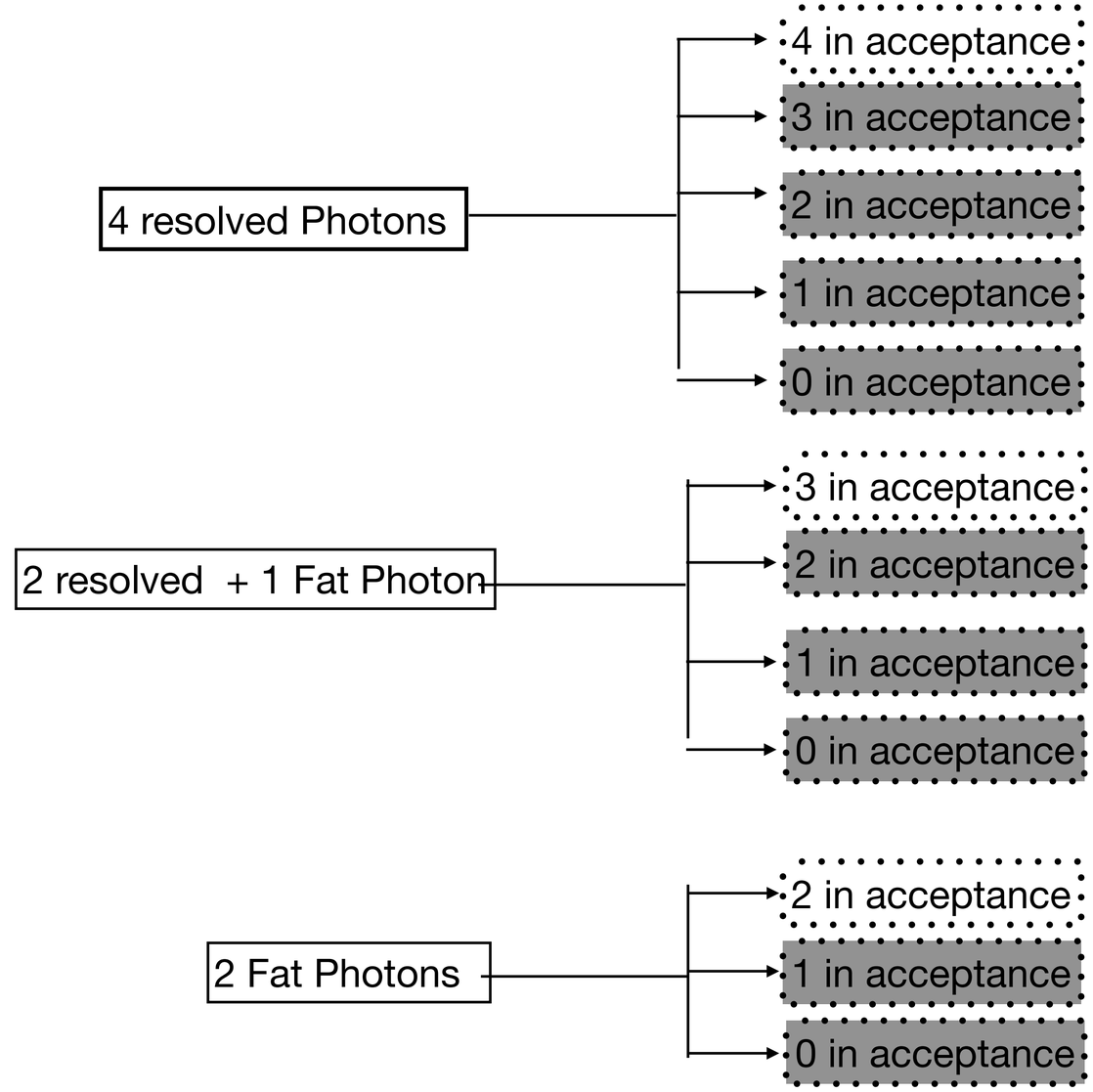
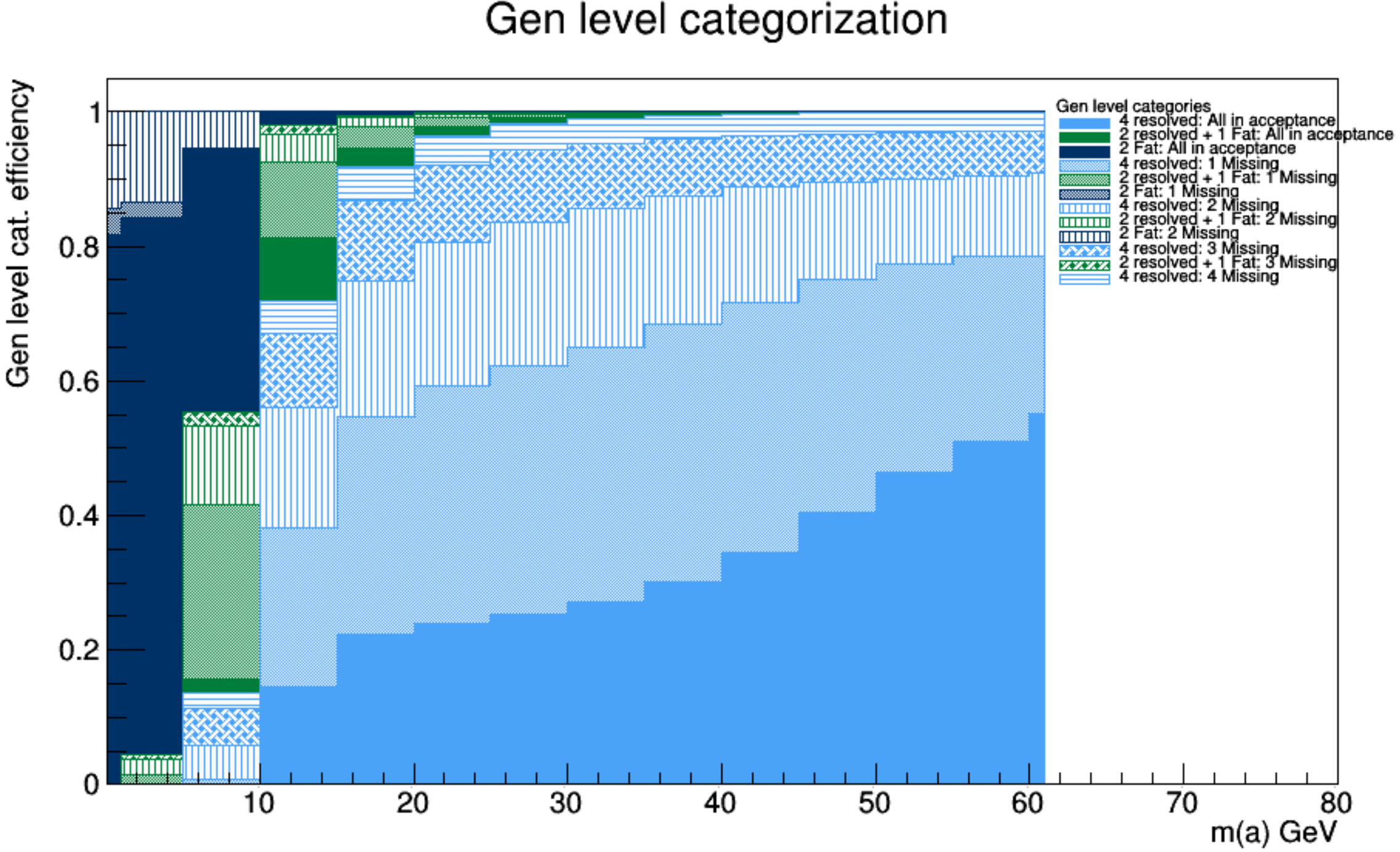
Gen Categorization Process

- Start with 4 photons
- Identify the two photons coming from the same “a”
- Calculate deltaR b/w those 2 photons
- If 0 photon pairs w/ deltaR < 0.3 -> **4 resolved**
- If 1 photon pair w/ deltaR < 0.3 -> **2 resolved + 1 fat**
- If 2 photon pairs w/ deltaR < 0.3 -> **2 fat**

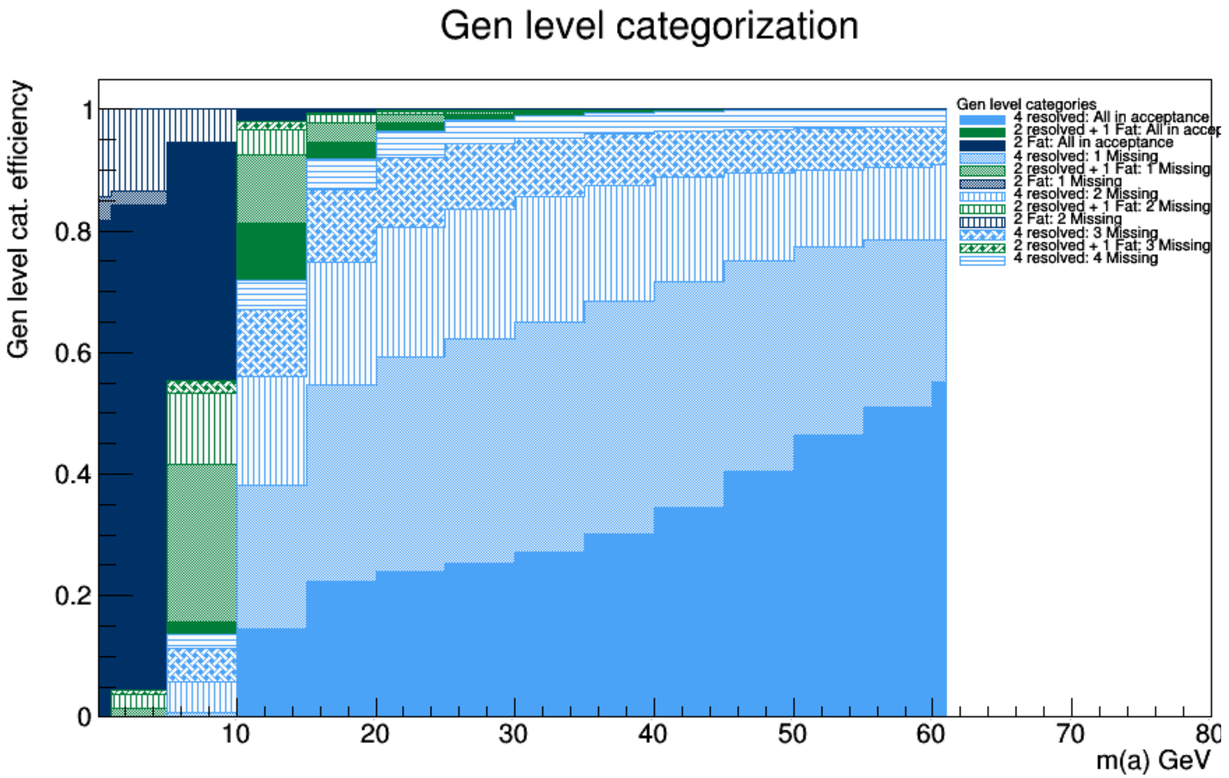


Can be classified as Others

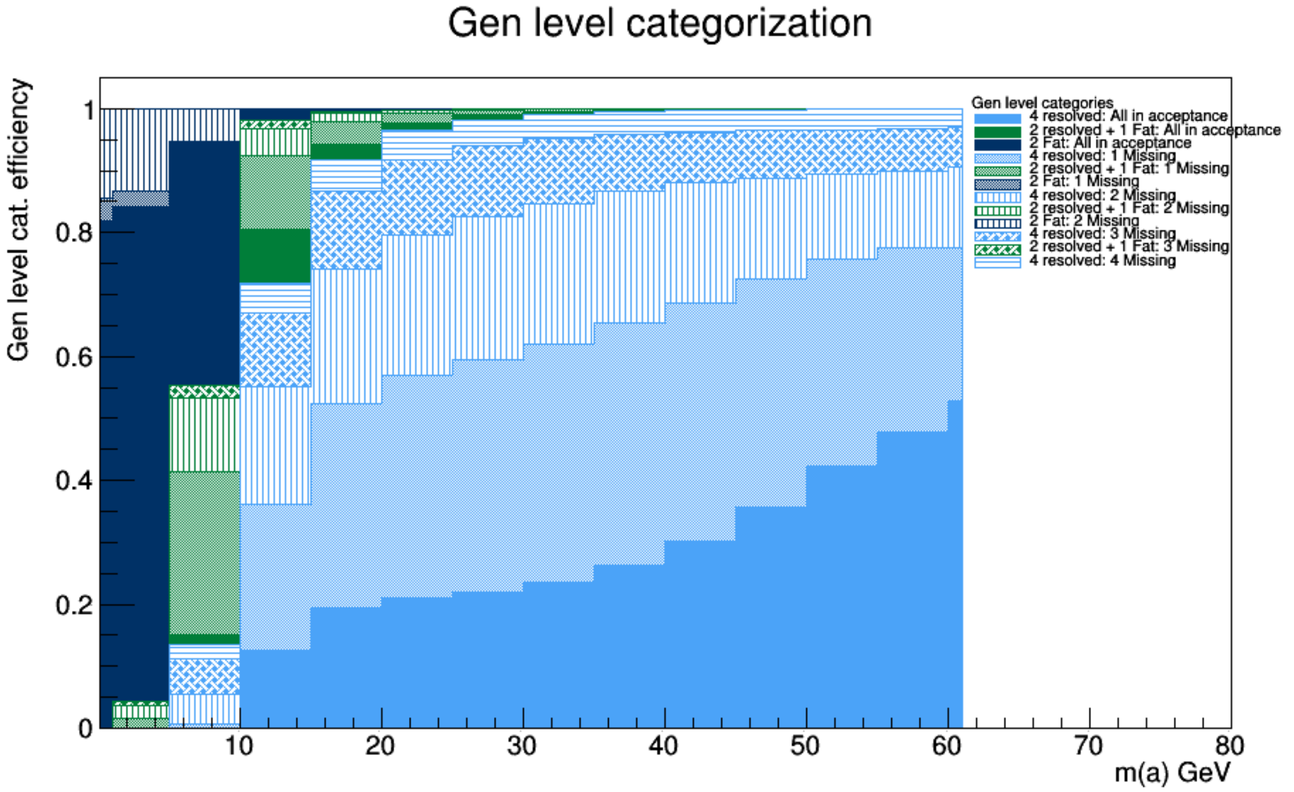

Gen level categorization
Gen level cat. efficiency
m(a) GeV
Gen level categories
4 resolved: All in acceptance
2 resolved + 1 Fat: All in acceptance
2 Fat: All in acceptance
4 resolved: 1 Missing
2 resolved + 1 Fat: 1 Missing
2 Fat: 1 Missing
4 resolved: 2 Missing
2 resolved + 1 Fat: 2 Missing
2 Fat: 2 Missing
4 resolved: 3 Missing
2 resolved + 1 Fat: 3 Missing
4 resolved: 4 Missing

- Eta acceptance — all ɣ's must have |η| < 2.5 (because photons need to be in ECAL region)
- Pt acceptance — ɣ Pt> 15 , this pt threshold can be lowered for ɣ3 and ɣ4
- Produce 6 different efficiency plots by changing the pt cut on ɣ3 and ɣ4 from 10 to 15 GeV (in steps of 1 GeV)

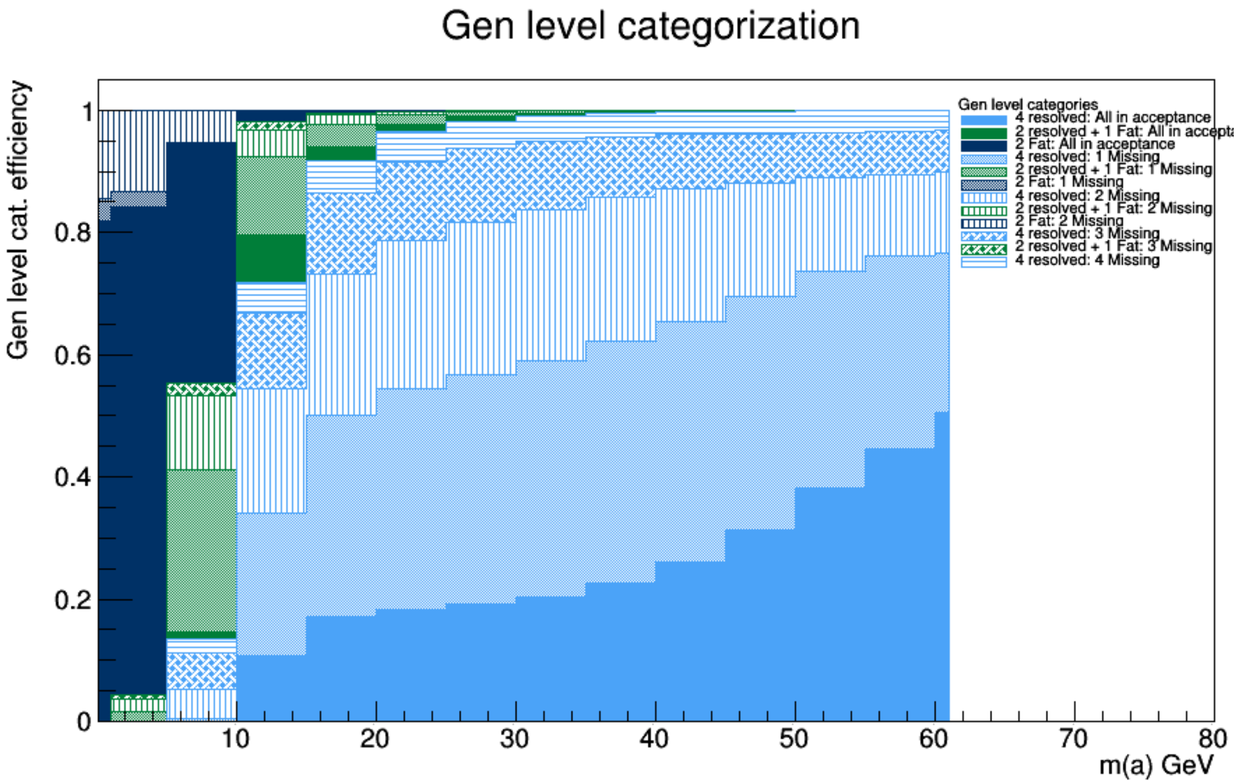
10 GeV cut



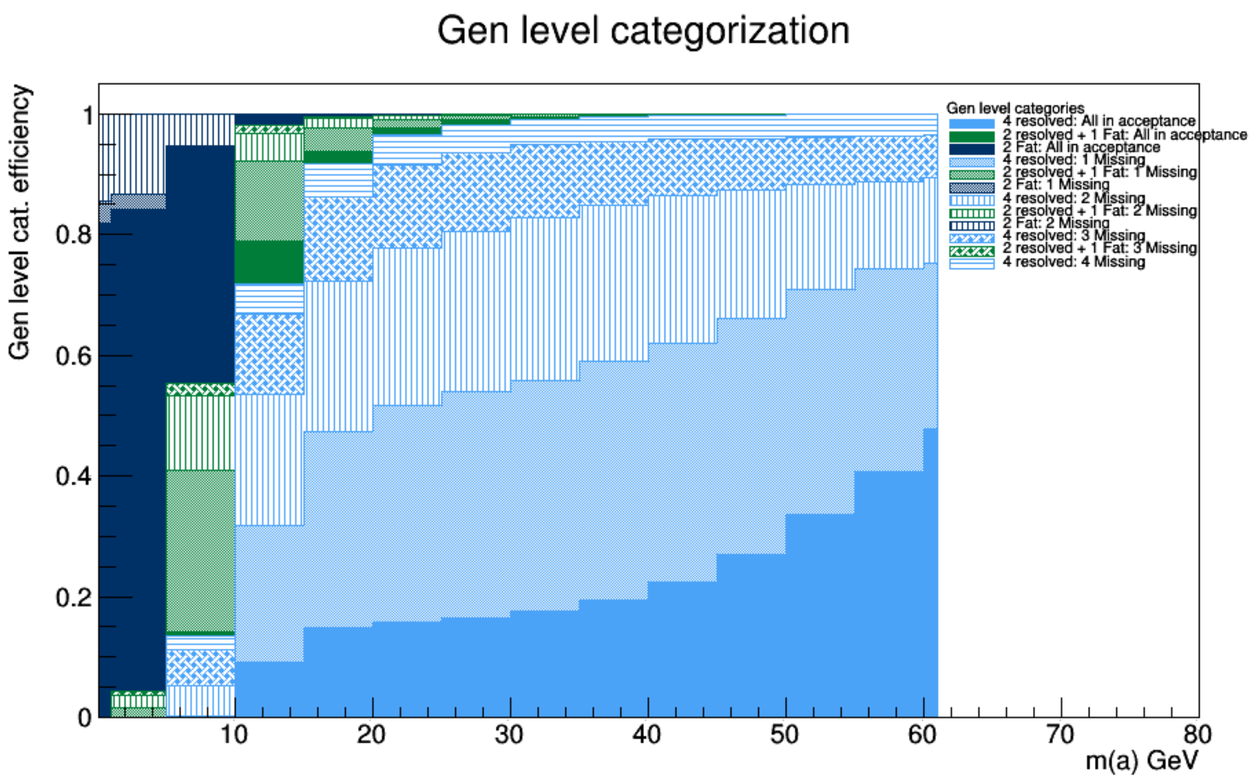
11GeV cut



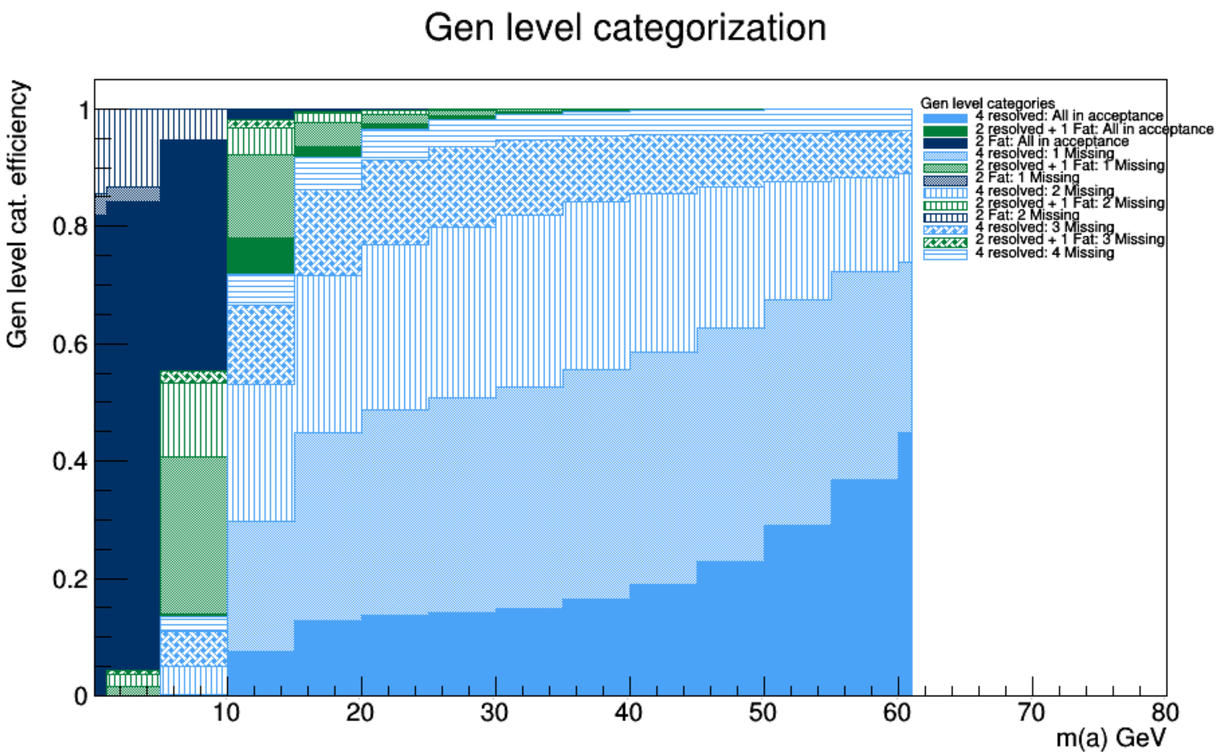
12 GeV cut



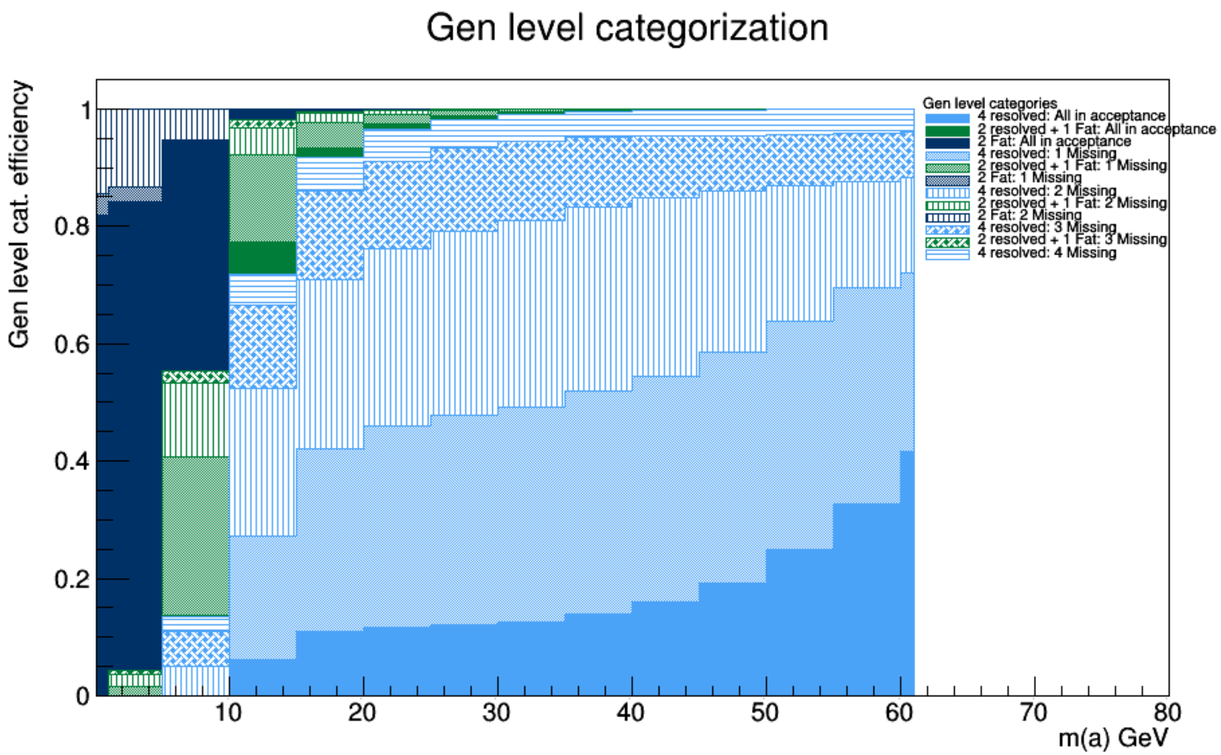
13 GeV cut



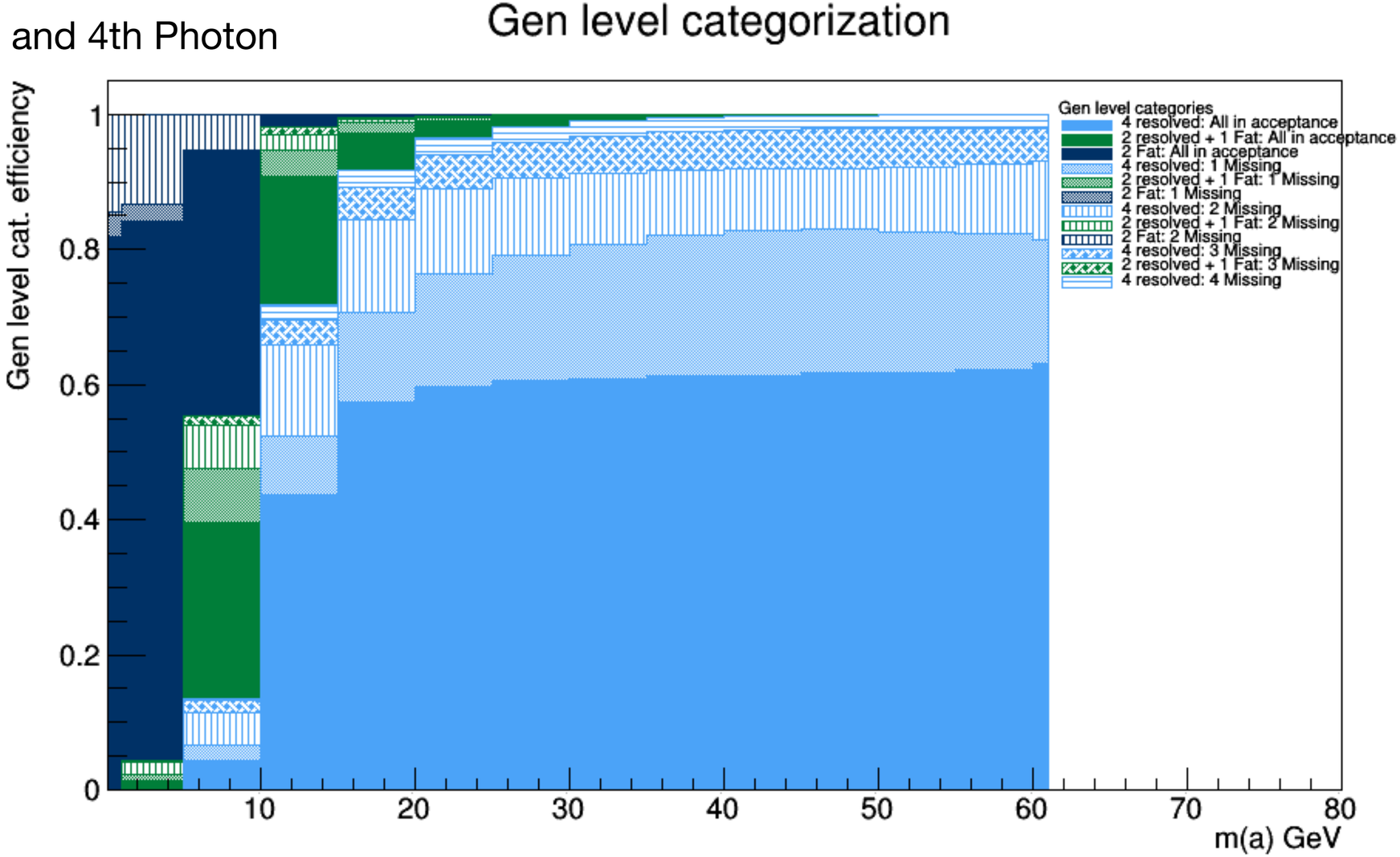
14 GeV cut



15 GeV cut

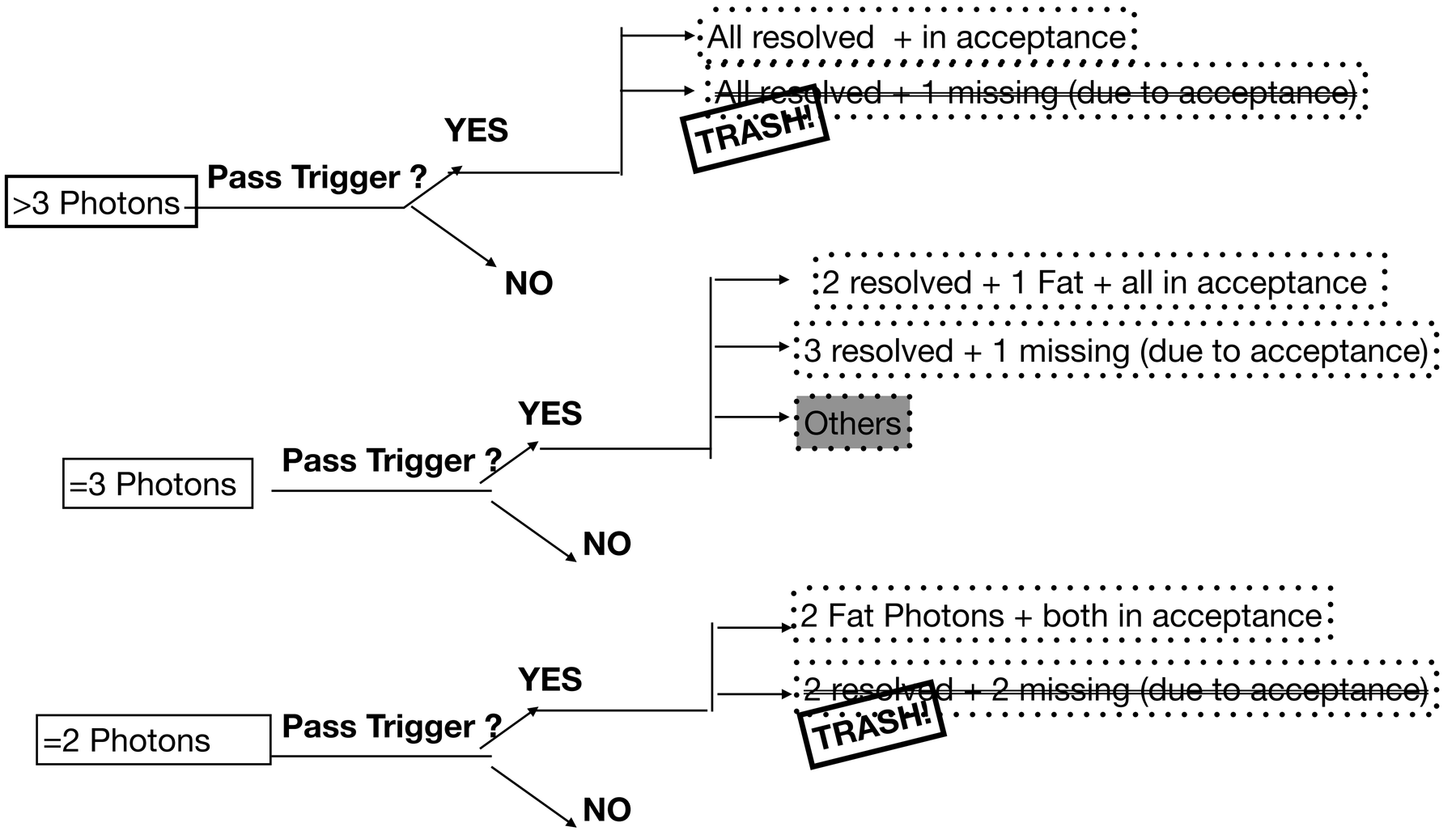


Check : remove Pt cut on the 3rd and 4th Photon

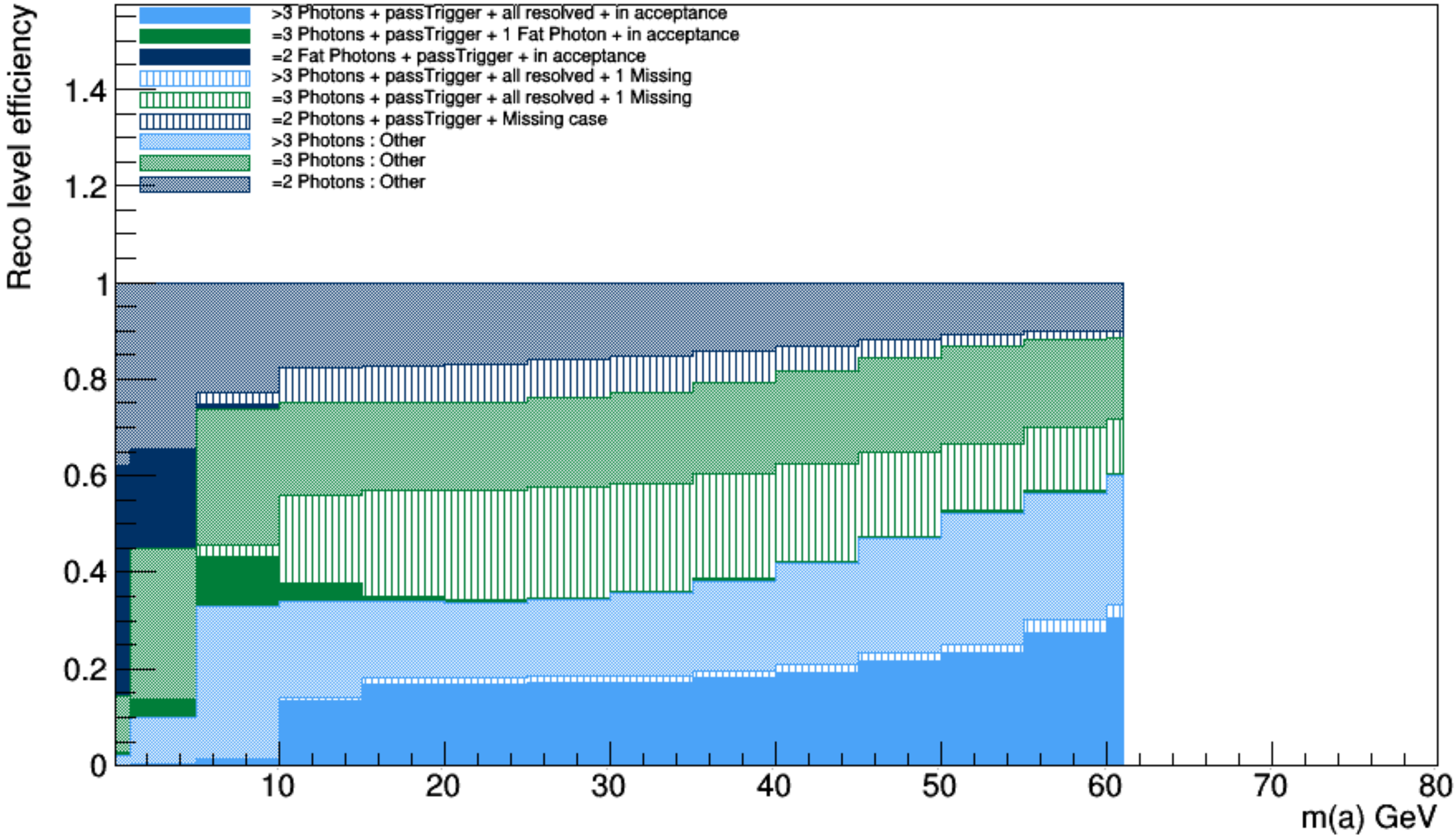


Reco Categorization Process

- Start with events w/ >0 photons

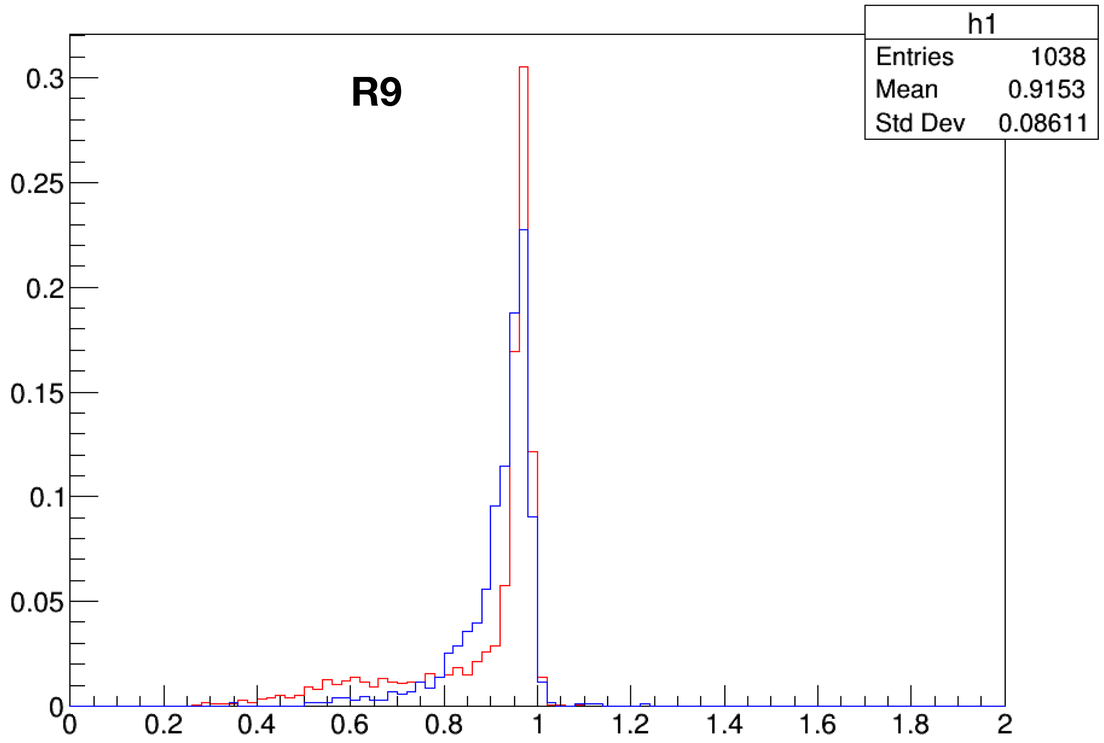


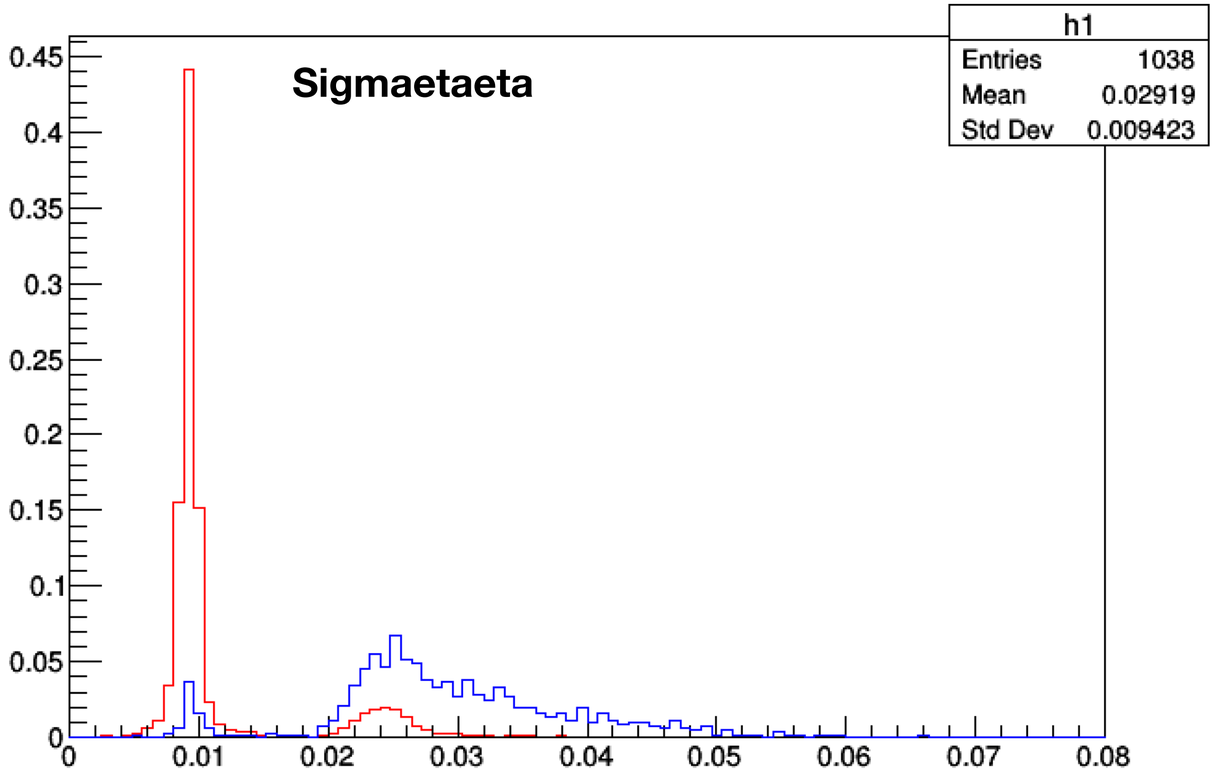
Reco level categorization



Calo variables to distinguish b/w 1 Fat + 2 resolved and 3 resolved + 1 missing case

m(a) = 10 GeV





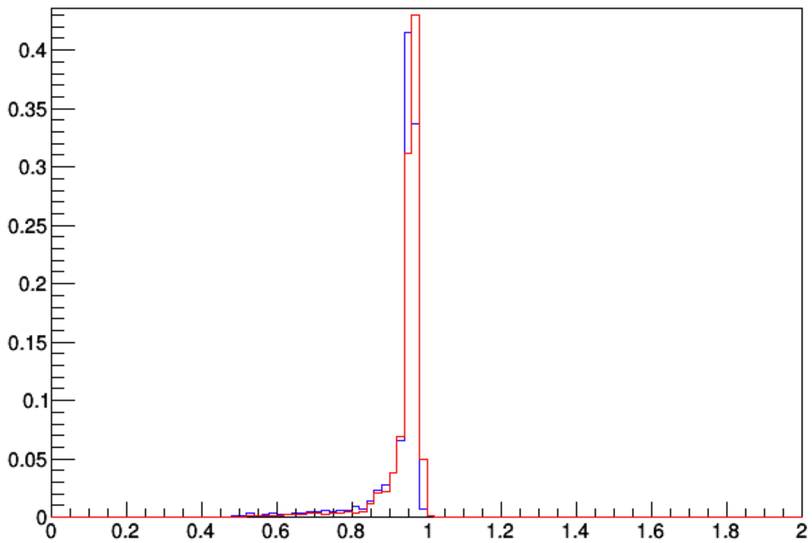
3 resolved + 1 missing
1 Fat + 2 resolved

- @ Reco level, for the 3 Photon case : Plot of R9 and Full 5X5 sigma eta eta for each of the 3 photons
- Red: Photon that has been identified as a Fat photon by gen matching
- Blue : Photon identified as resolved

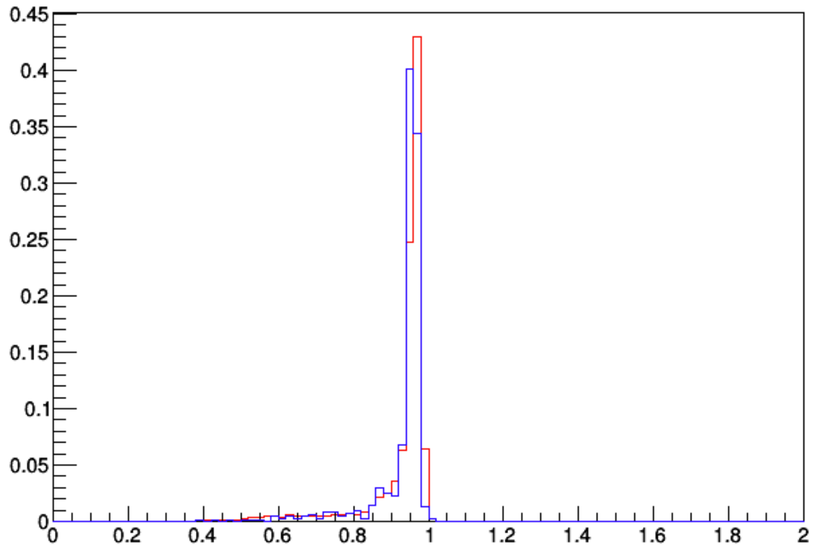
R9

m(a) = 10 GeV

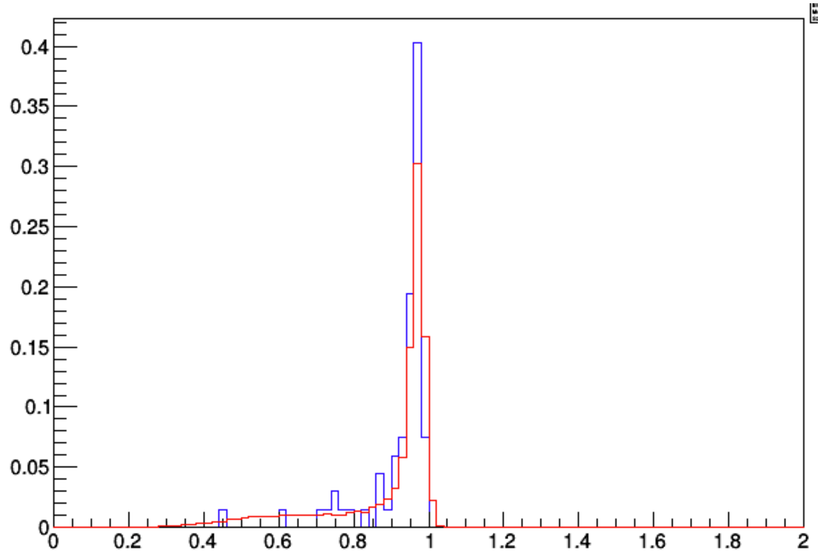
Photon 1



Photon 2



Photon 3



Full 5X5 sigma eta eta

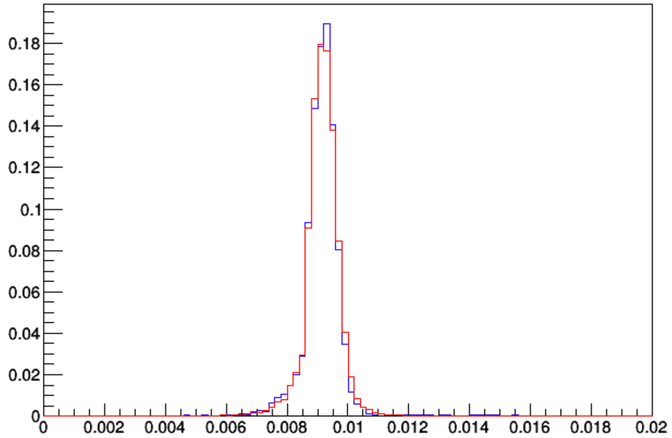
m(a) = 10 GeV

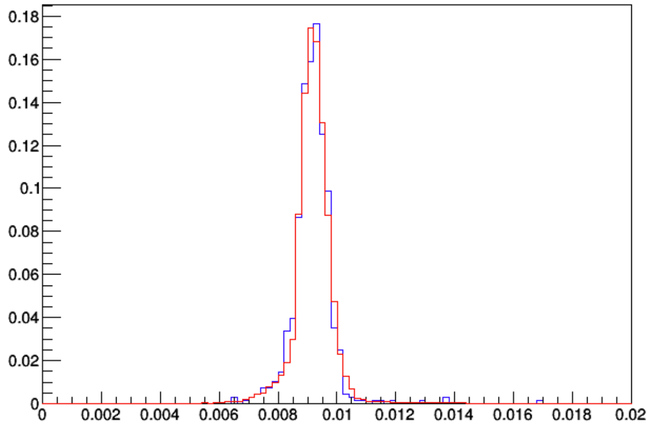
Photon 1

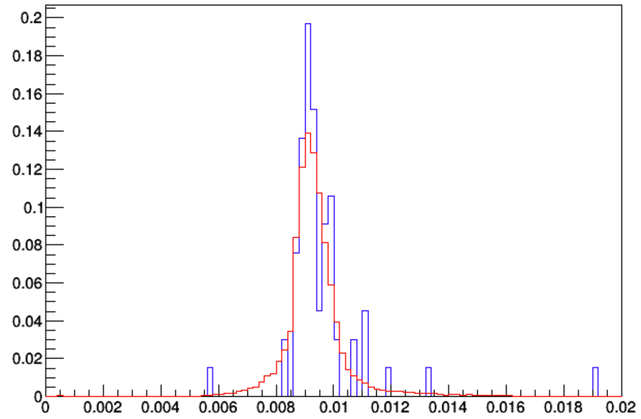
Photon 2

Photon 3

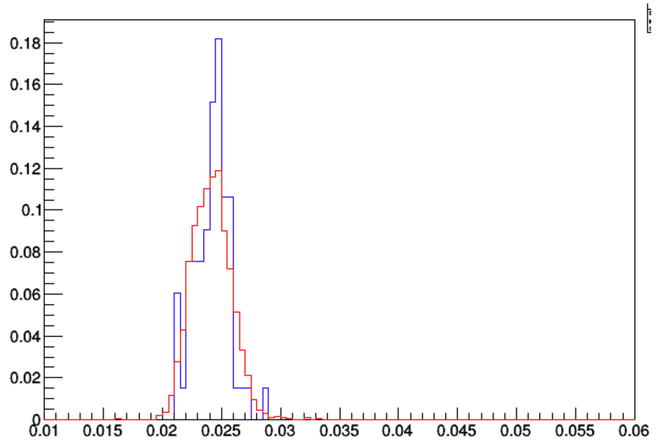
EB

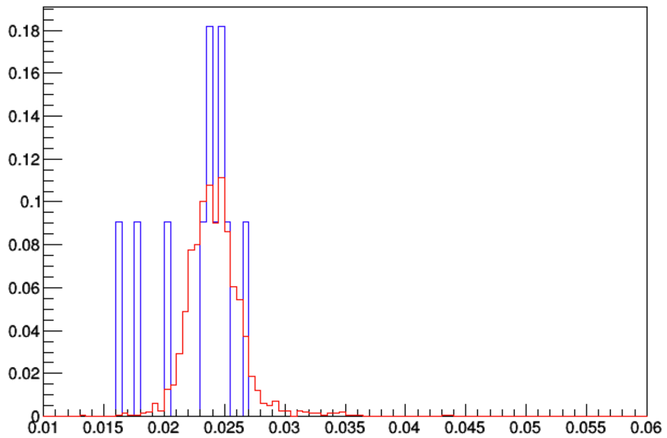


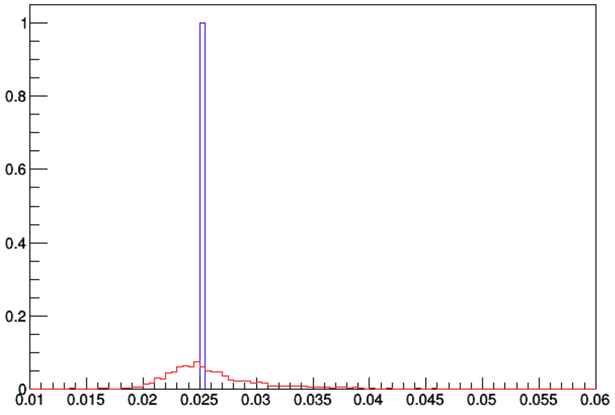




EE







EXTRA

R9 **m(a) = 5 GeV**