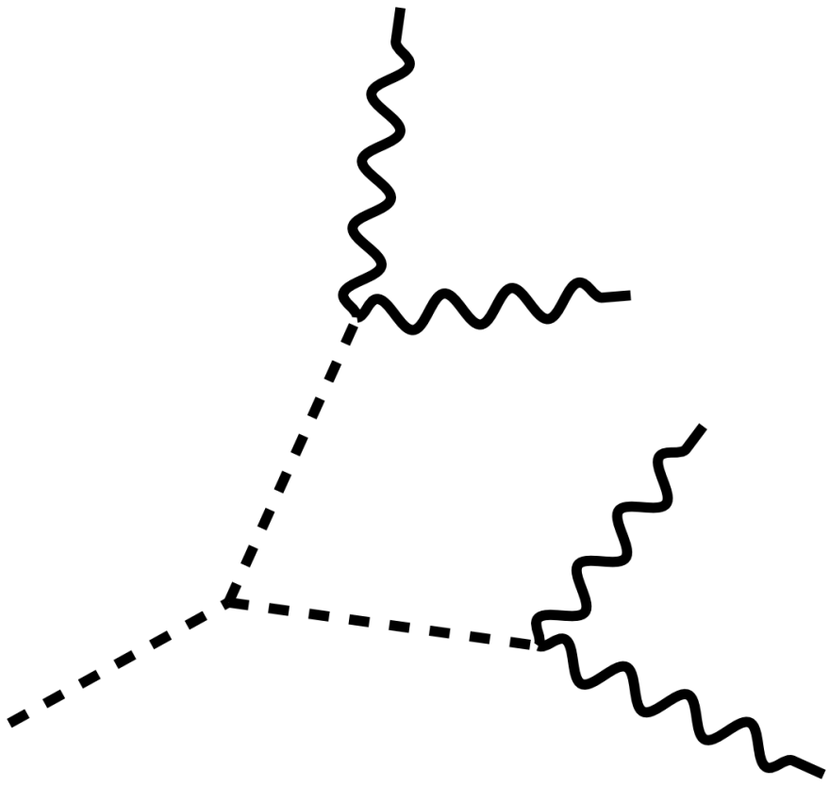
h(125)→aa→γγγγ



Higgs to 4 Gamma Update

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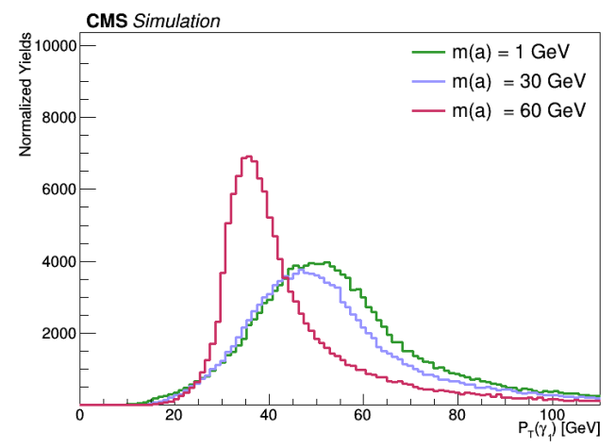
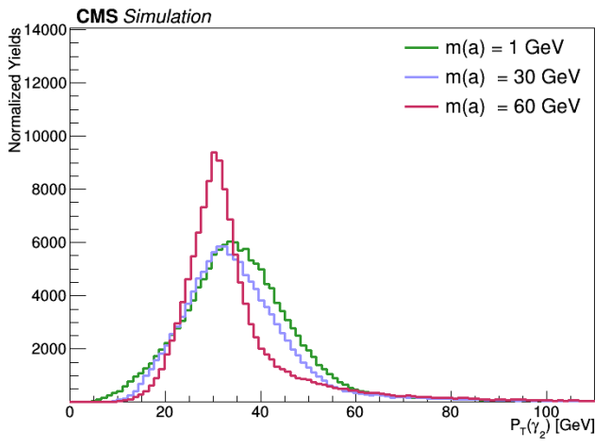
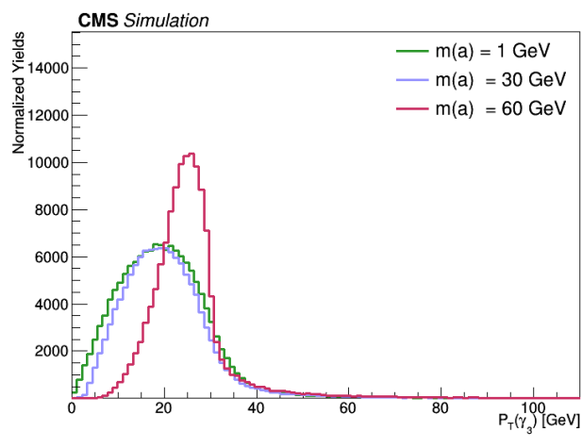
Hgg Working Group Meeting

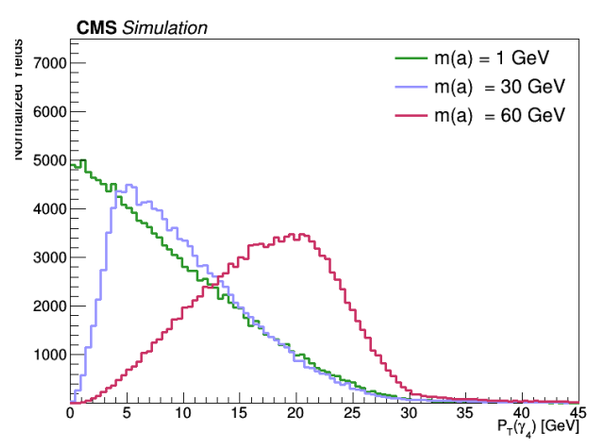
GEN LEVEL STUDY

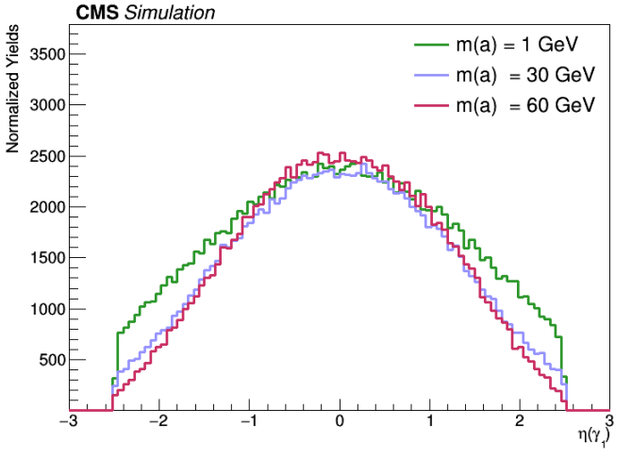
- @ Gen level there are always 4 photons
- The plots below show the P_T and η distribution of the 4 photons(ordered in P_T) for m(a) = 1, 30 and 60 GeV
- Plots are normalized to the number of events

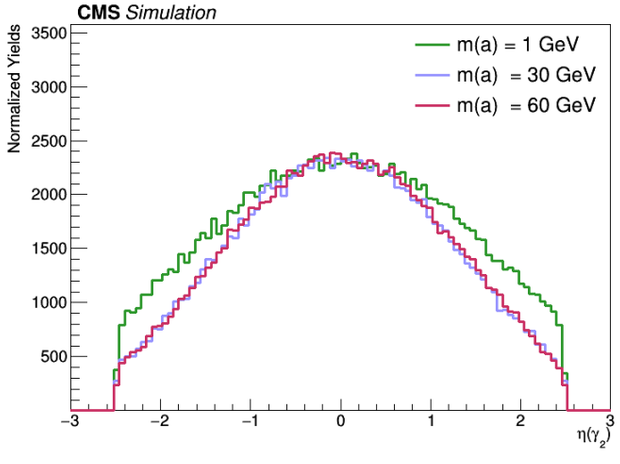


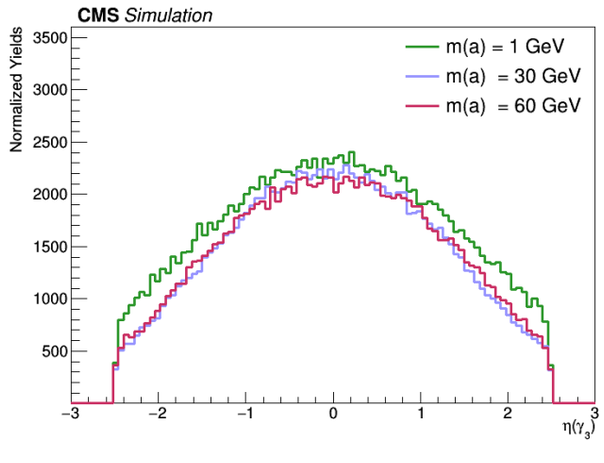


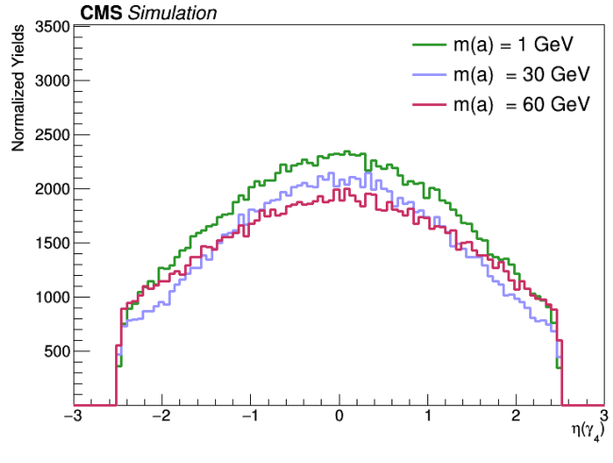












GEN LEVEL STUDY

- Create different categories @ Gen level based on Delta R and (P_T + η) acceptance
- Current acceptance cuts being applied to choose the ɣ's @reco level: P_T > 15 GeV and |η| < 2.5
- Categorization process :

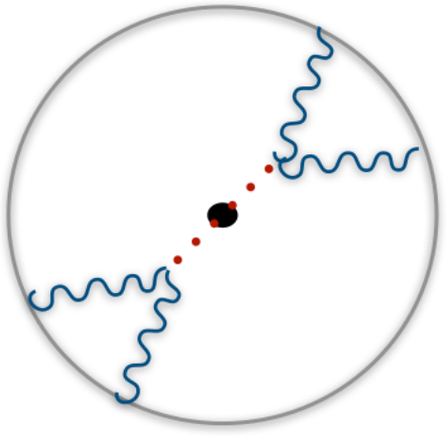
  - Calculate delta R b/w each of the 6 photon pairs

    - **No pairs found with deltaR < 0.3**
      - **All ɣ's within acceptance** - 4 resolved photons
      - **1 ɣ out of acceptance** - 3 resolved + 1 missing photon

    - **1 pair found with deltaR < 0.3**
      - **All ɣ's (resolved and fat) within acceptance** - 1 Fat + 2 resolved photons
      - **1 ɣ out of acceptance** - 1 Fat + 1 resolved +1 missing photon

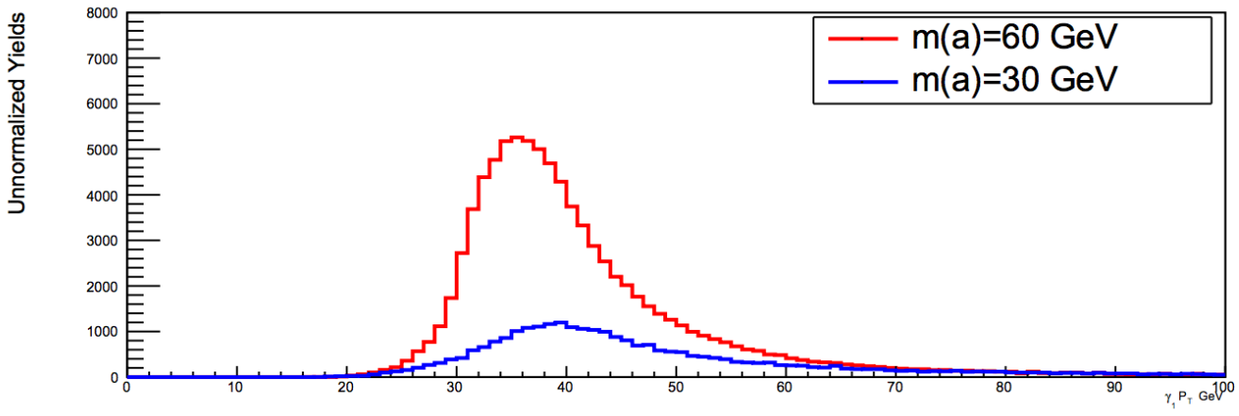
    - **2 pairs found with deltaR < 0.3**
      - **Both fat photons within acceptance** - 2 Fat photons

- Events that don't fall into any of these 5 categories (e.g: 2 or 3 photons are out of pt acceptance) are categorized into "others"

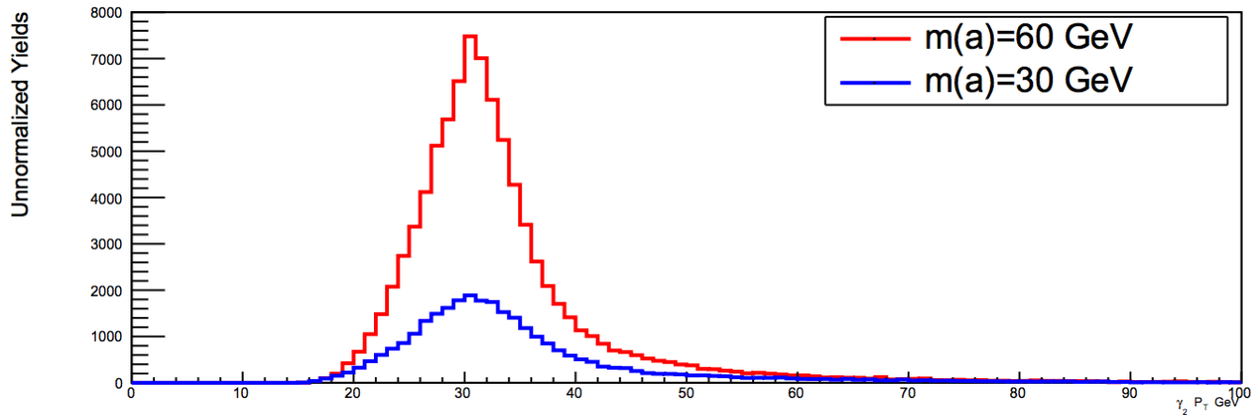


Case 1: 4 RESOLVED PHOTONS

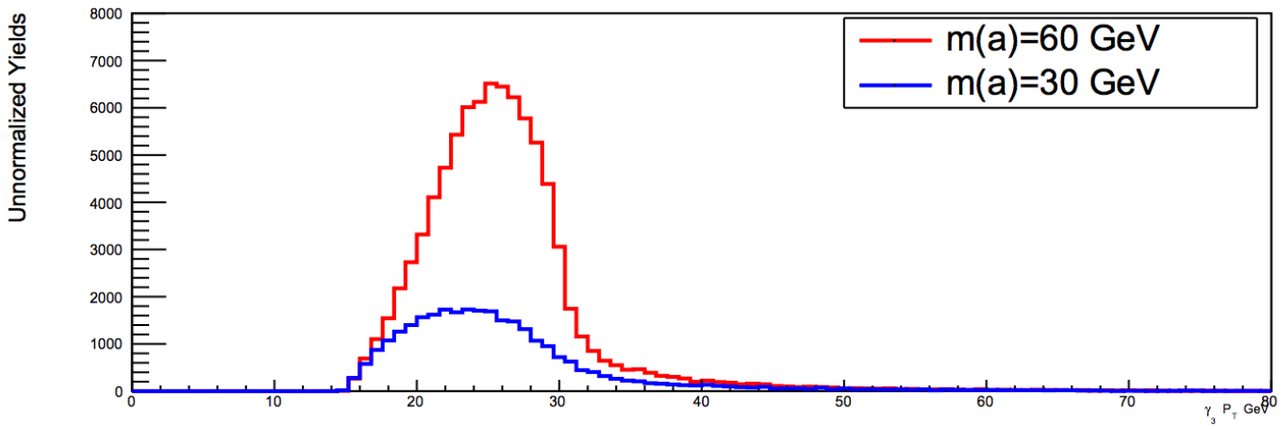
Resolved γ1



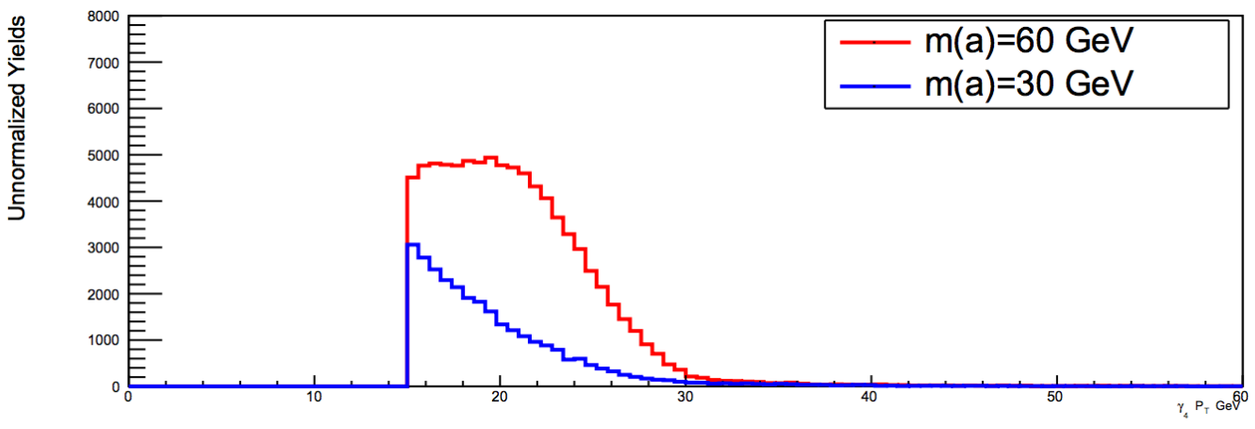
Resolved γ2



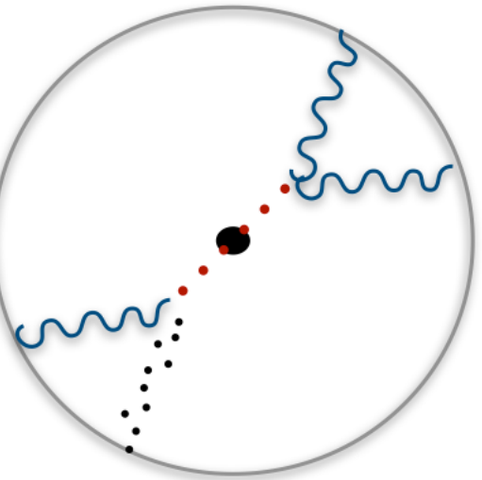
Resolved γ3



Resolved γ4

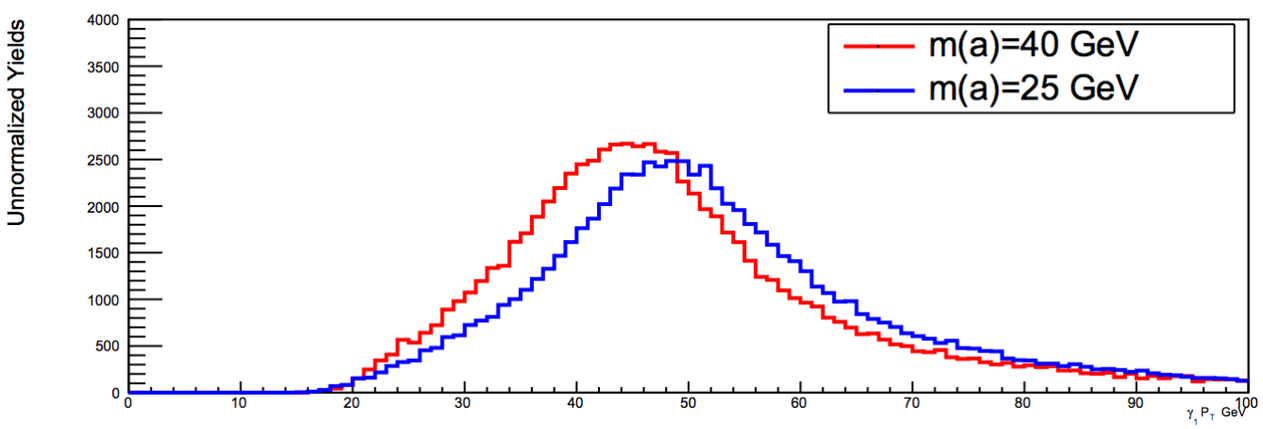


Plots are normalized to the number of events

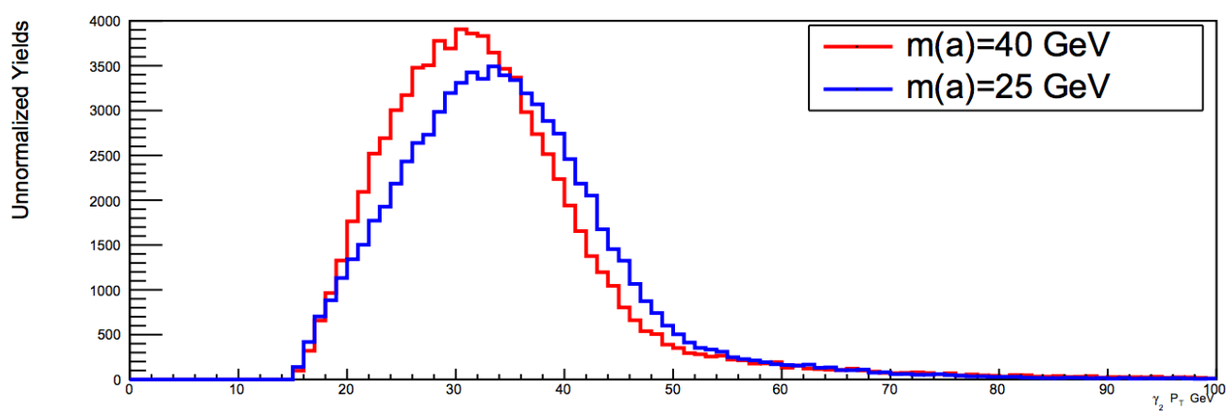


Case 2 : 3 RESOLVED + 1 MISSING PHOTON

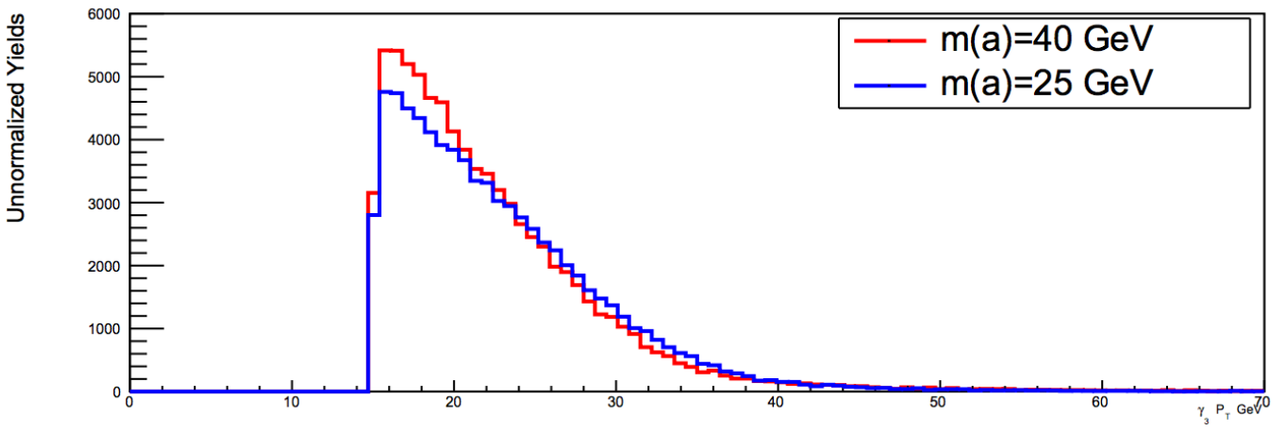
Resolved γ1



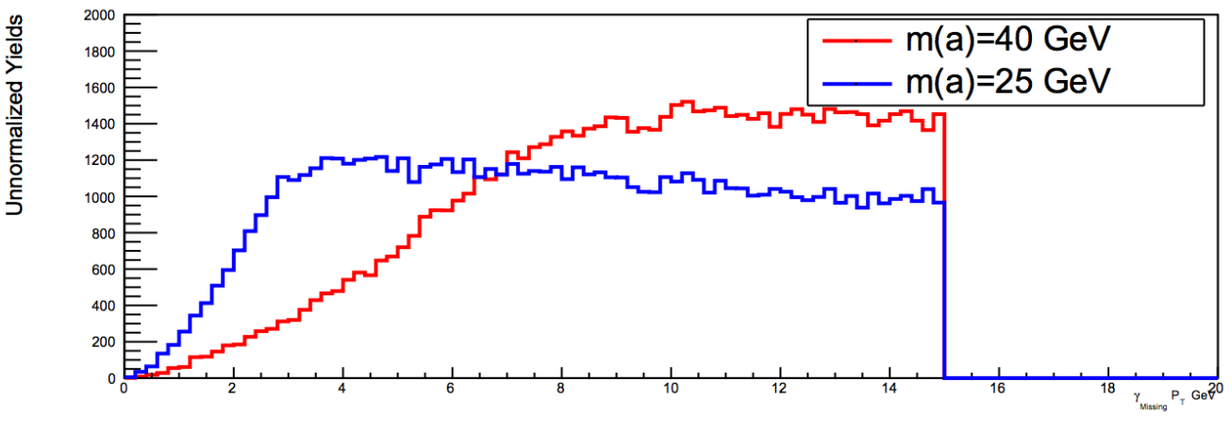
Resolved γ2



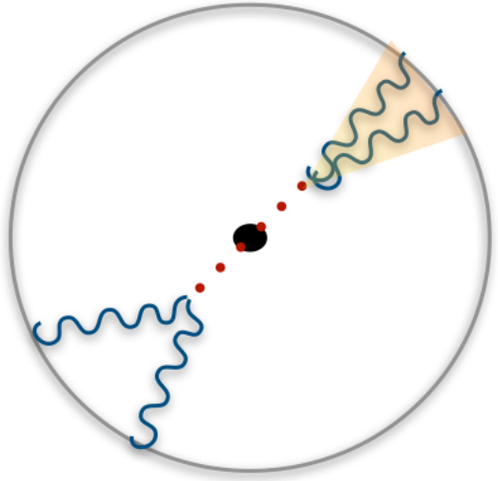
Resolved γ3



Missing γ

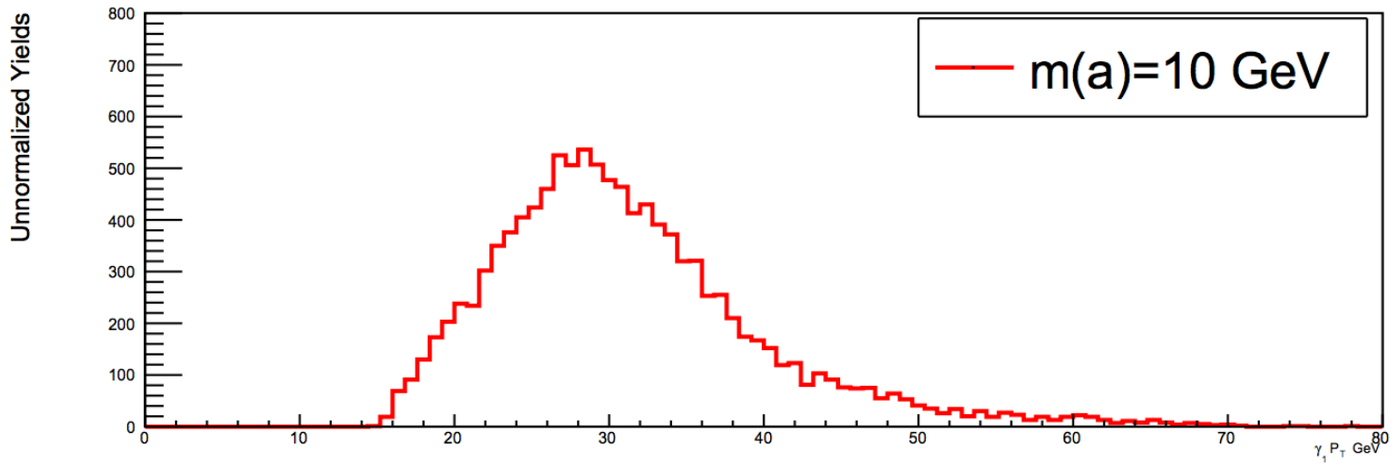


Plots are normalized to the number of events

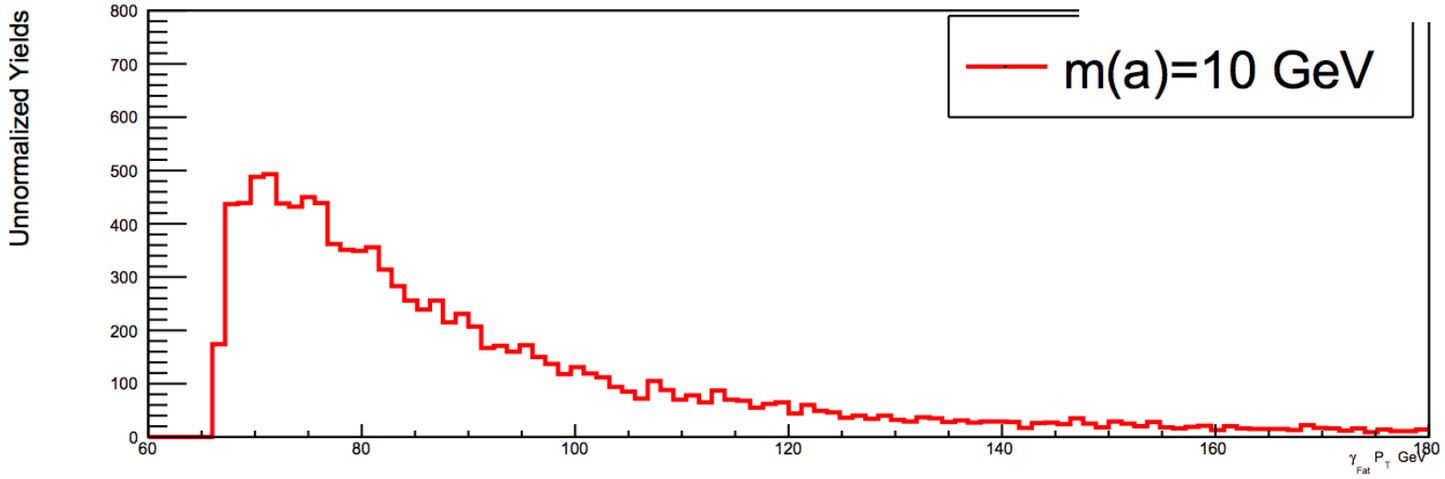


Case 3 : 1 FAT + 2 RESOLVED PHOTONS

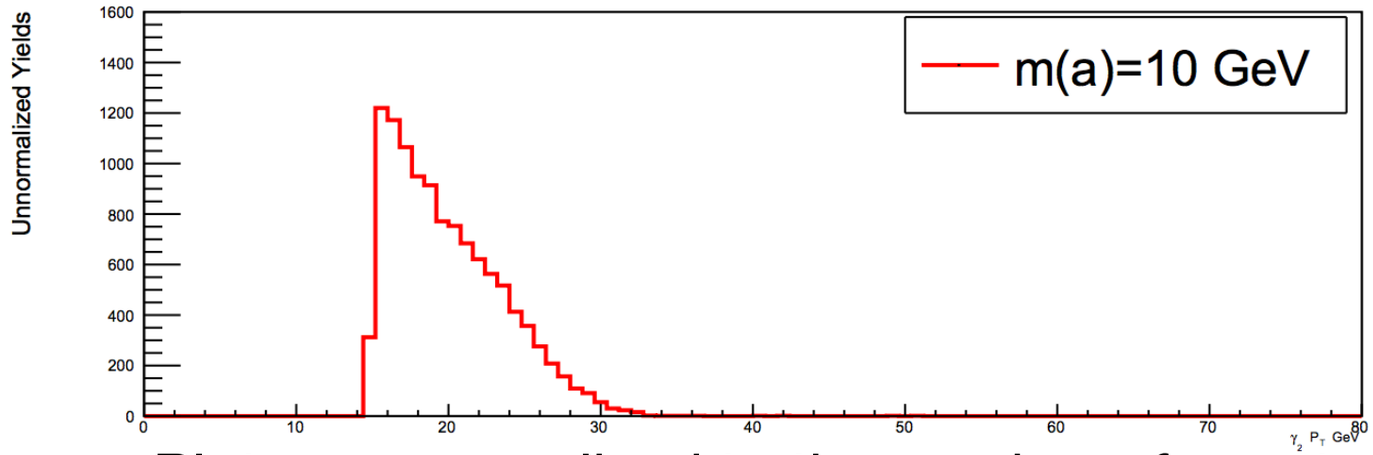
Resolved γ1



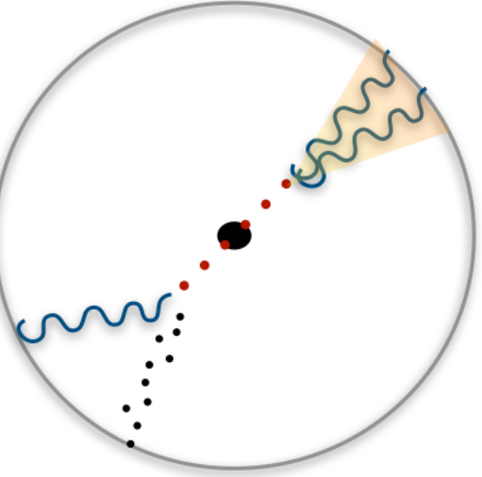
Fat γ



Resolved γ2

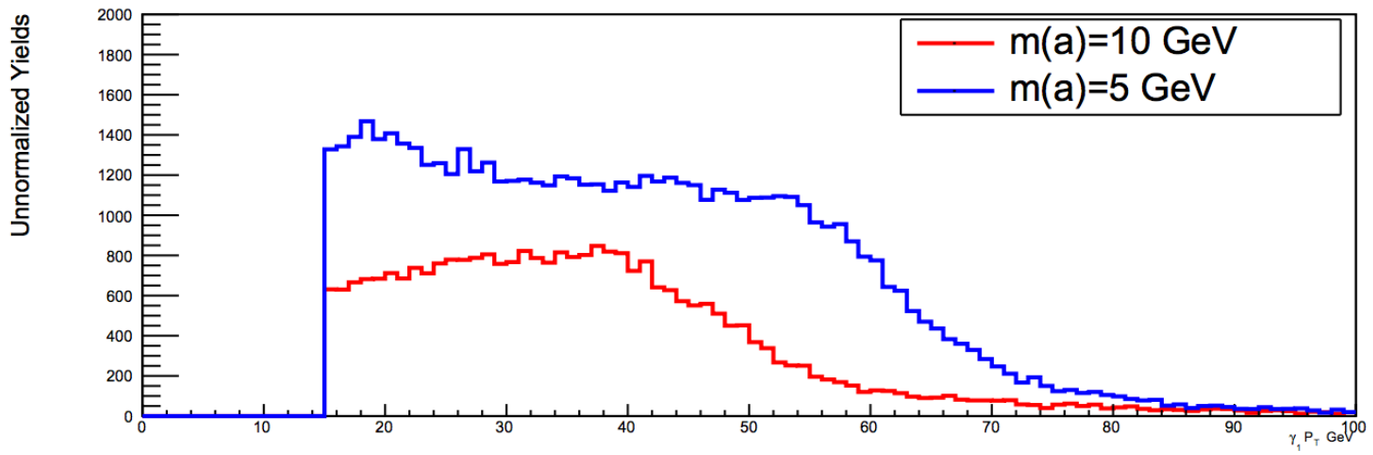


Plots are normalized to the number of events

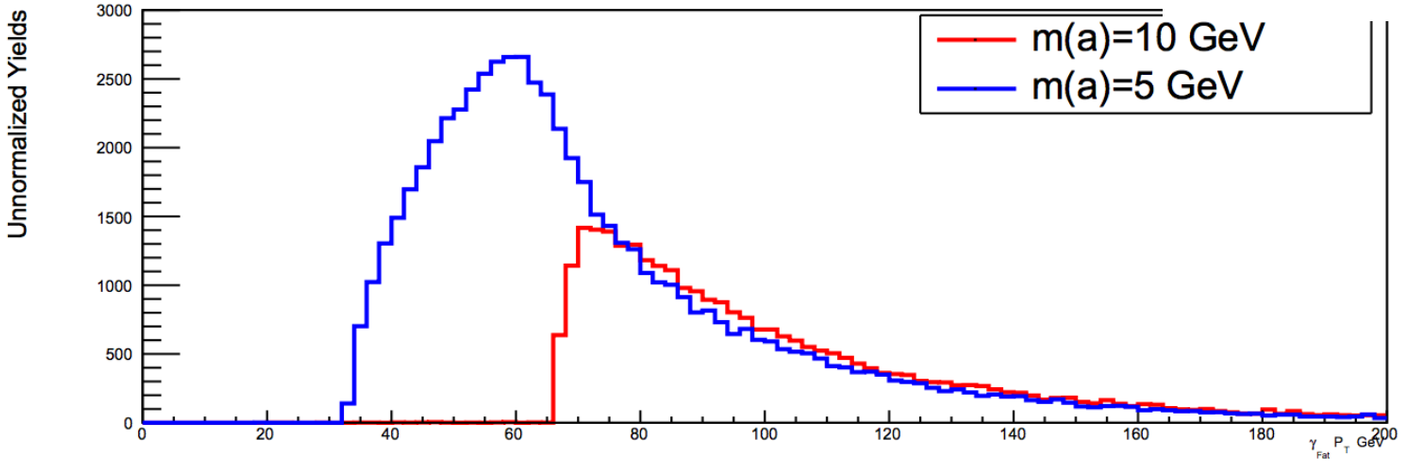


Case 4 : 1 FAT + 1 RESOLVED + 1 MISSING

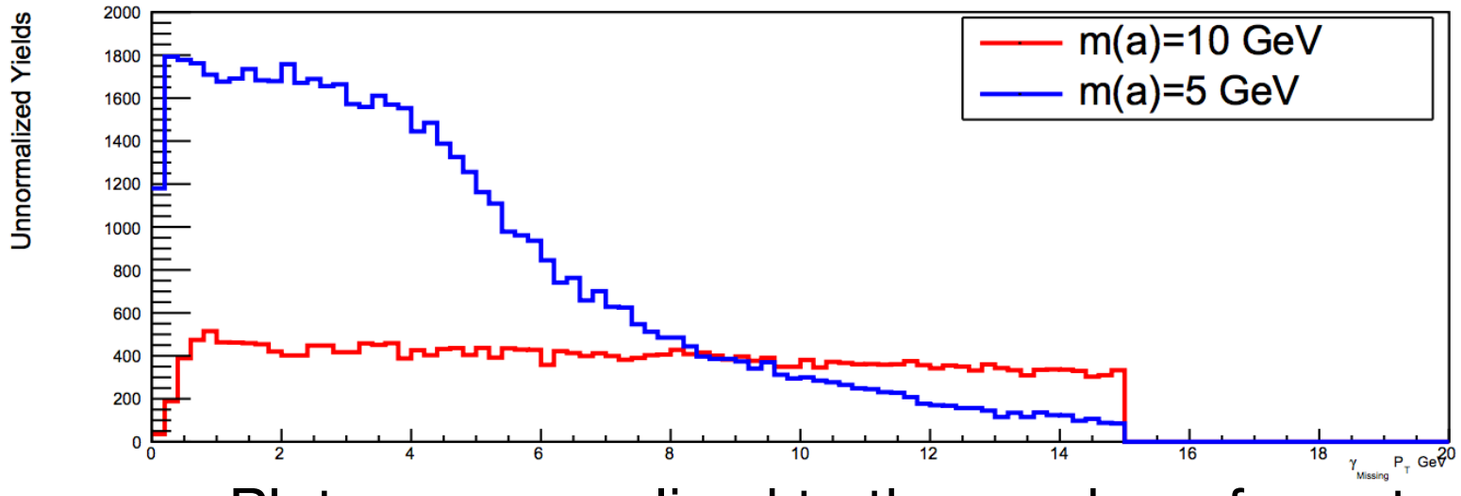
Resolved γ



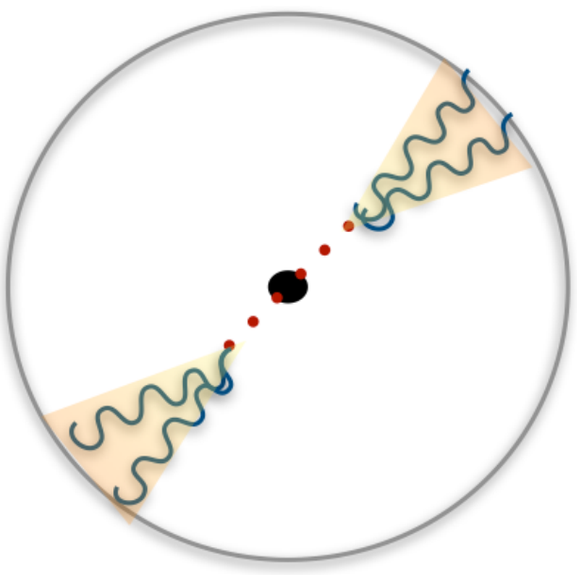
Fat γ



Missing γ

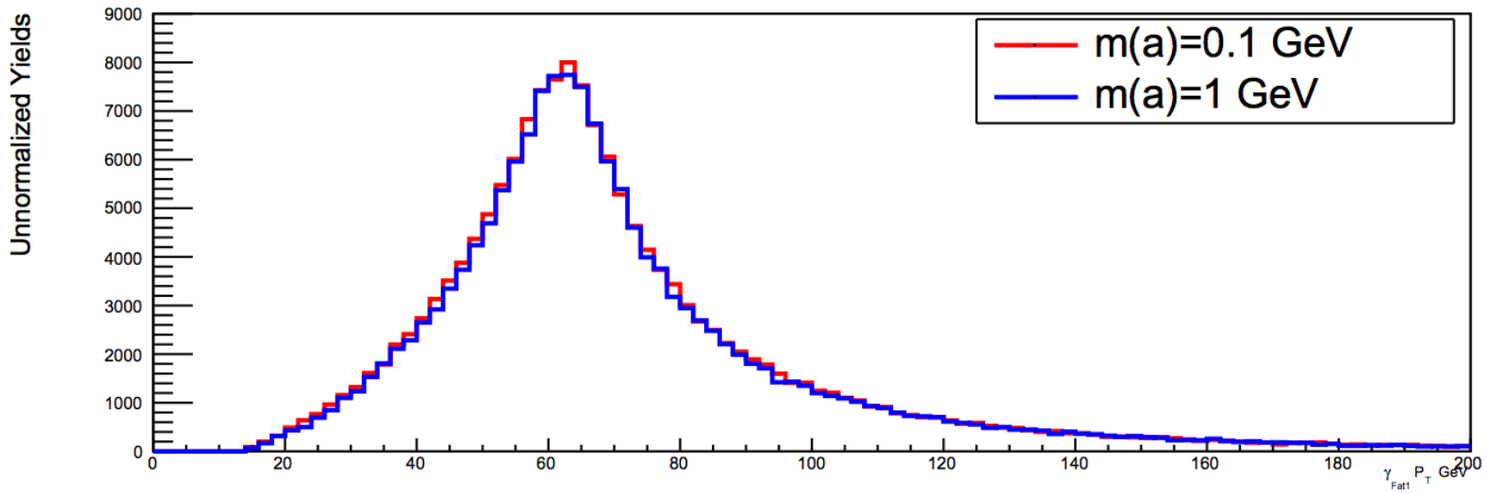


Plots are normalized to the number of events

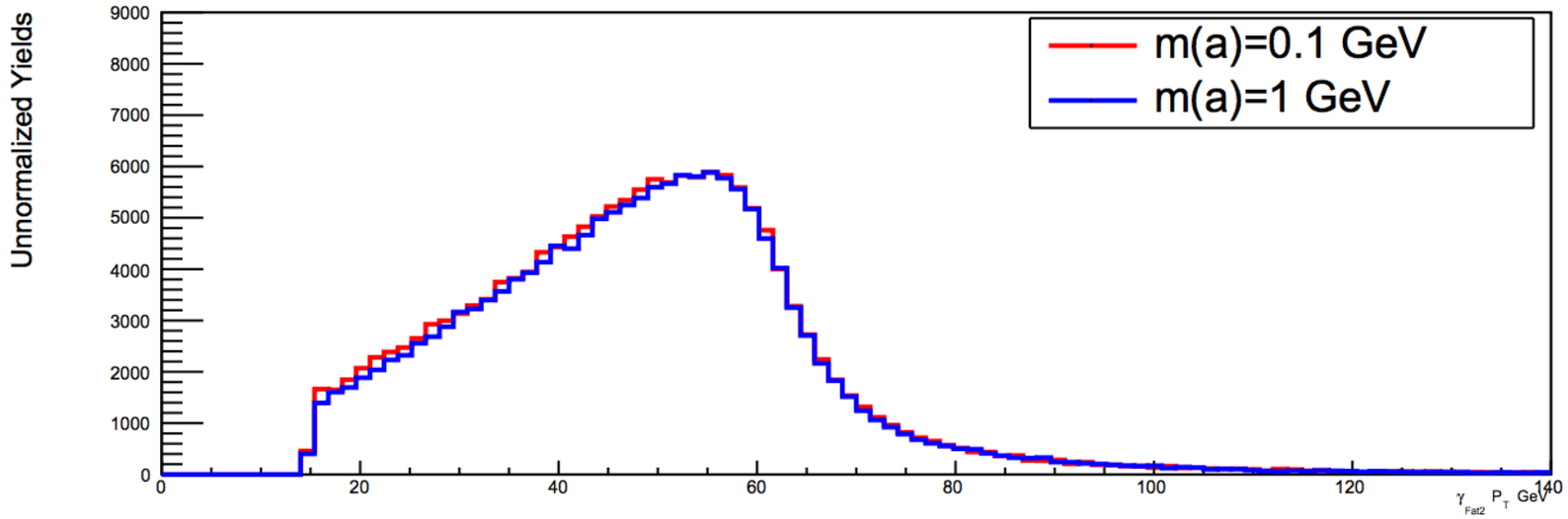


Case 5 : 2 FAT PHOTONS

Fat γ1

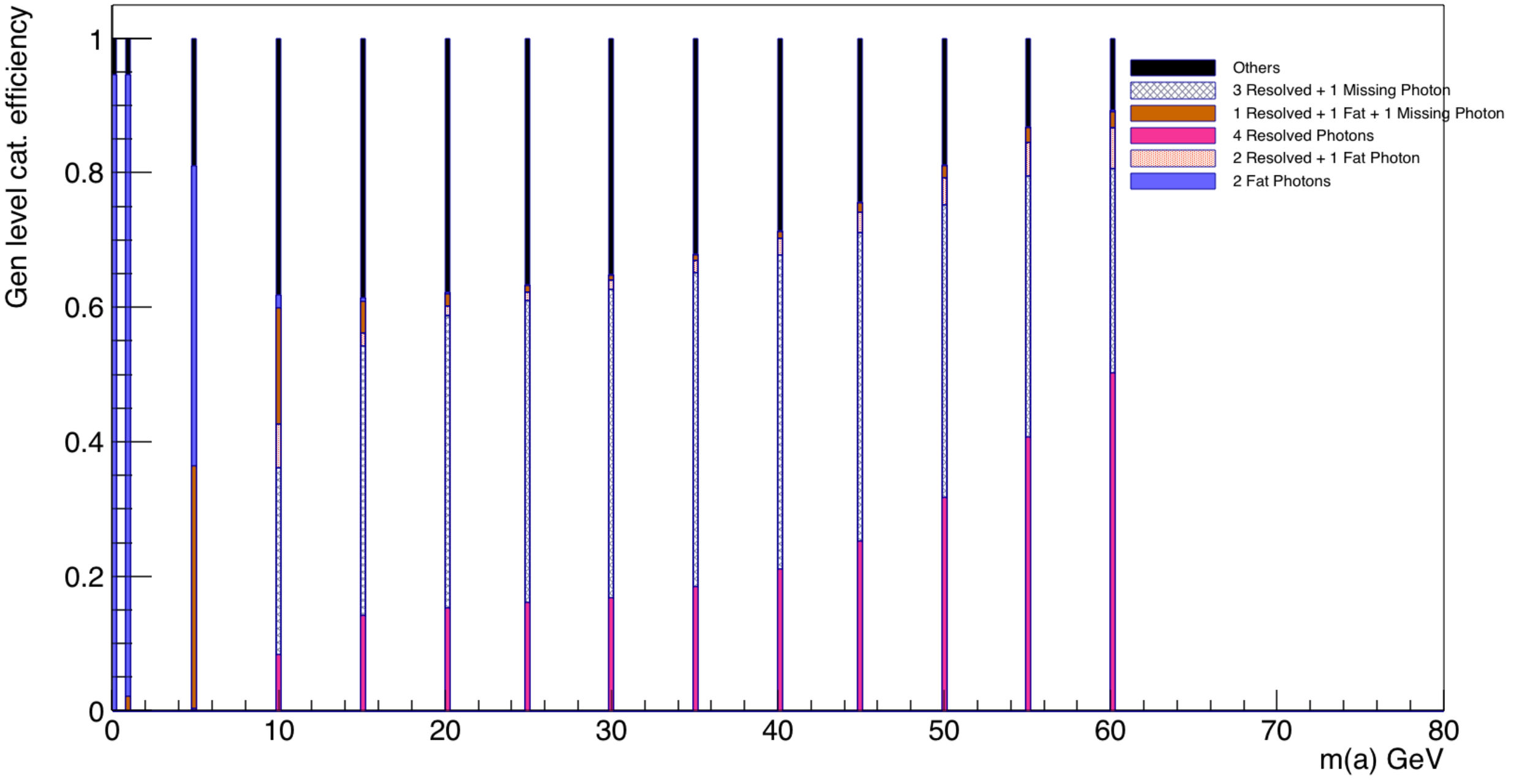


Fat γ2



Plots are normalized to the number of events

- Plot showing the population of different categories for each signal mass point
- Different colors indicate the fraction of events falling into each of the previously described categories



NEXT STEPS

- Should the P_T cut be relaxed for recovering the efficiency being lost due to ɣ falling outside the acceptance ?

- How low can we go in P_T ?

- Next step : Once the categorization cuts are finalized @gen level, we will mimic this categorization @reco level.

BACKUP

- Delta R b/w the different photon pairs