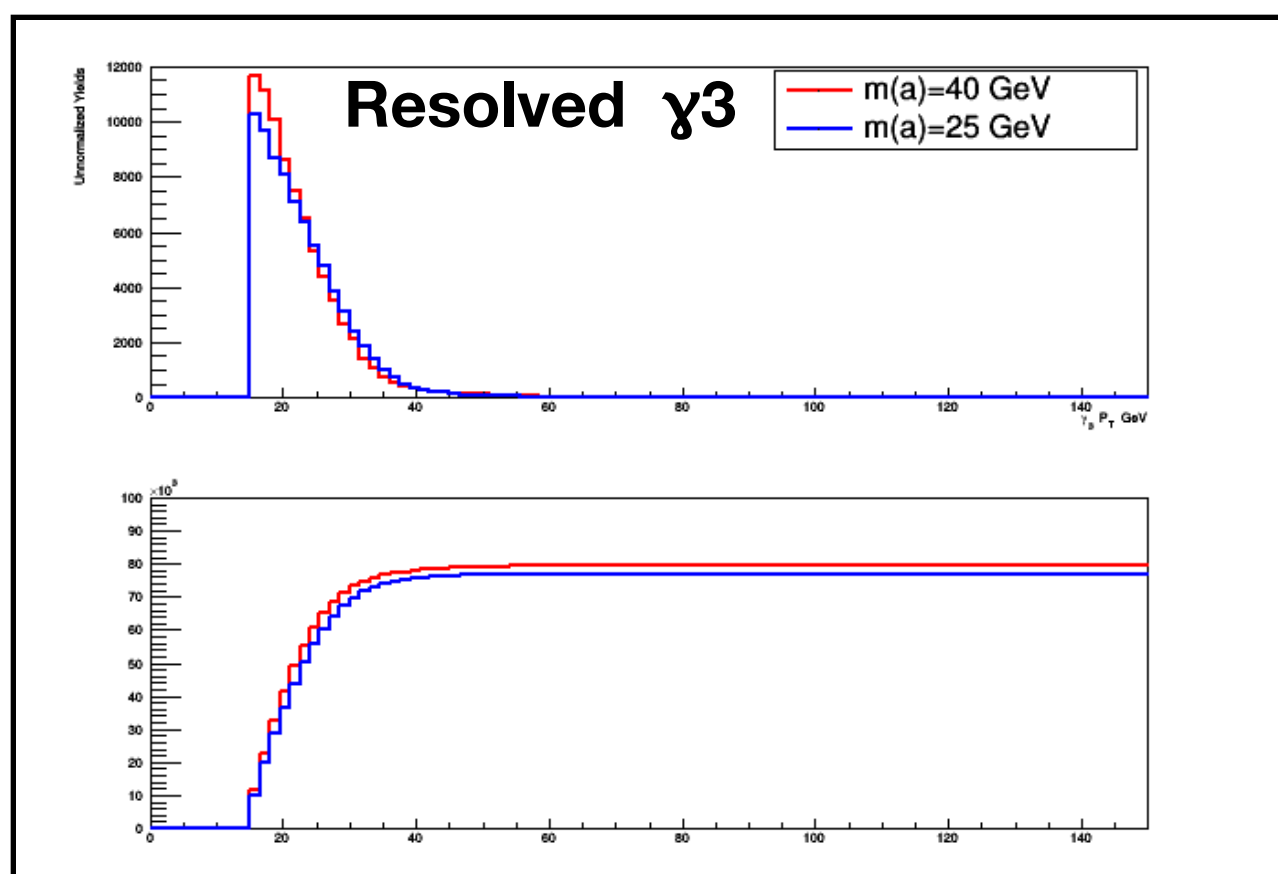
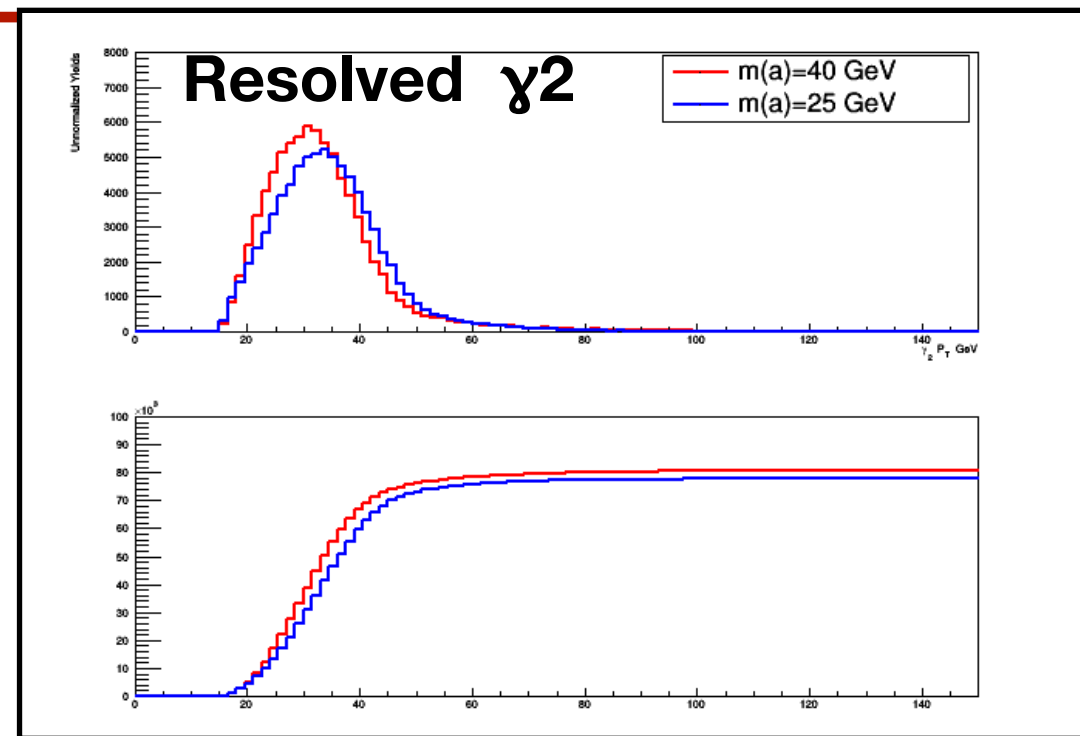
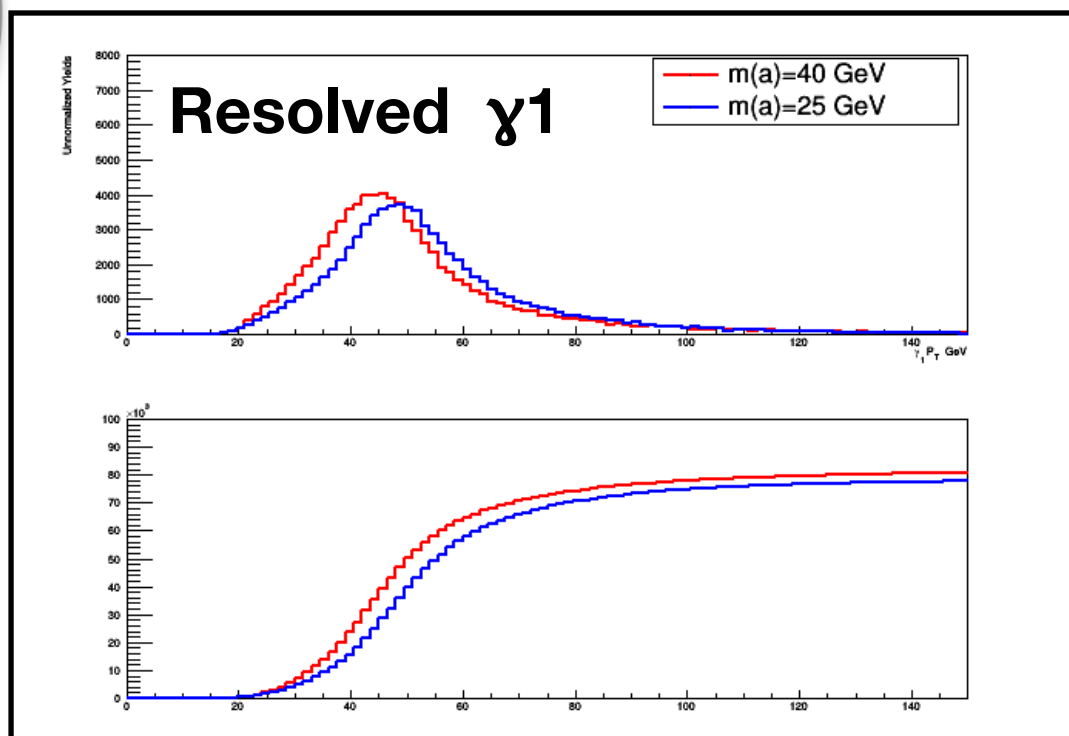
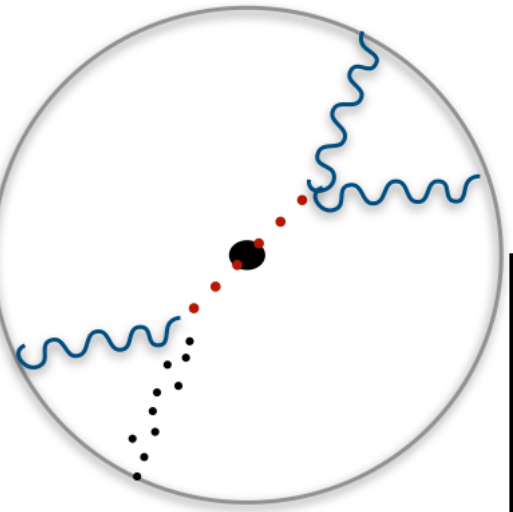
Gen level categorization



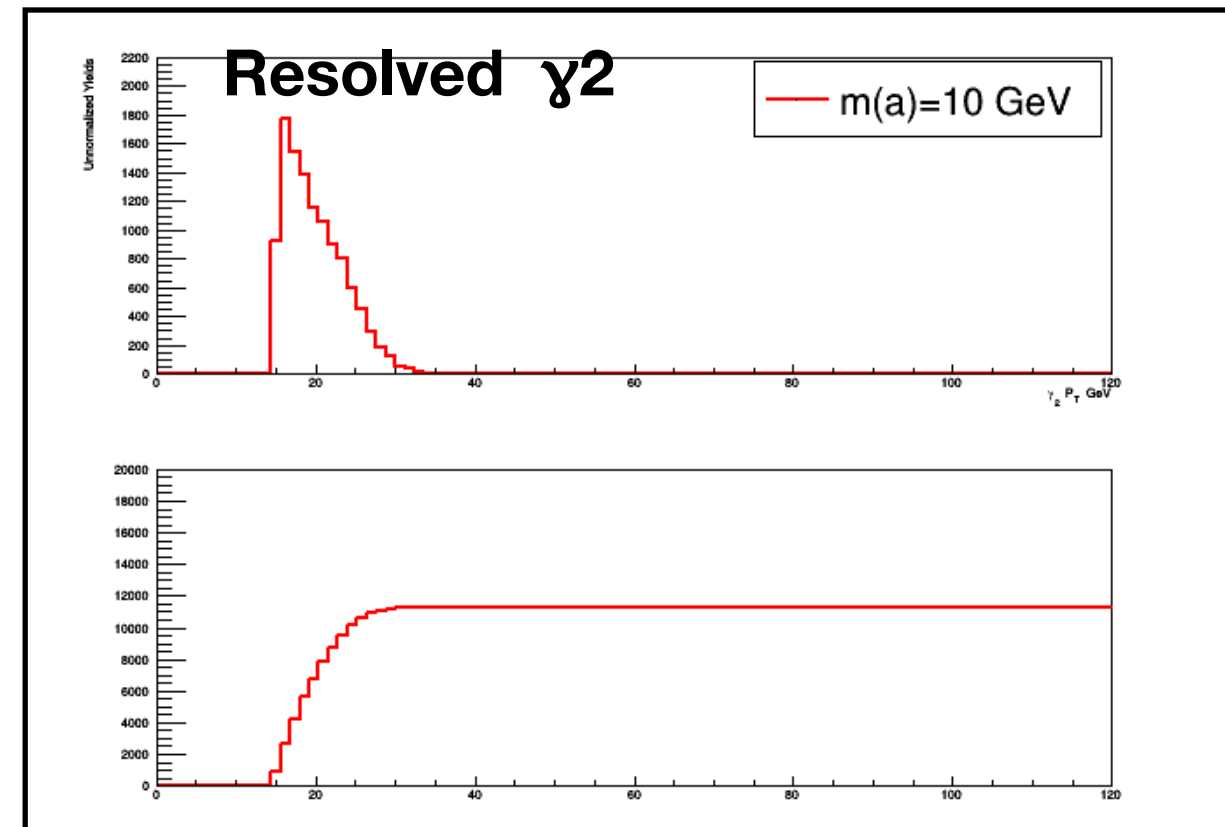
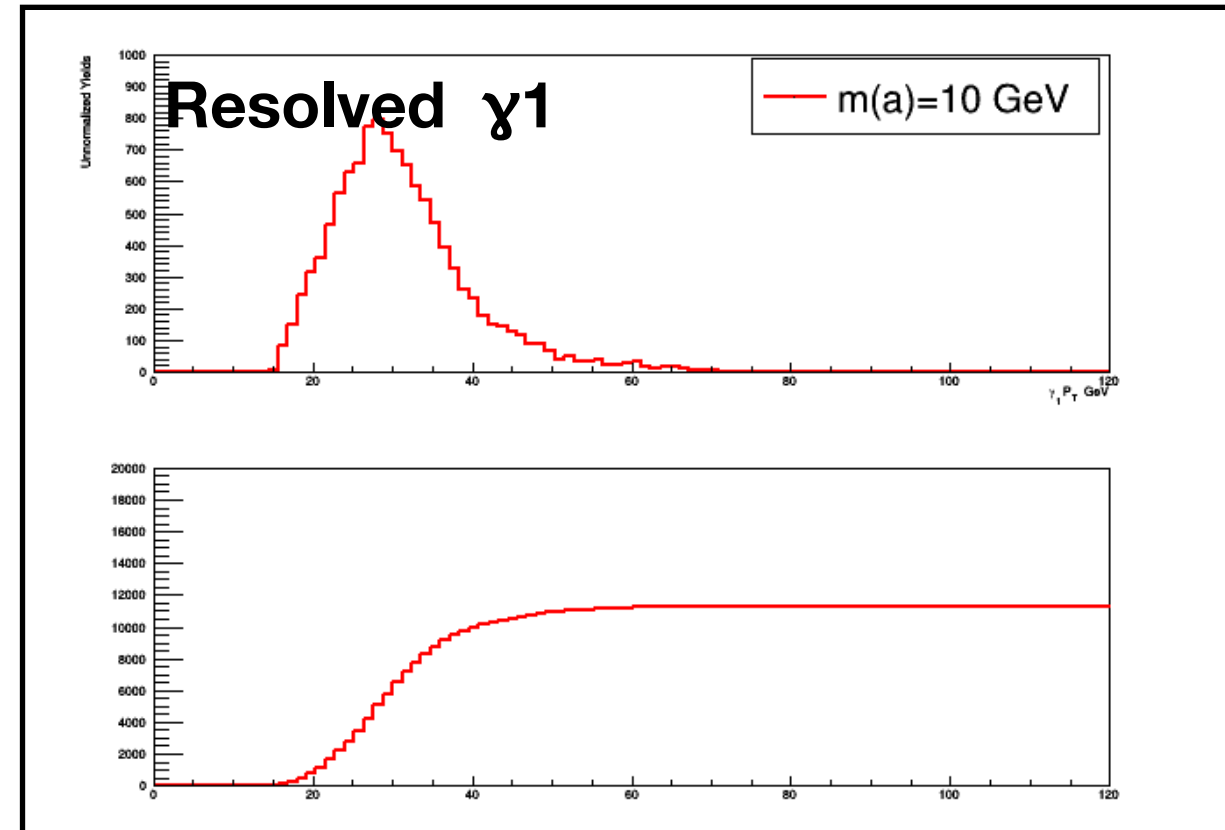
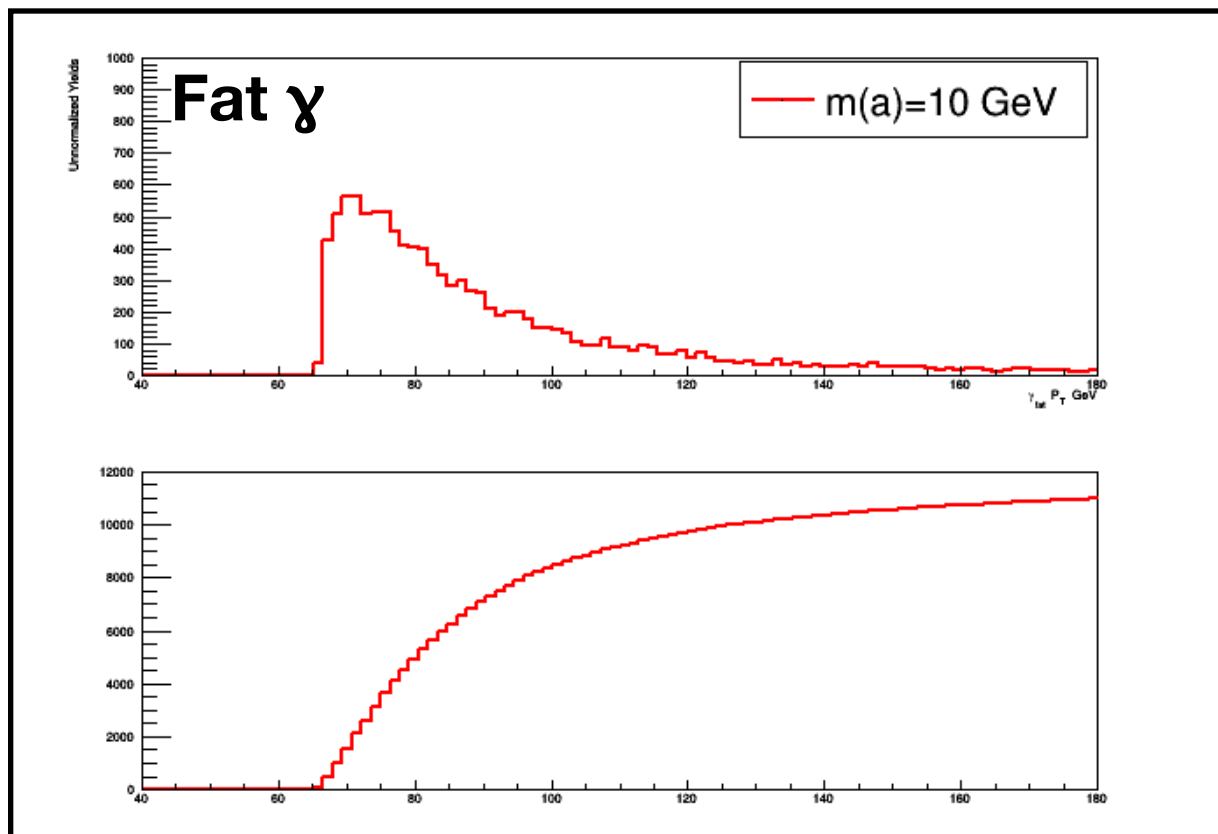
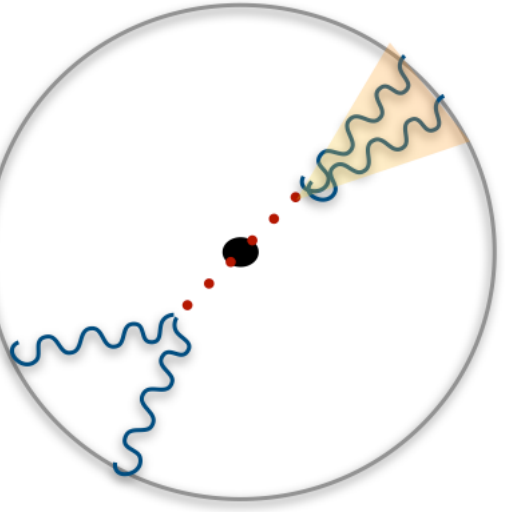
4 resolved photons

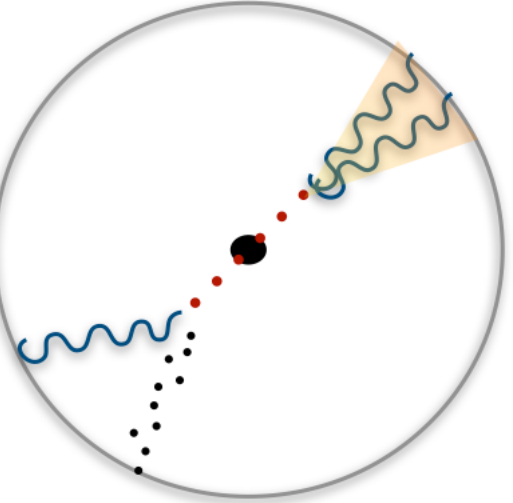


3 resolved + 1 missing photon

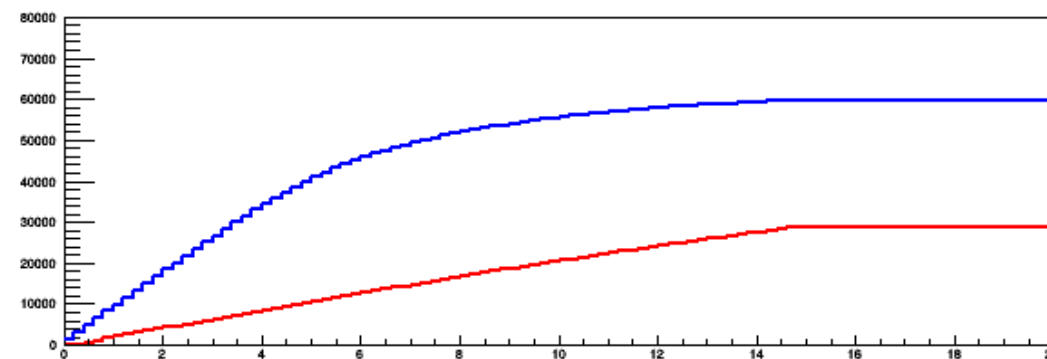
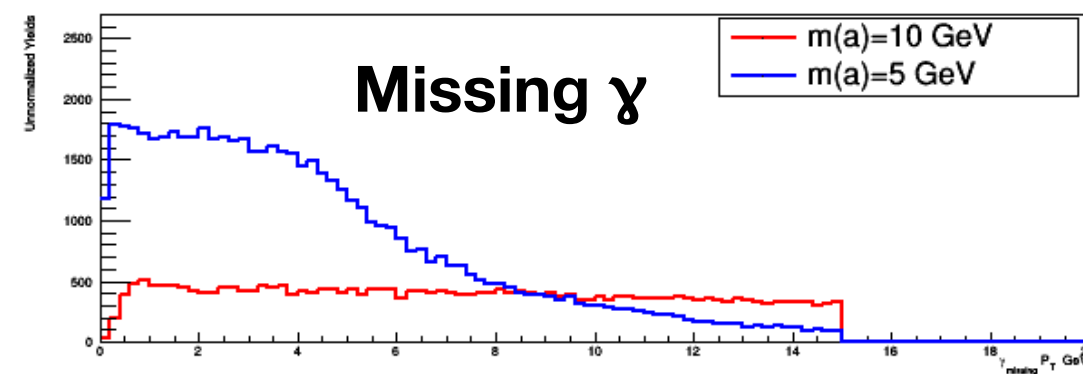
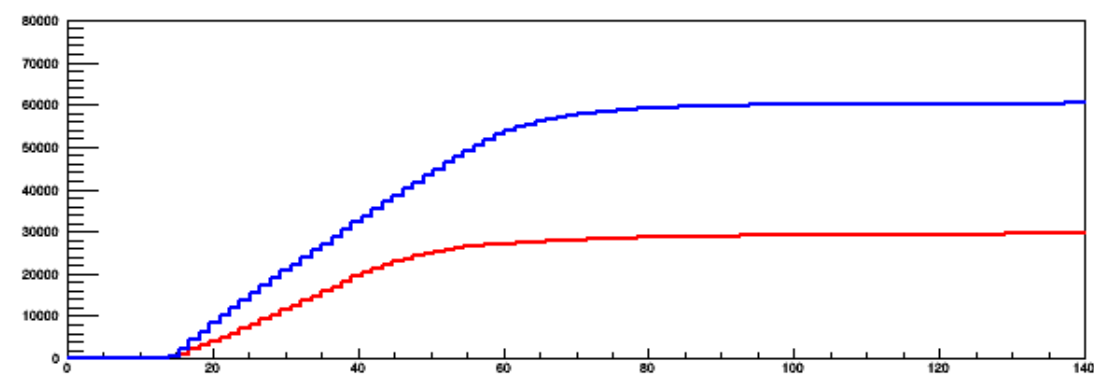
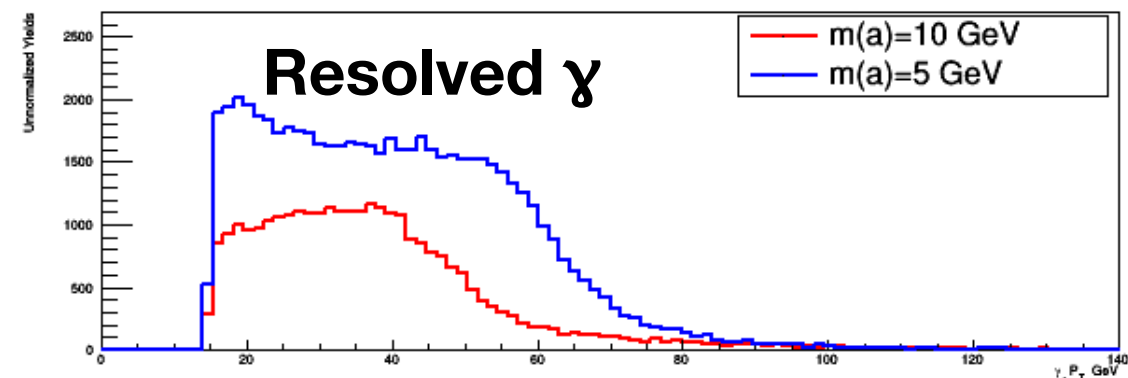
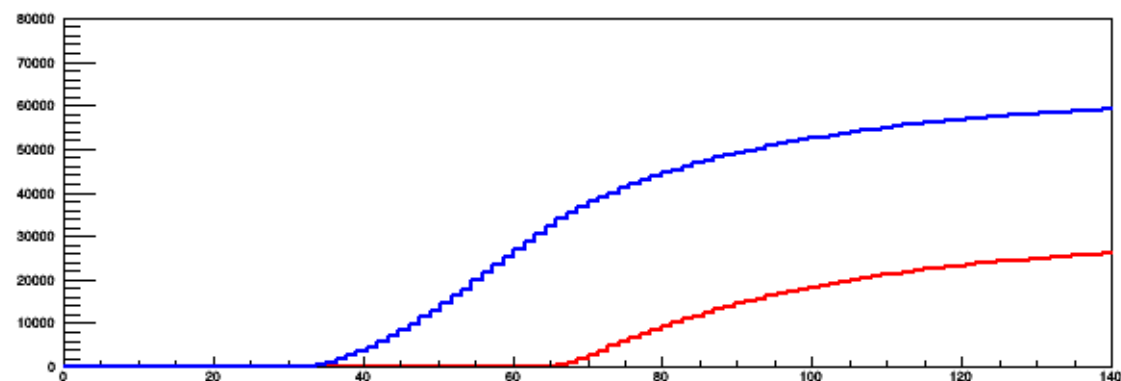
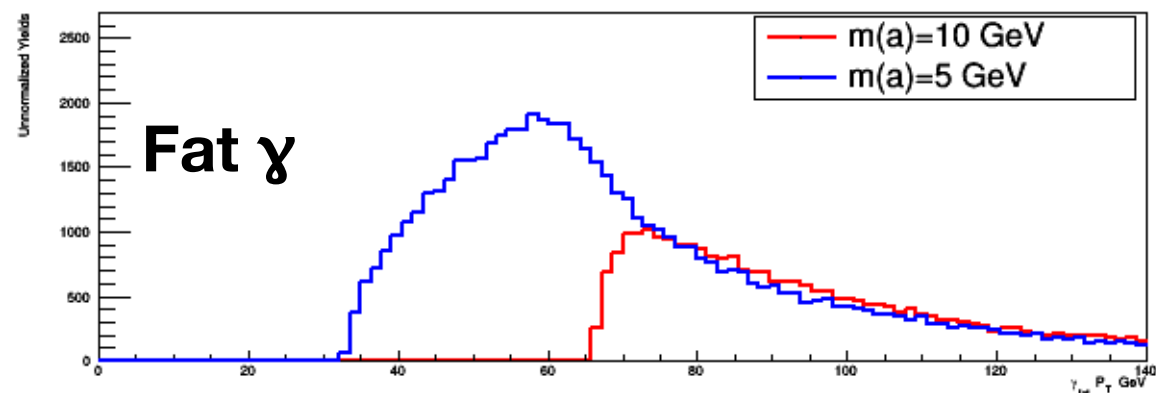


2 merged + 2 resolved photons

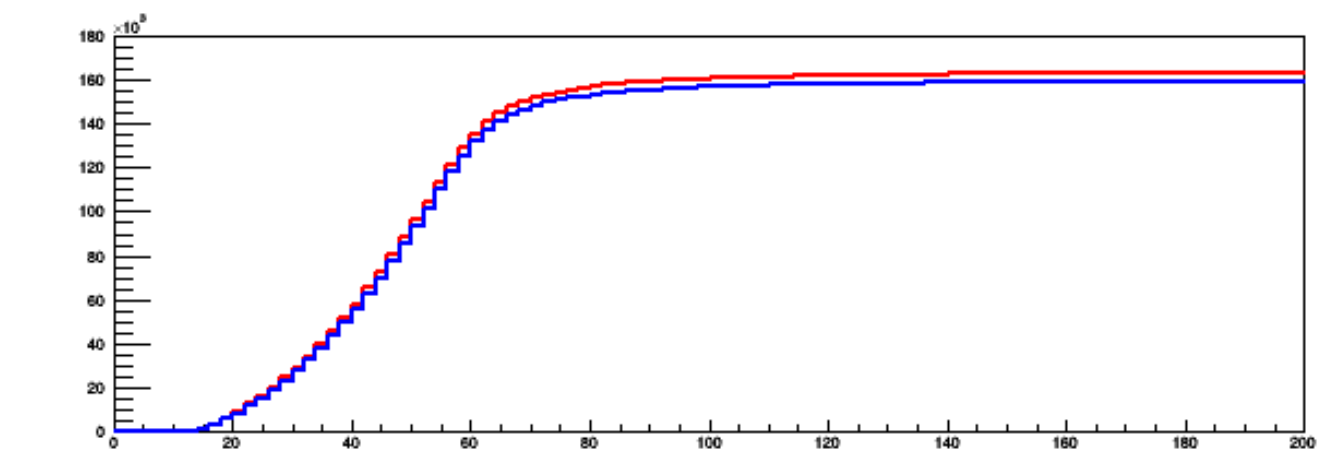
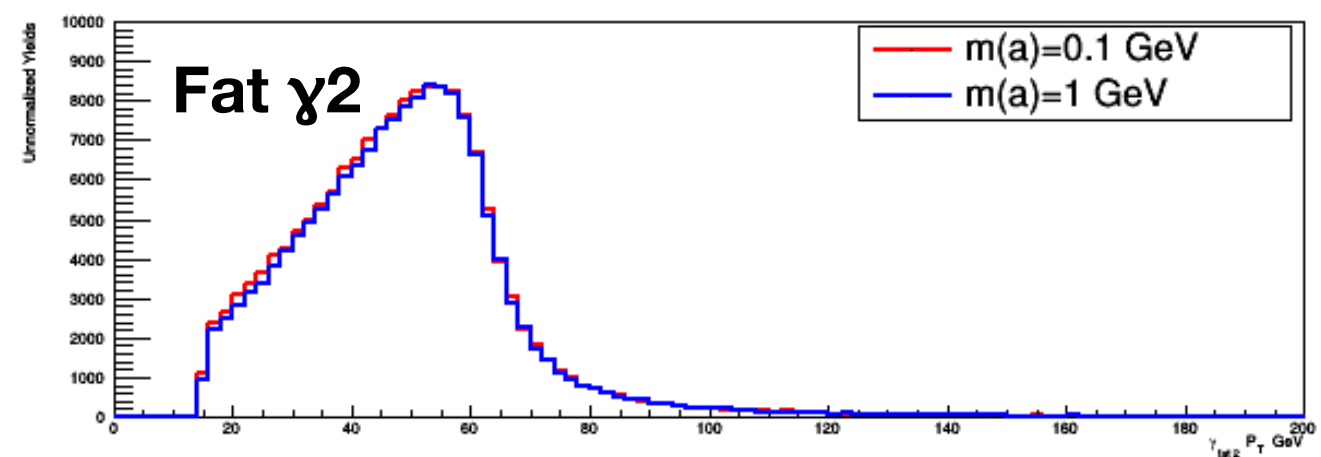
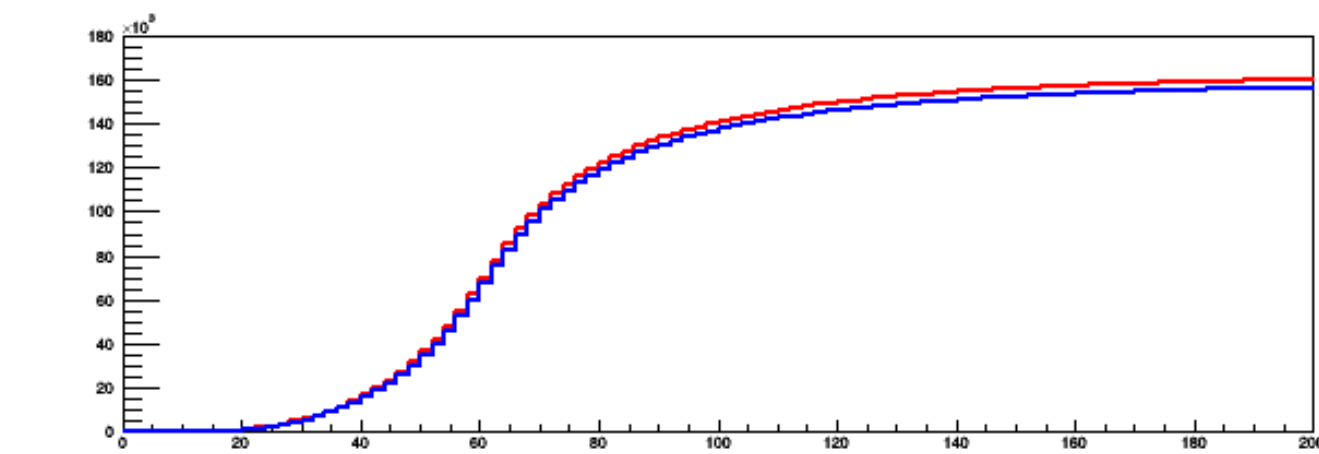
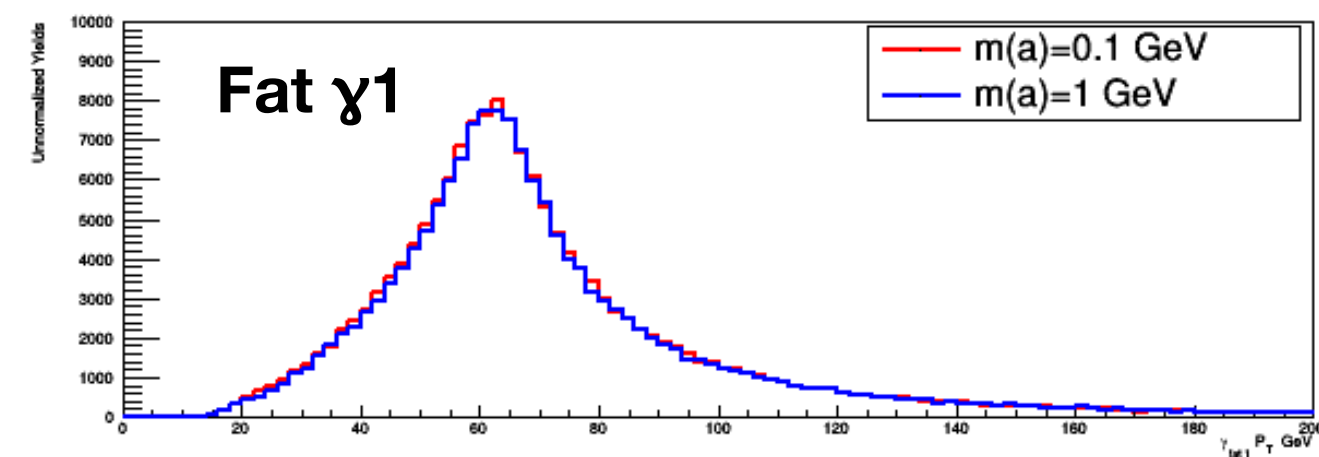
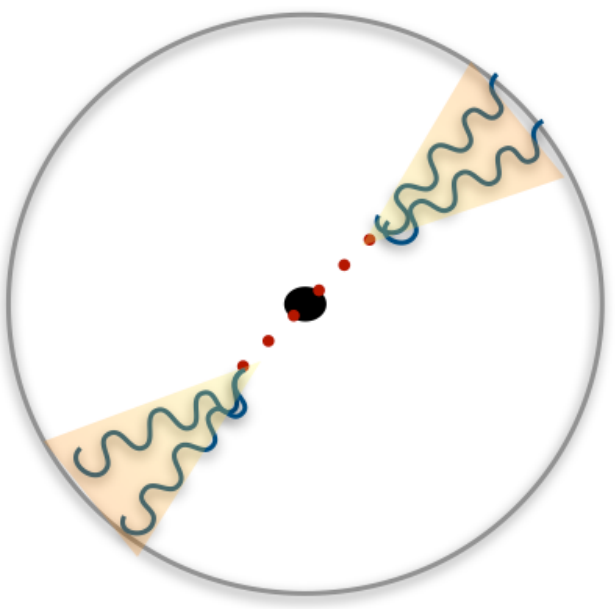




2 merged + 1 resolved + 1 missing

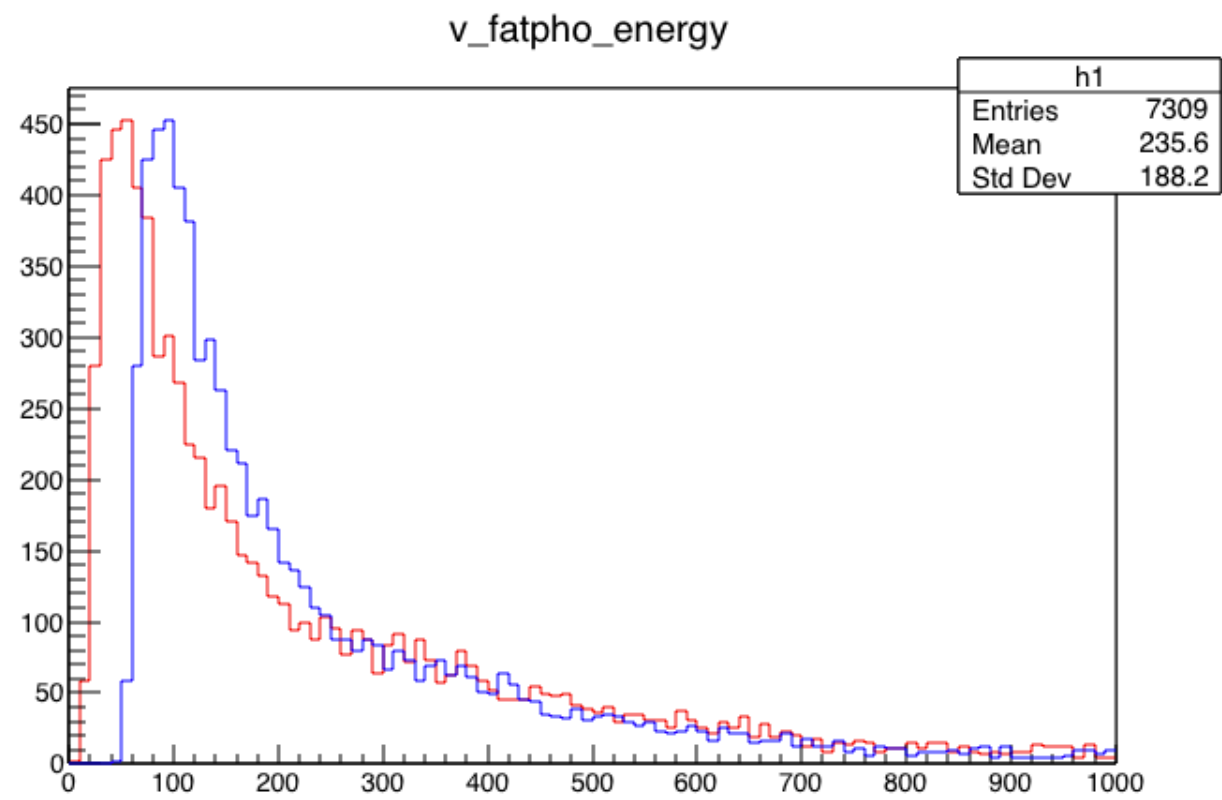


2 merged + 2 merged

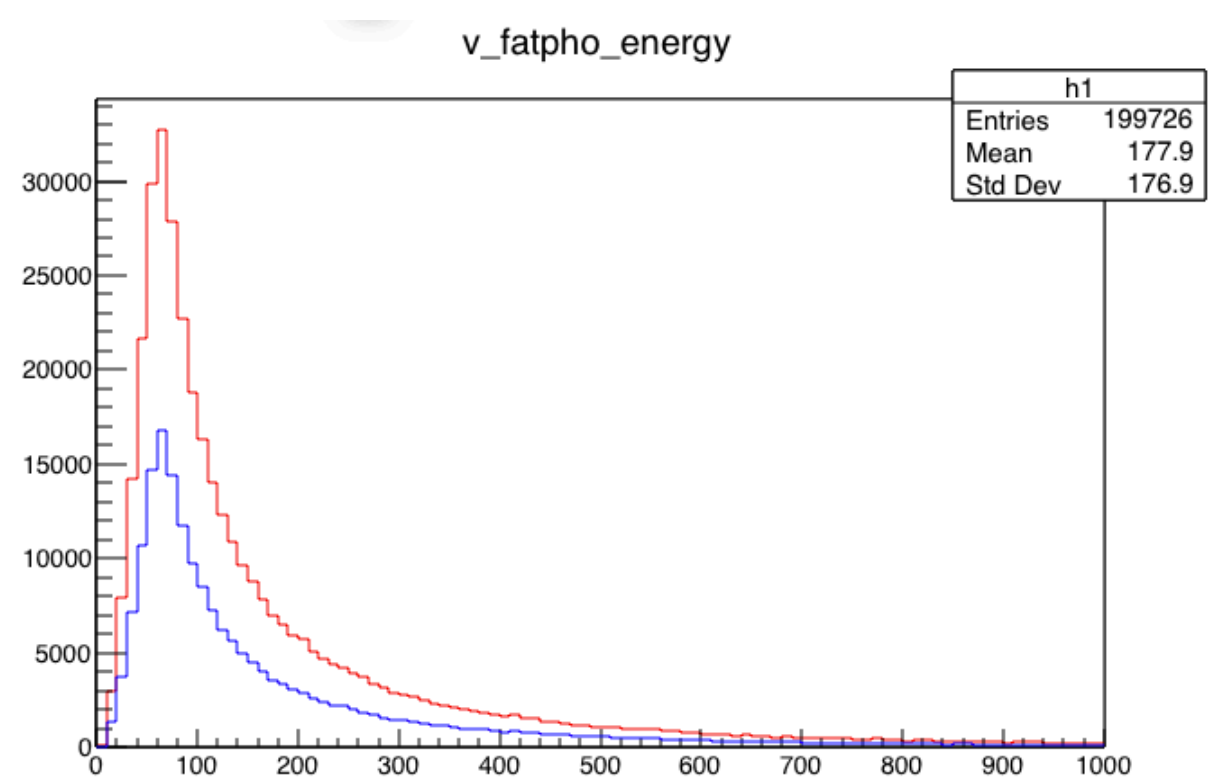


Identify a fat photon (2 men photons matched with a repo photon)
 Energy of Lorentz vector of fat photon + mass of “a”
Blue line : a mass added

40 geV

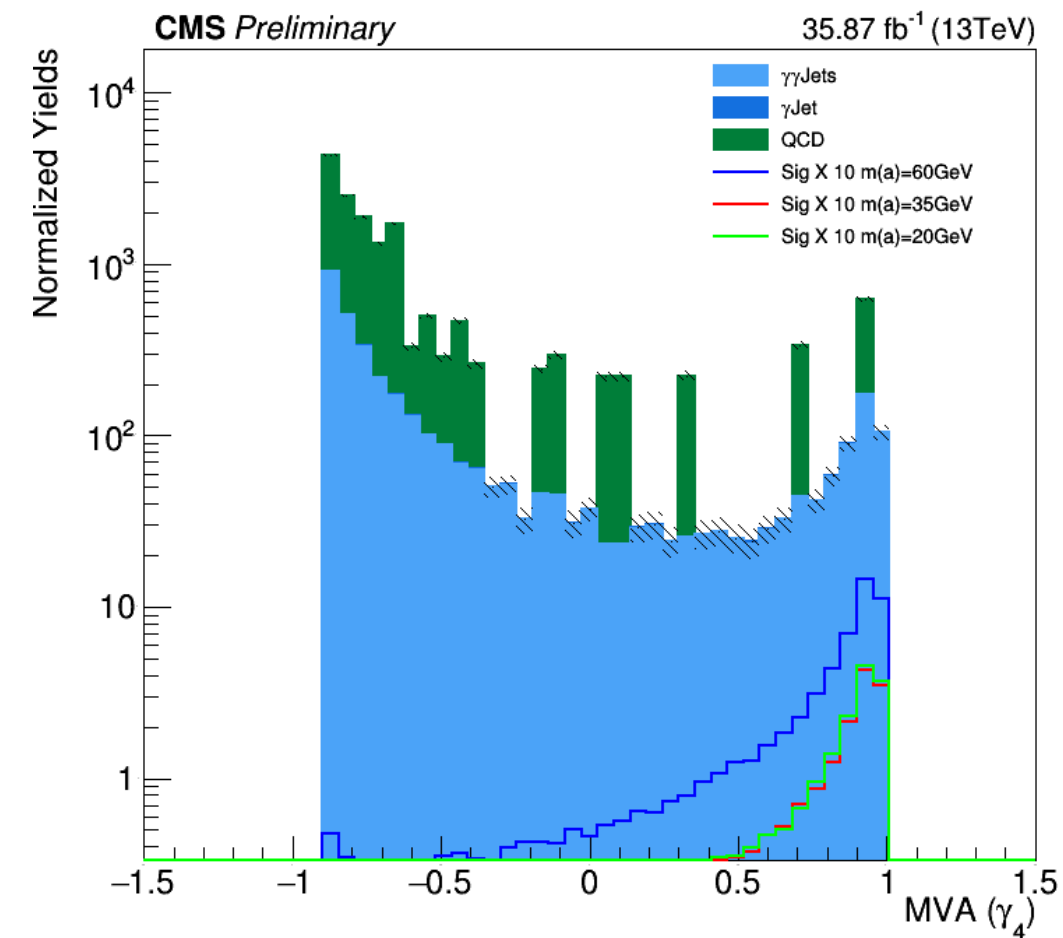
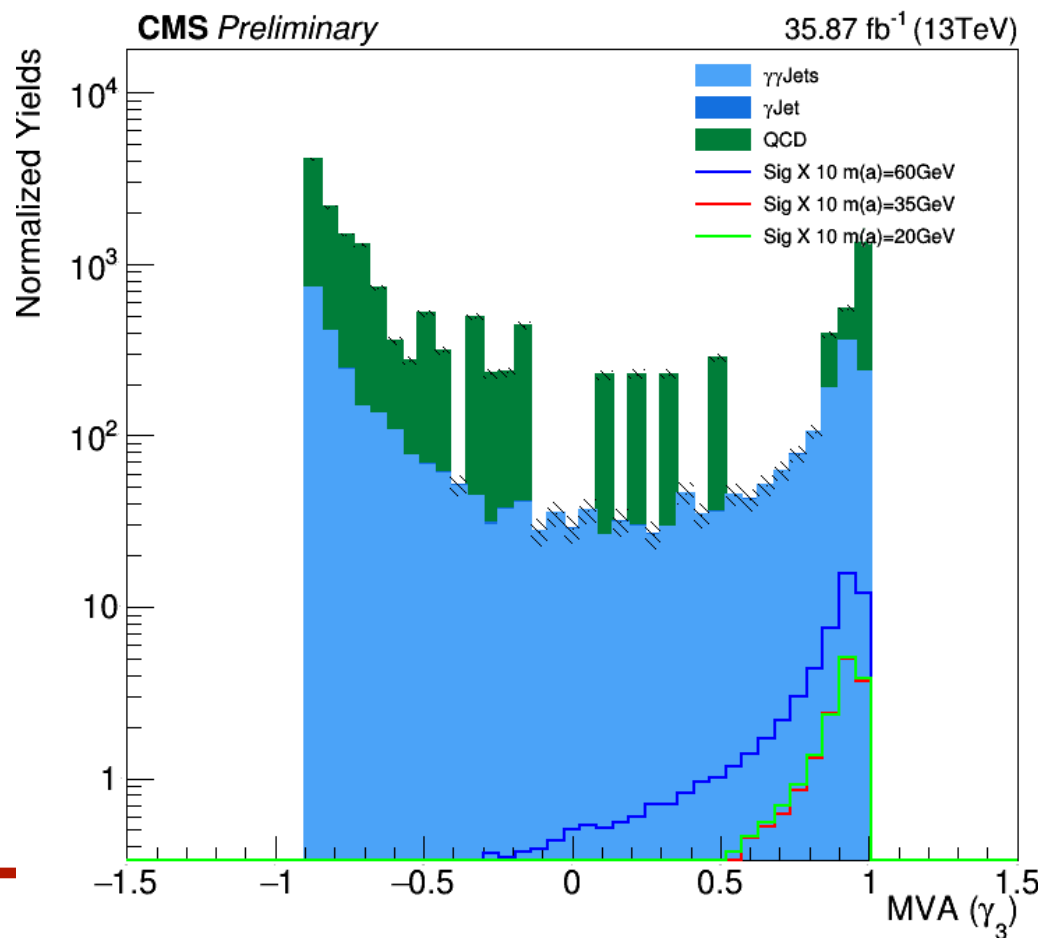
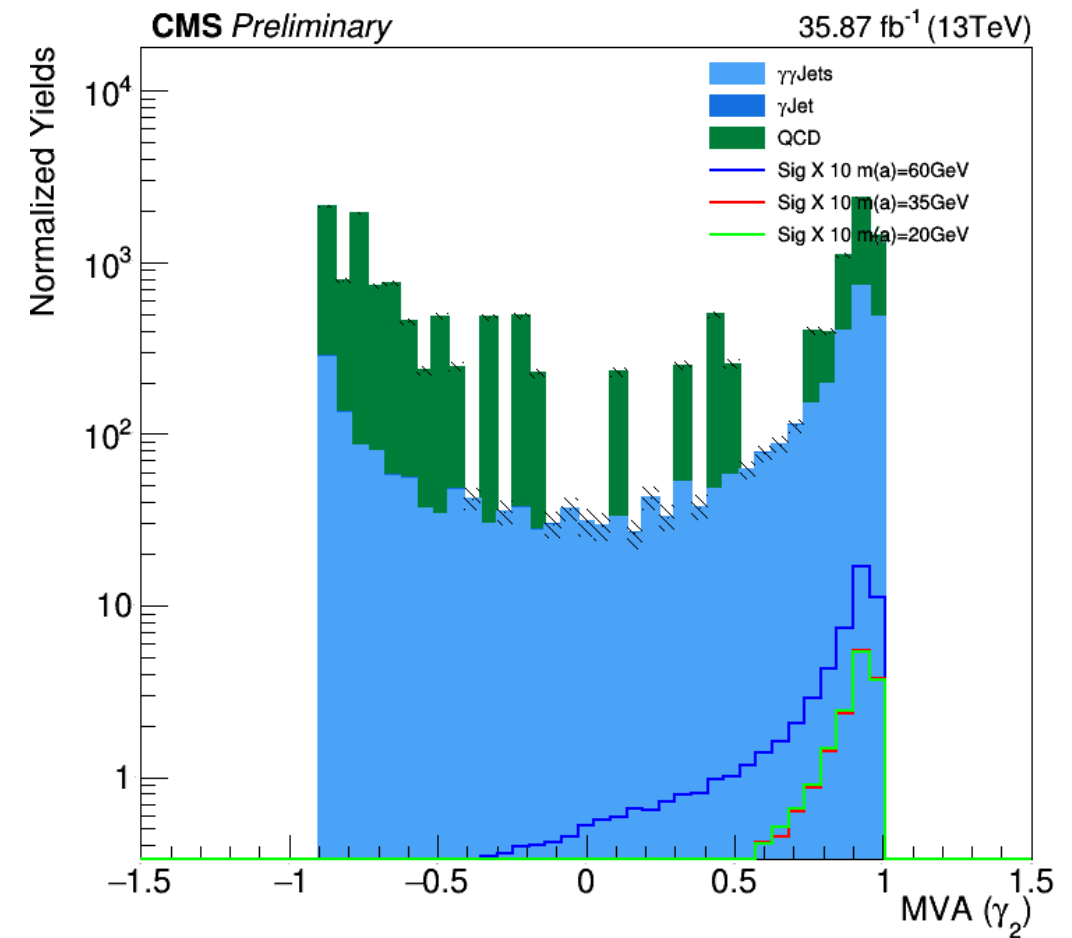
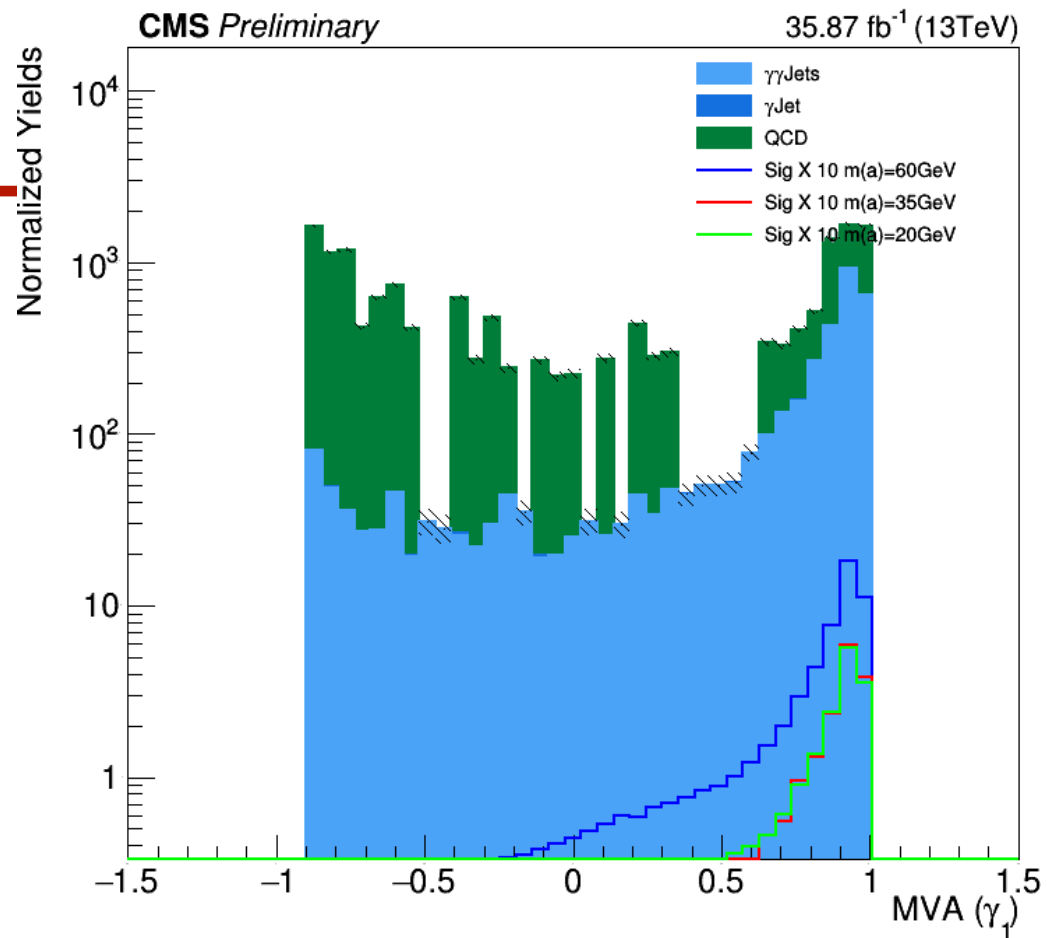


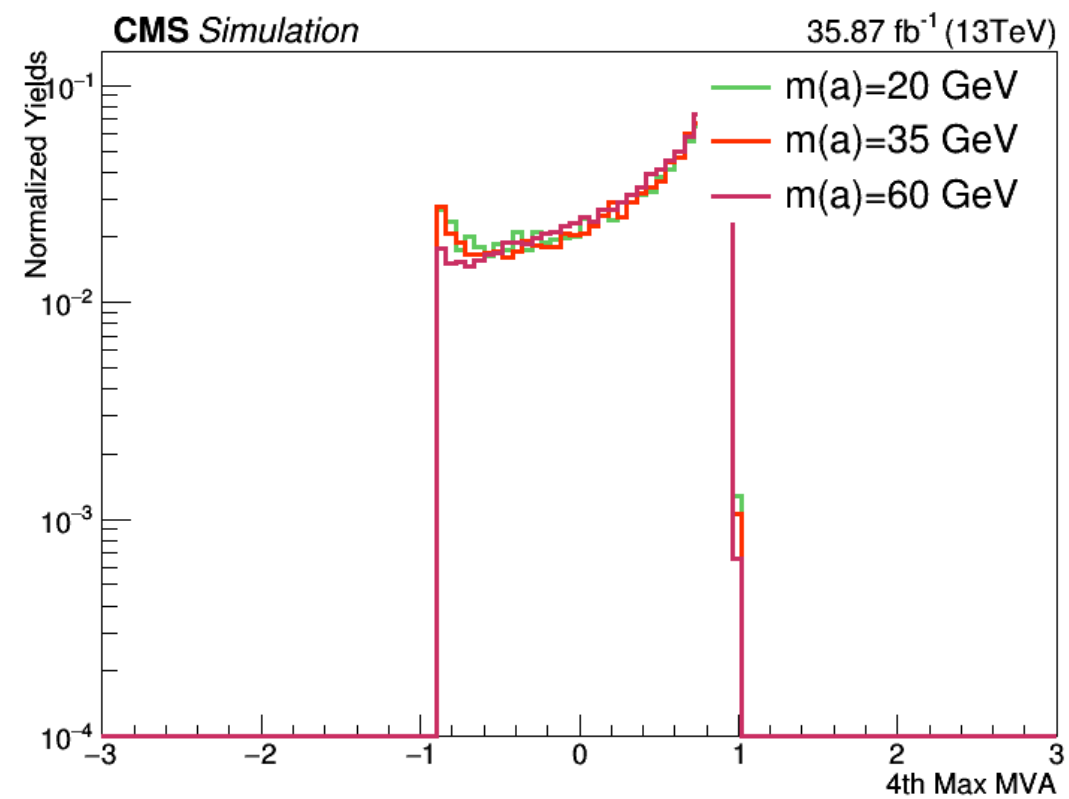
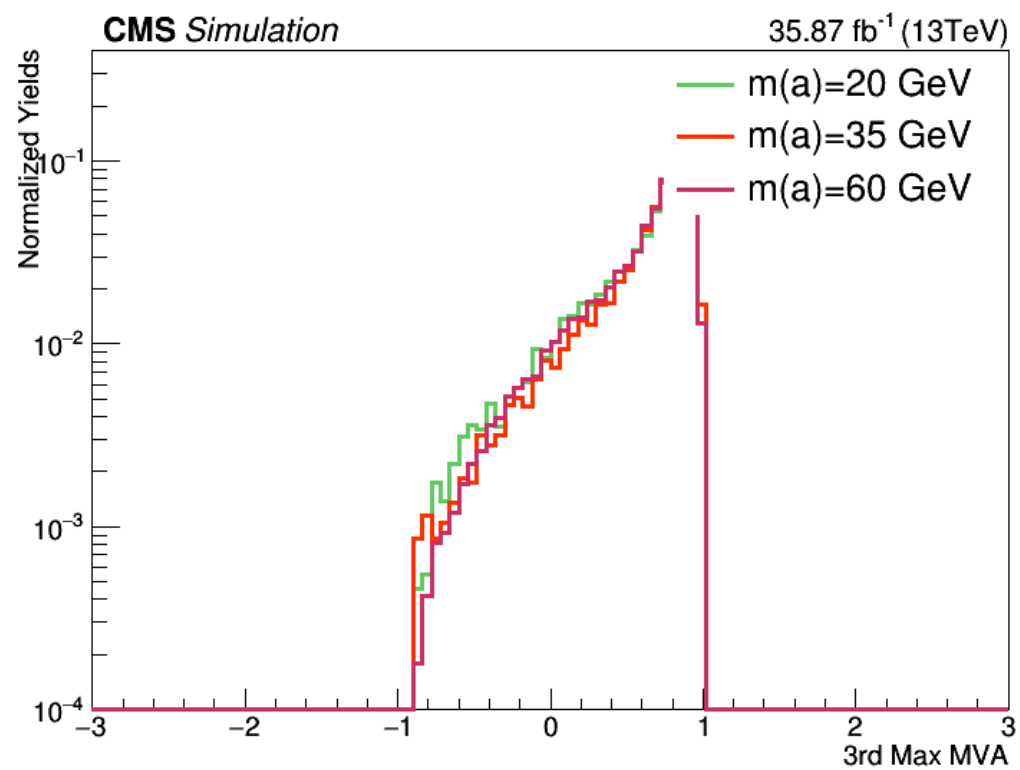
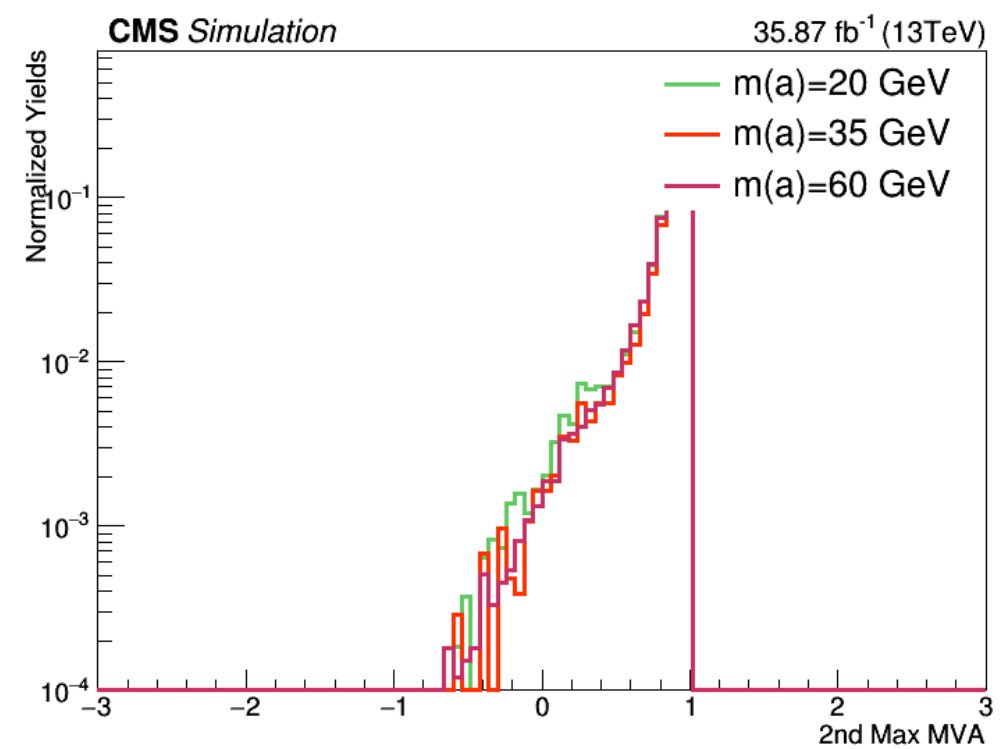
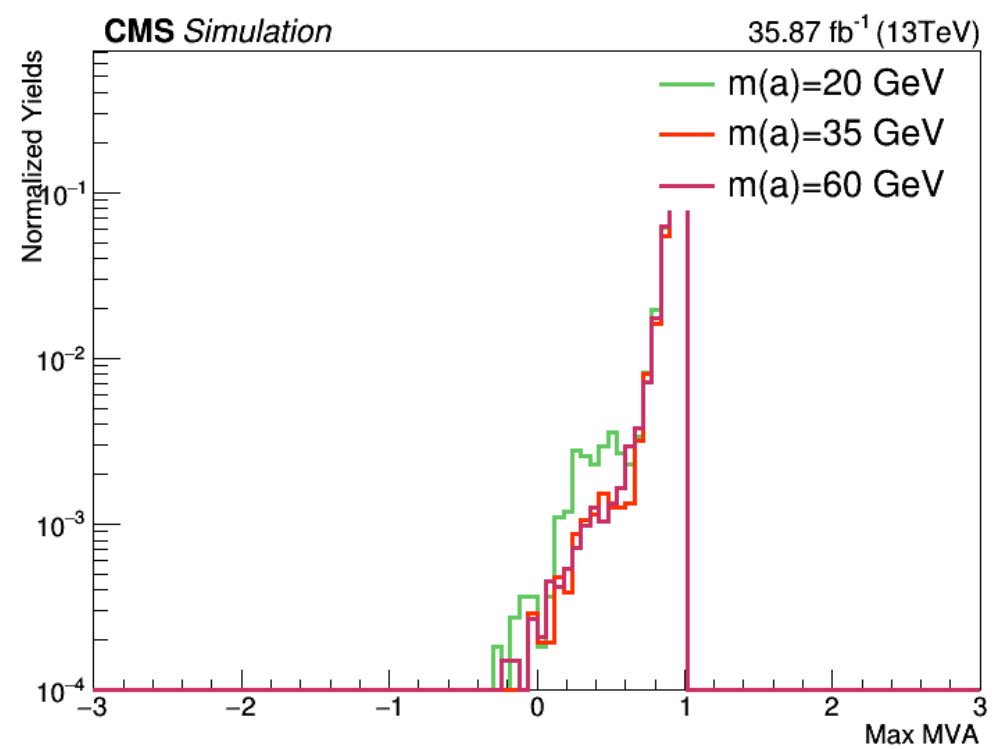
0.1 geV



γ Jets20toInf and γ Jets40toInf samples are missing here

(Problem with running the skimmer code — memory issue)





- The HLT paths we are using currently are the two low mass paths:

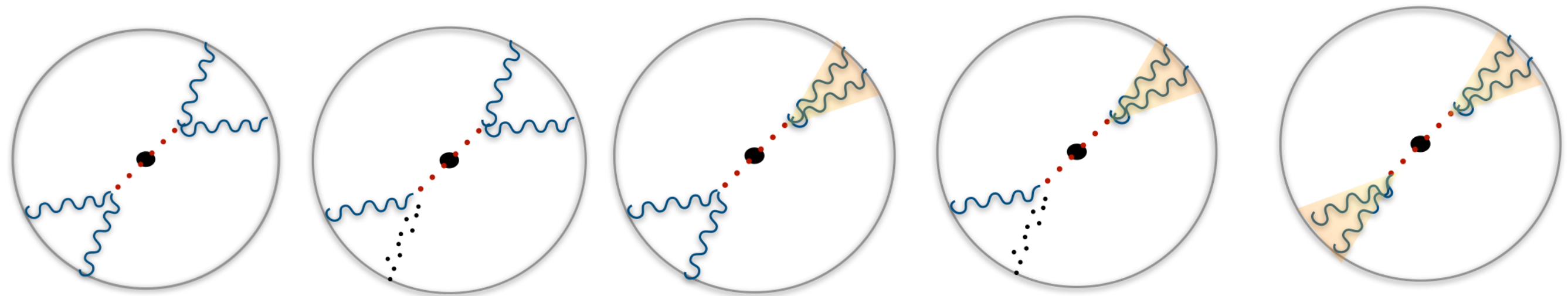
- **HLT_Diphoton30PV_18PV_R9Id_AND_IsoCalold_AND_HE10p0_R9Id_DoublePixelVeto_Mass55_v7**
- **HLT_Diphoton30EB_18EB_R9Id_OR_IsoCalold_AND_HE10p0_R9Id_DoublePixelVeto_Mass55_v7**

- The L1 seeds are:
- An OR of these L1 seeds is applied

L1_SingleEG30	L1_SingleIsoEG28
L1_SingleEG32	L1_SingleIsoEG30
L1_SingleEG34	L1_SingleIsoEG32
L1_SingleEG36	L1_SingleIsoEG34
L1_SingleEG38	L1_SingleIsoEG36
L1_SingleEG40	L1_DoubleEG_15_10
L1_SingleIsoEG22er	L1_DoubleEG_18_17
L1_SingleIsoEG24er	L1_DoubleEG_20_18
L1_SingleIsoEG26er	L1_DoubleEG_22_10
L1_SingleIsoEG28er	L1_DoubleEG_22_12
L1_SingleIsoEG30er	L1_DoubleEG_22_15
L1_SingleIsoEG32er	L1_DoubleEG_23_10
L1_SingleIsoEG34er	L1_DoubleEG_24_17
L1_SingleIsoEG24	L1_DoubleEG_25_12
L1_SingleIsoEG26	

Gen level study

- The different categories @ gen level
- Solid lines - photons with $P_t > 15$ GeV (resolved photons)
- Dotted lines - photons with $P_t < 15$ GeV (missing photon)
- Lines that are close together - photons with $\Delta R < 0.3$ (merged photons)



Case1:
4 resolved
photons

Case2:
3 resolved
+1 missing
photon

Case3:
2 merged + 2
resolved
photons

Case4:
2 merged + 1
resolved + 1
missing

Case5:
2 merged
+ 2
merged
photons

- Events that don't fall into any of these 5 categories (e.g: 2 photons are out of pt acceptance) are categorized into "others"