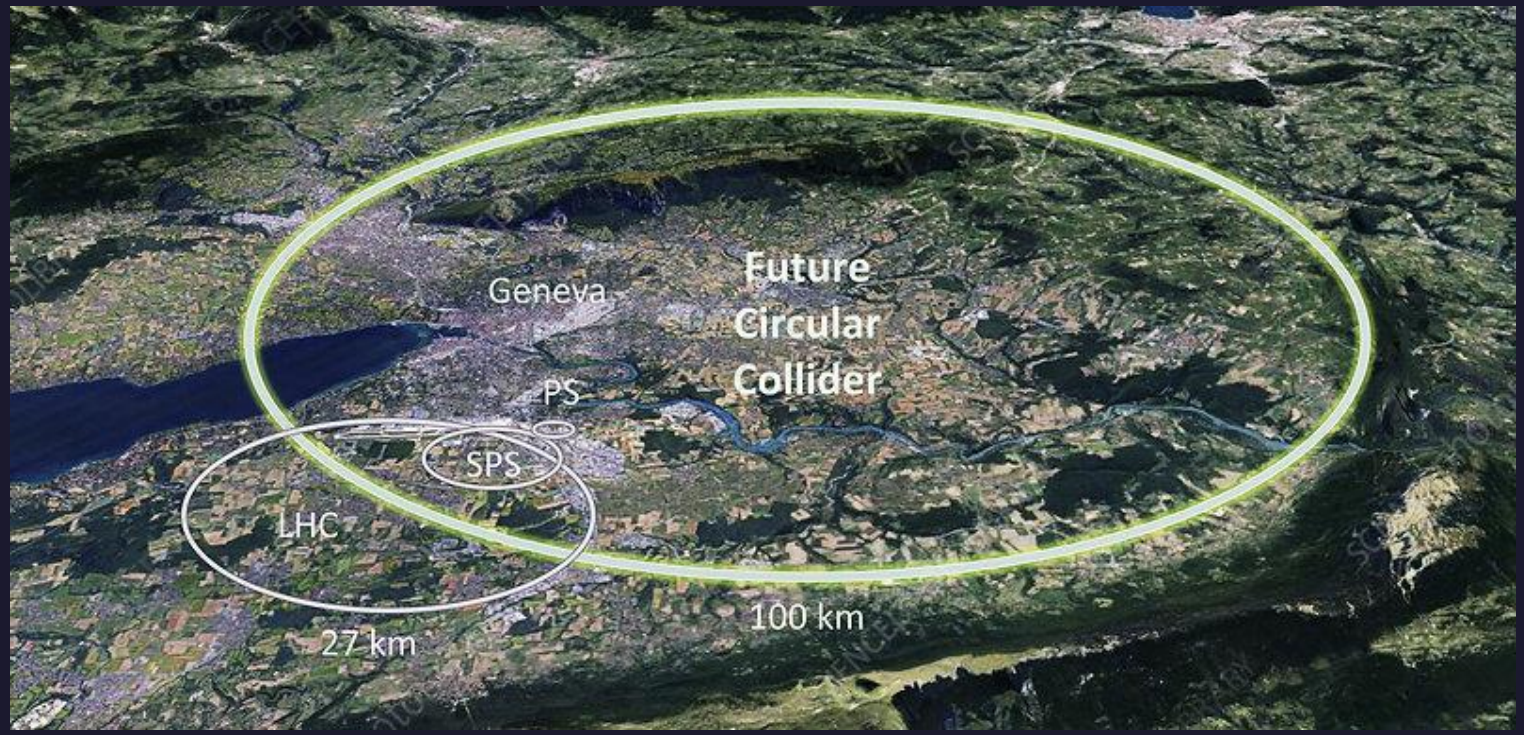
Long-lived axion-like particles at the FCC-ee

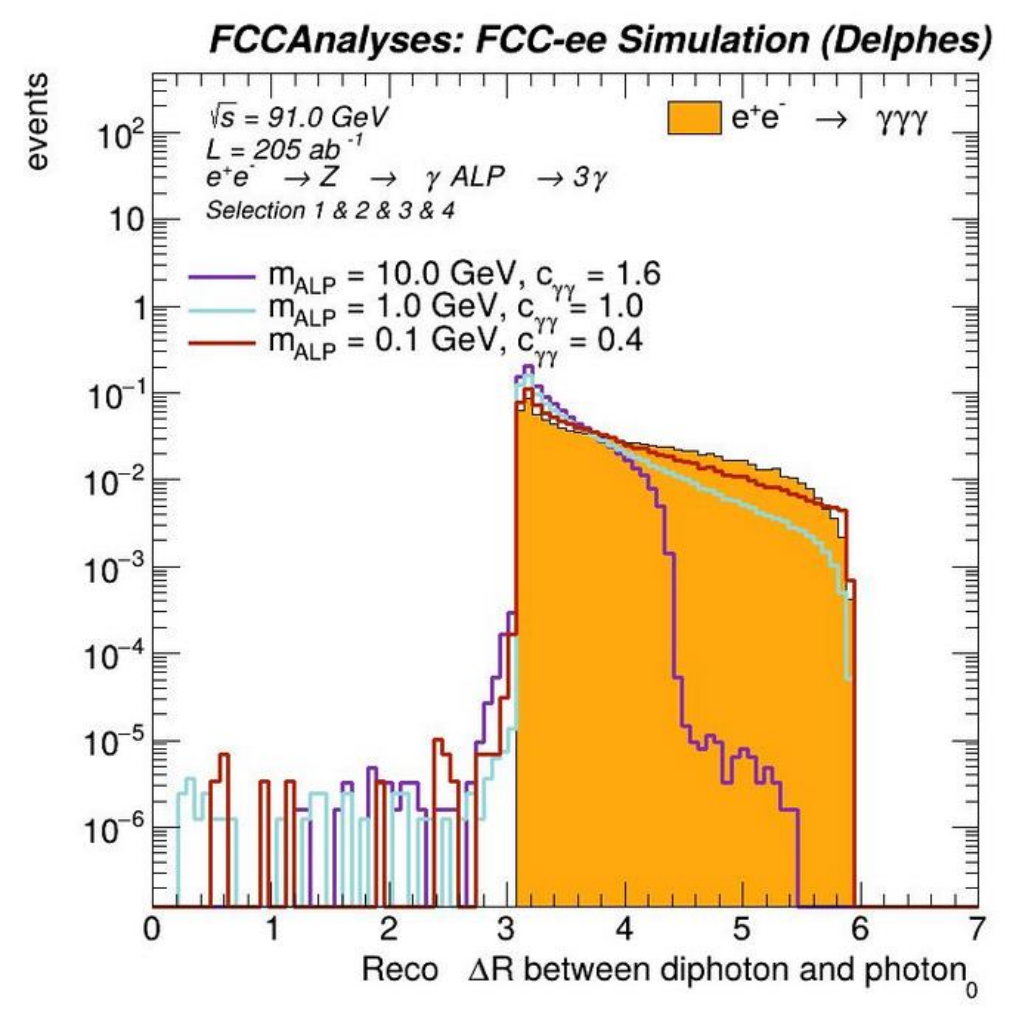
Weekly meeting with Juliette and Lovisa



Freya Blekman, Juliette Alimena, Lovisa Rygaard, **Elnura Bakhishova**

13.02.25

Delta R between diphoton and leading photon



Introduce new accessor function in .cc script

- calculate tlv of diphoton
- get deltaR between diphoton and leading photon

-->Doesn't help with further selection but was worth checking out

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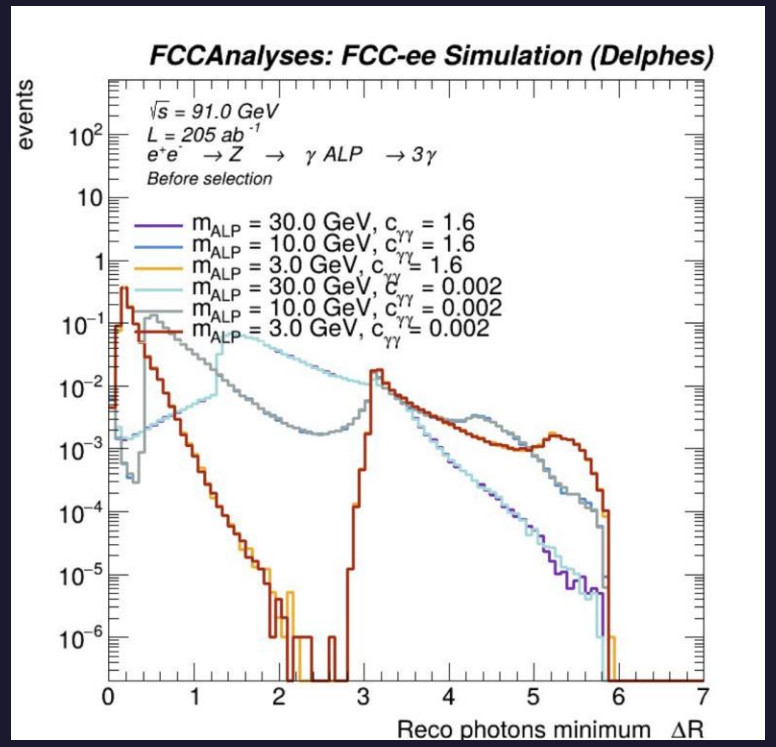
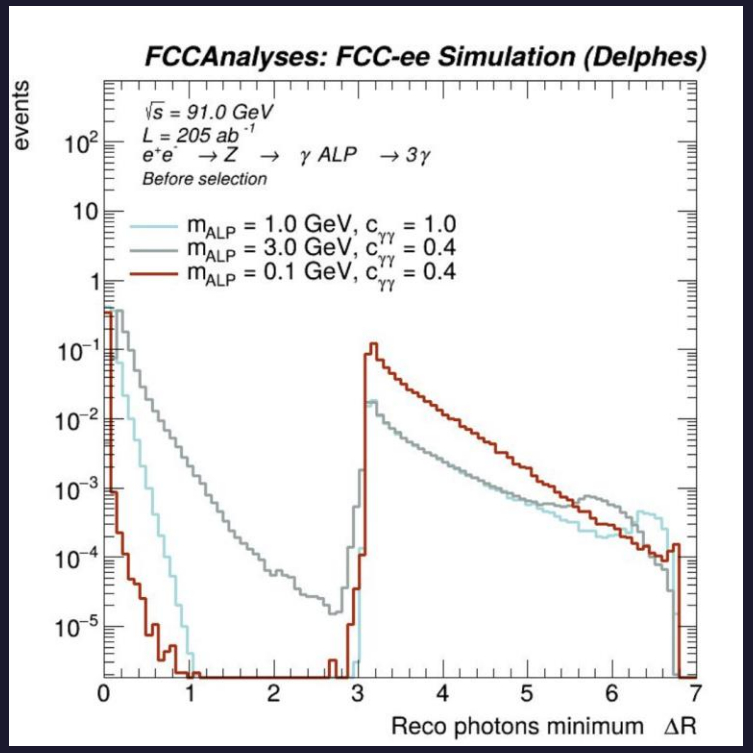
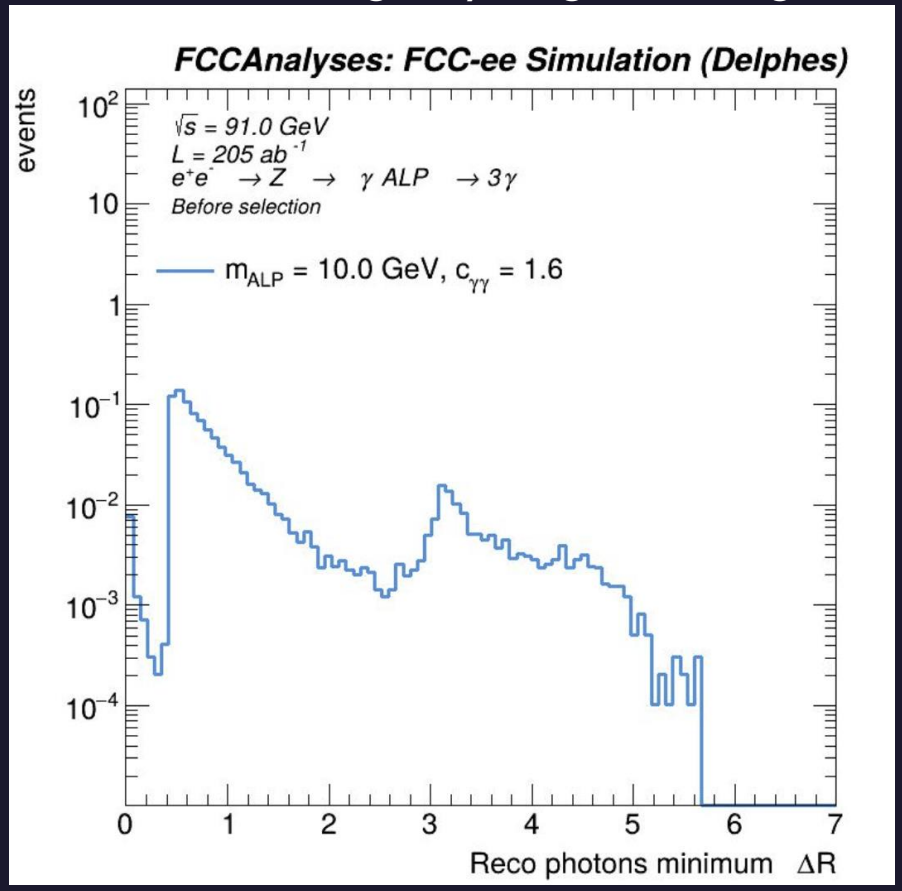
Min deltaR





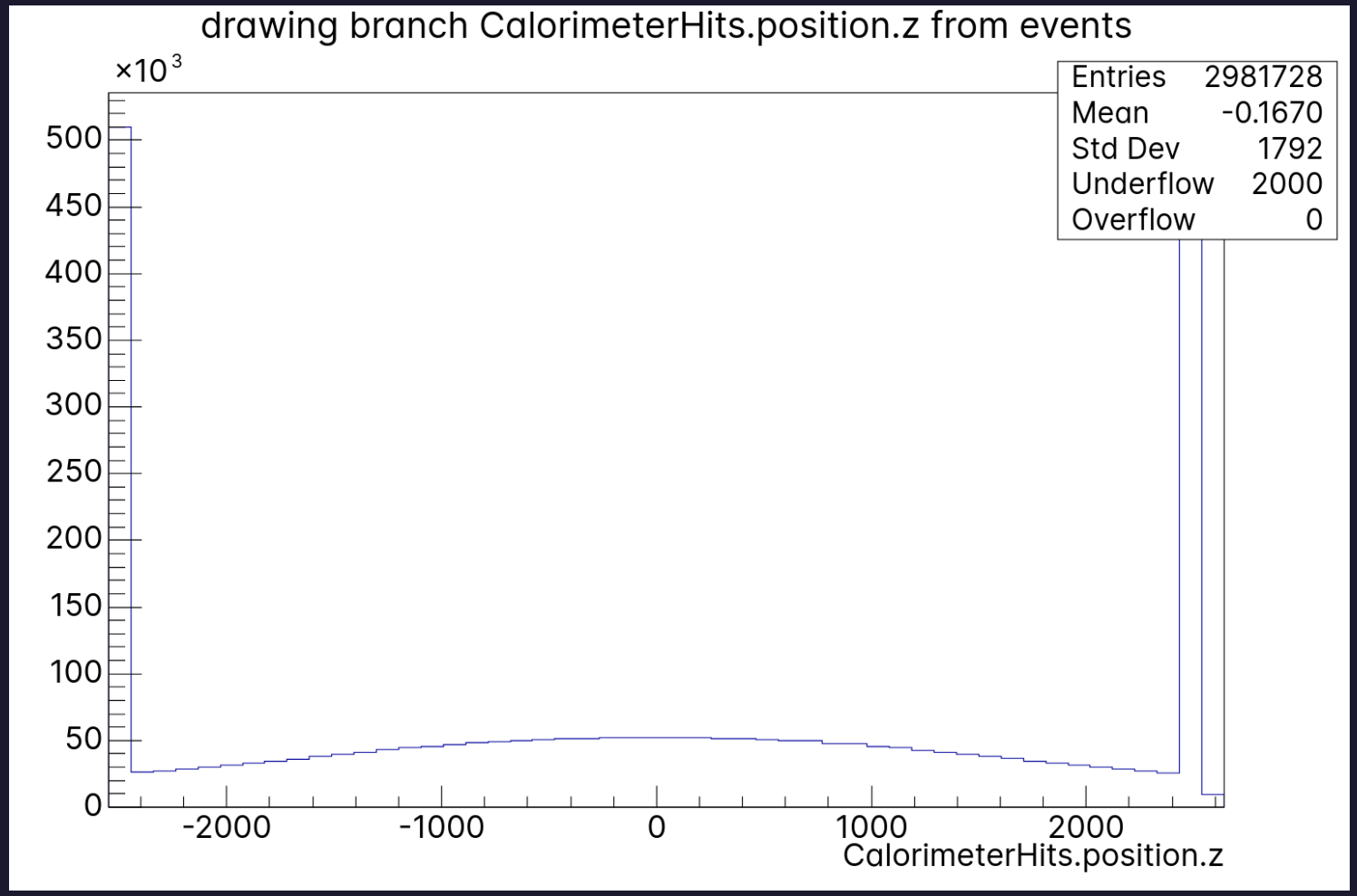
With adjusted MG parameter for pt and mindeltaR

→ did not change anything for the signal



Reconstructing calorimeter hit time

CalorimeterHits position



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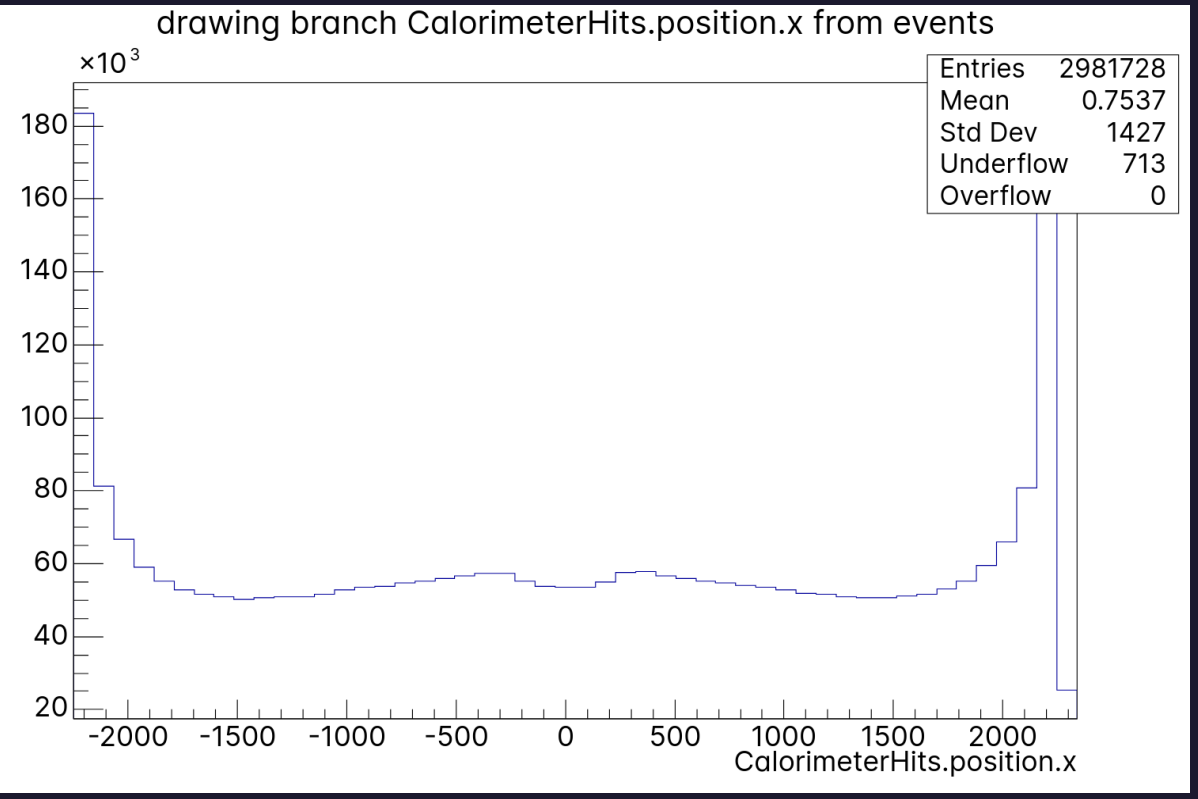
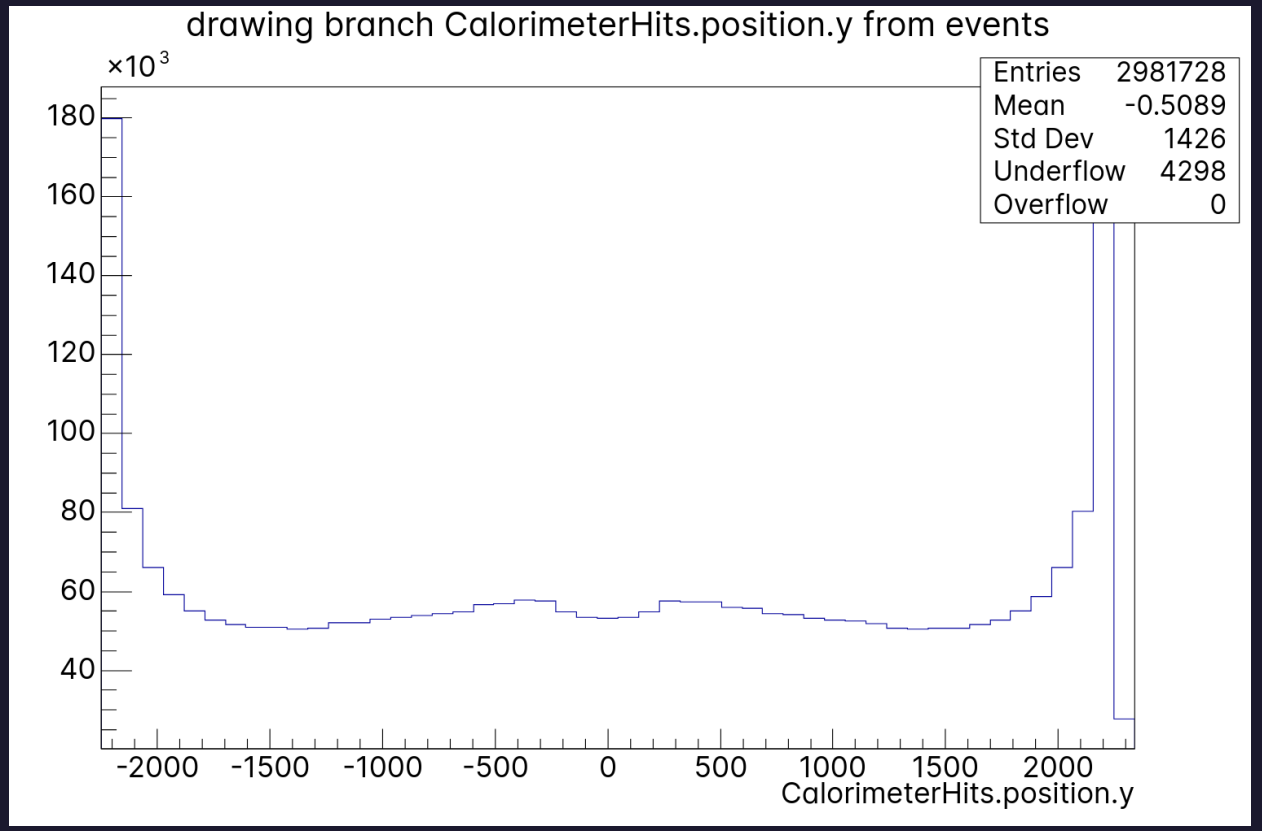
CalorimeterHits position





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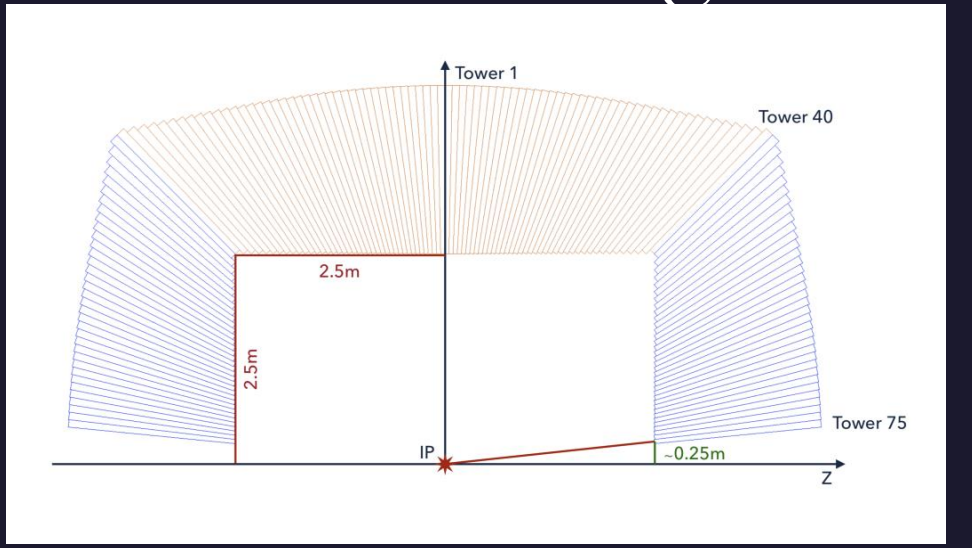
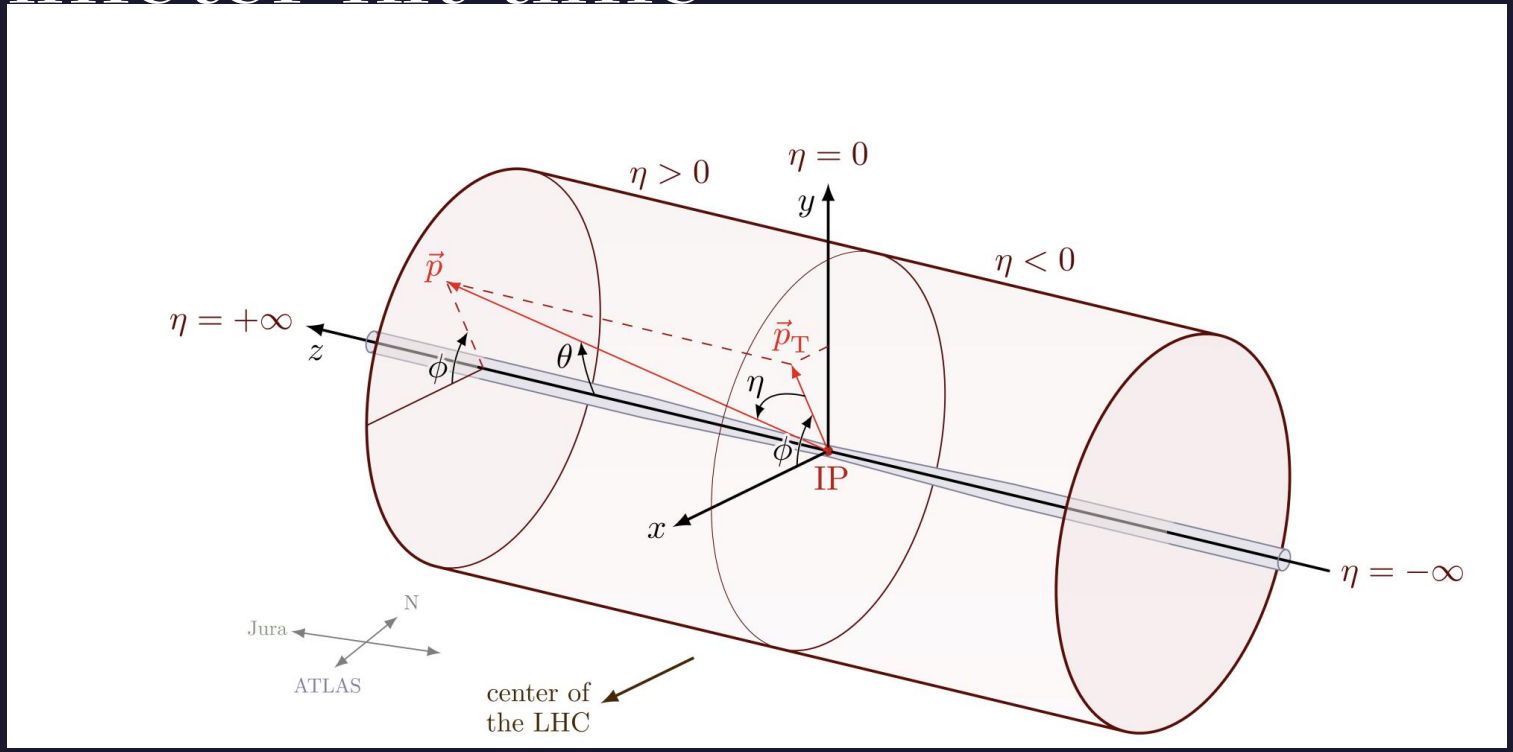
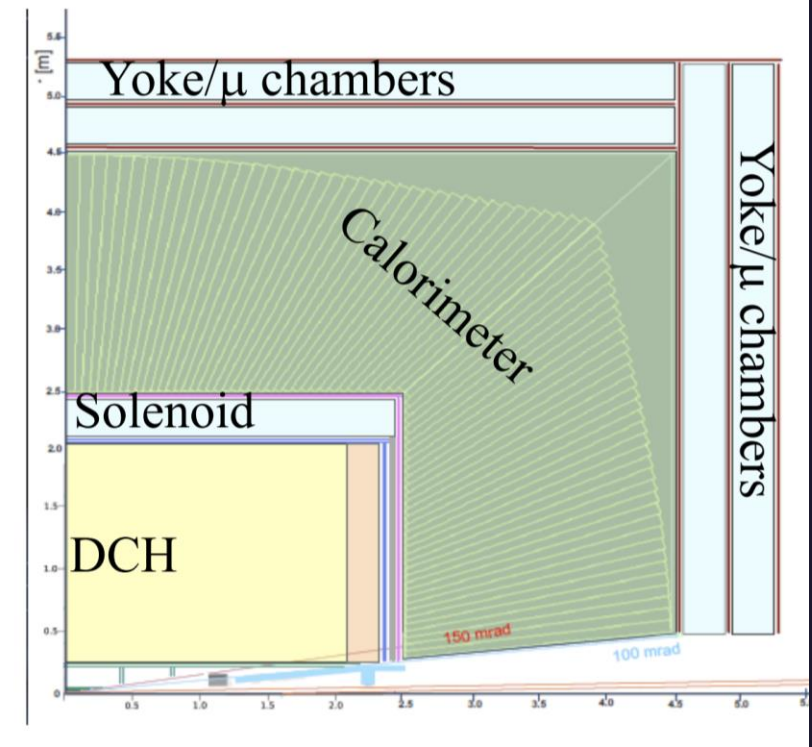
Reconstructing calorimeter hit time







Calculate length of path travelled by leading photon (straight path from interaction point)

- use photon_0 's momentum (from TLorentzvector) to find coordinates of when the calorimeter would be hit

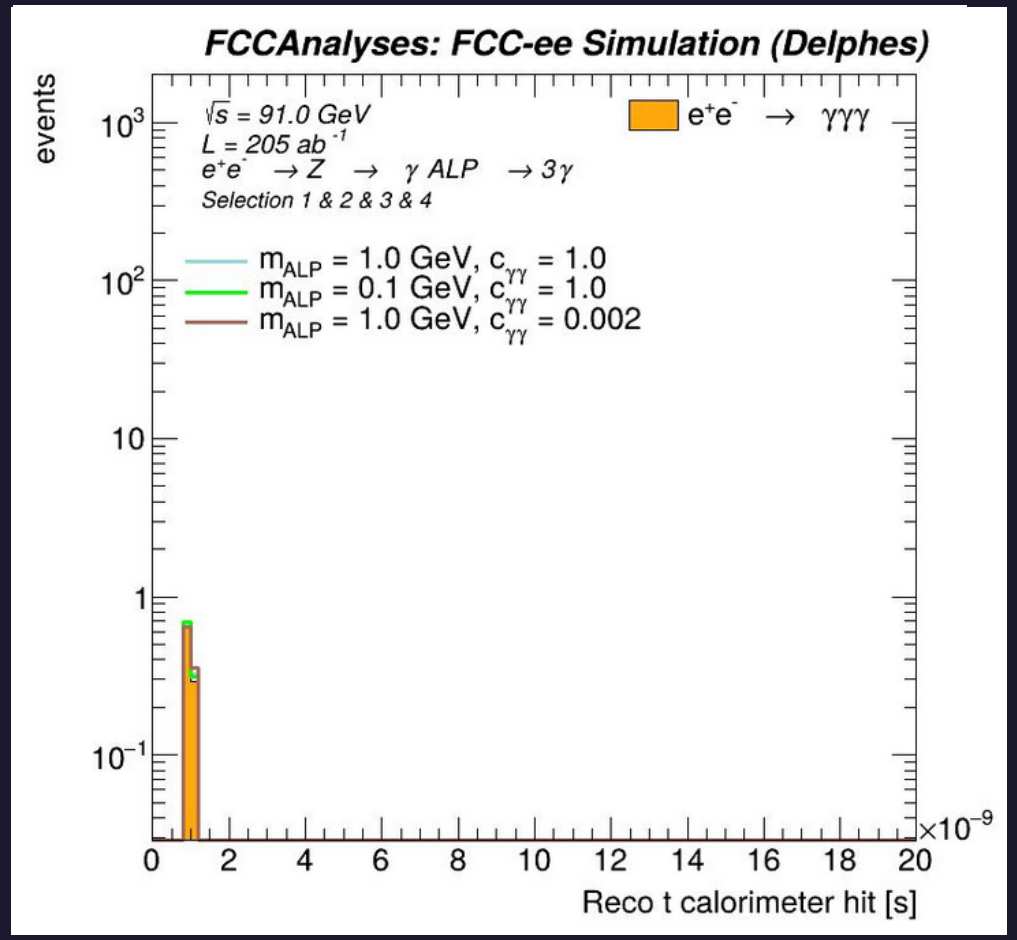
Calculate length of path travelled by ALP + displaced photon (=longer path)

- use photon_1/2 's momentum to do the same
- use ALP production vertex coordinates from gen level
- calculate vector between these 2 coordinates and its length, use max trajectory length of (photon1,photon2)

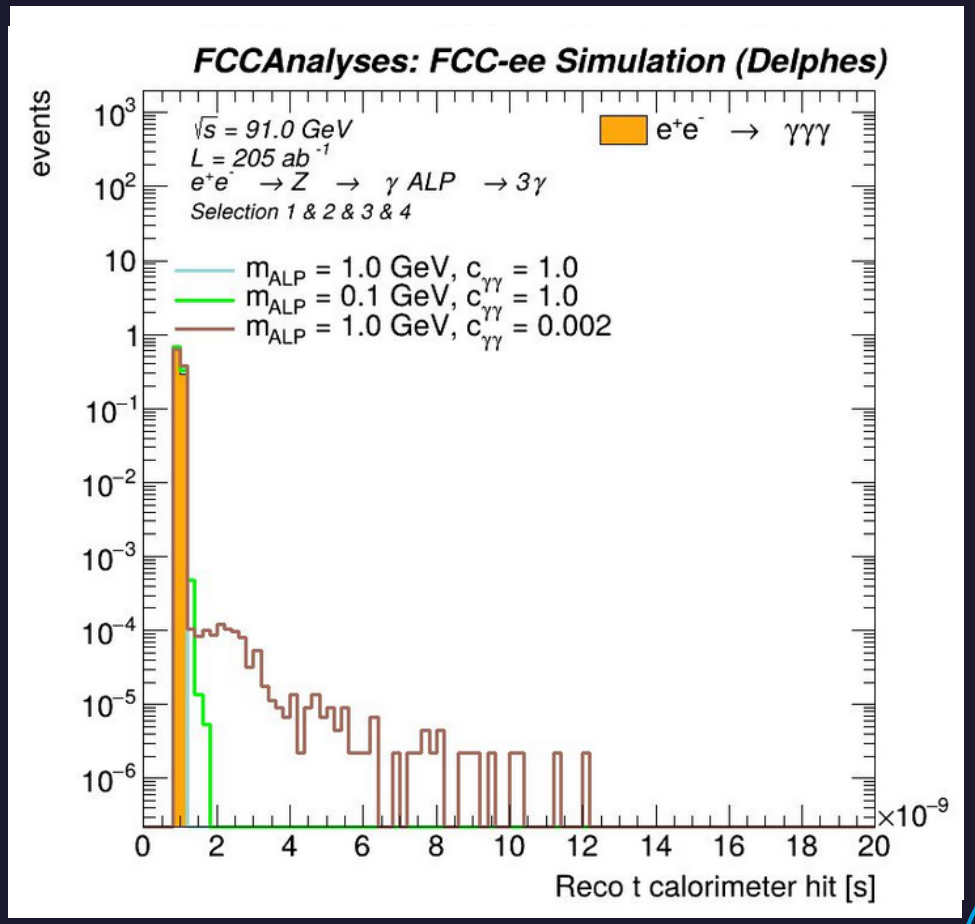
-->get time difference of those 2 paths (assuming speed of light)

time of calorimeter hits

Photon_0 (=without displacement)



Photon_1/Photon_2 (=displaced photon)



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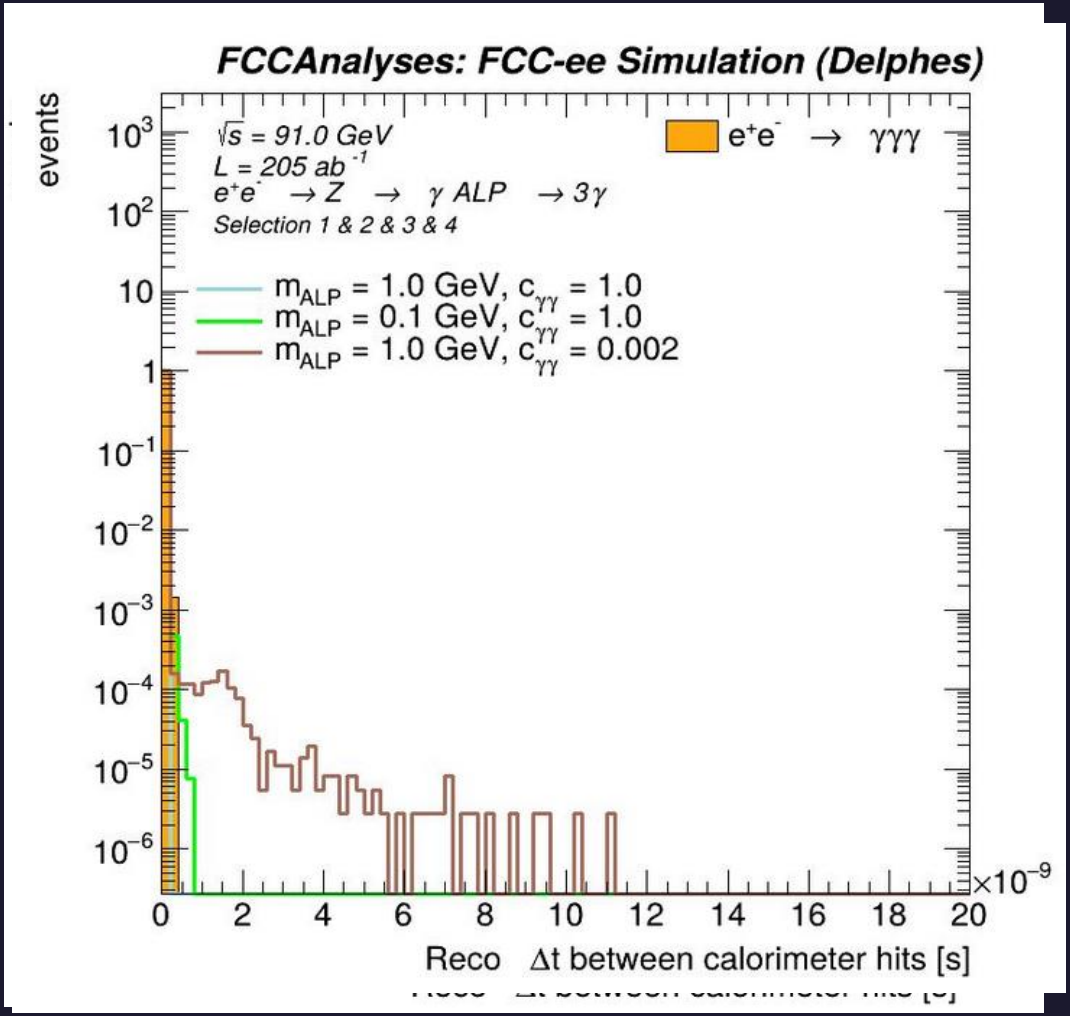
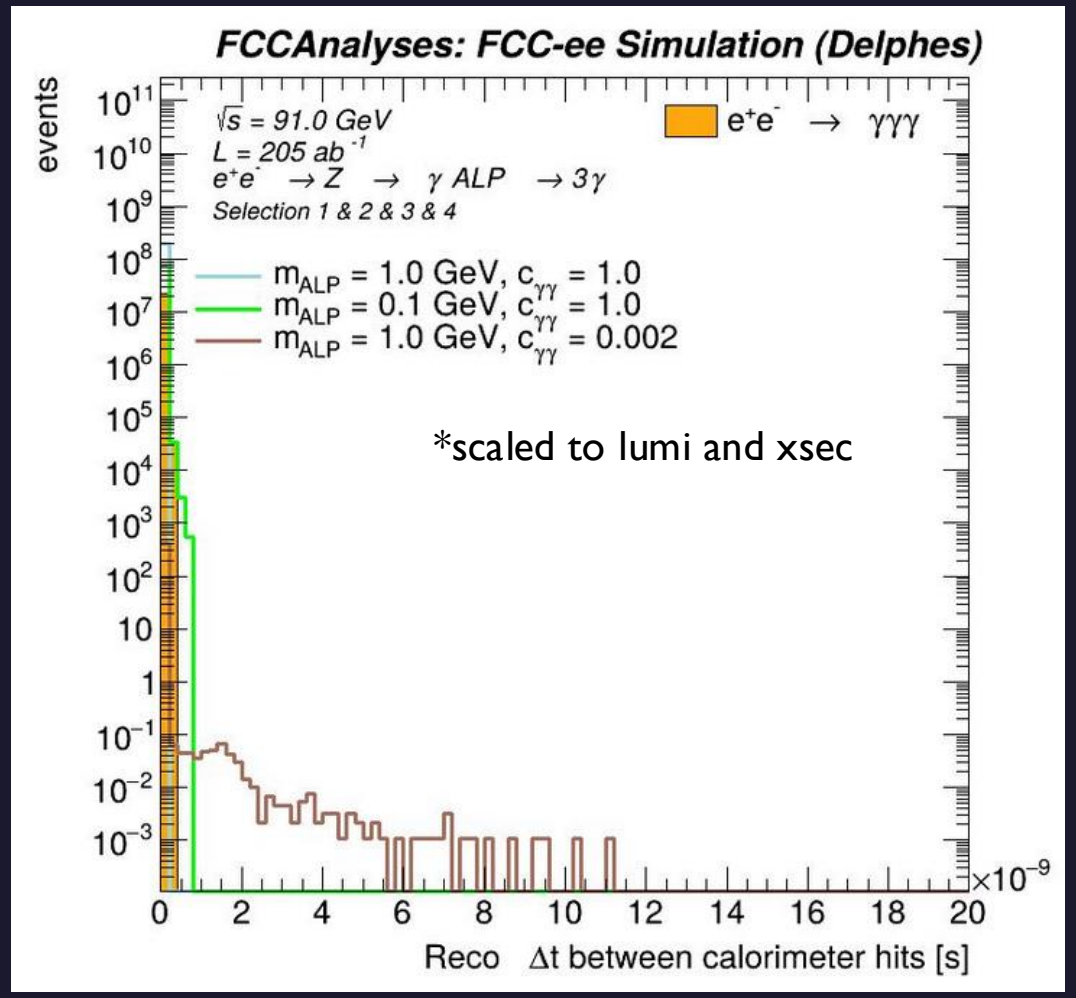
Delta time of calorimeter hits





Signal still peaking at 0

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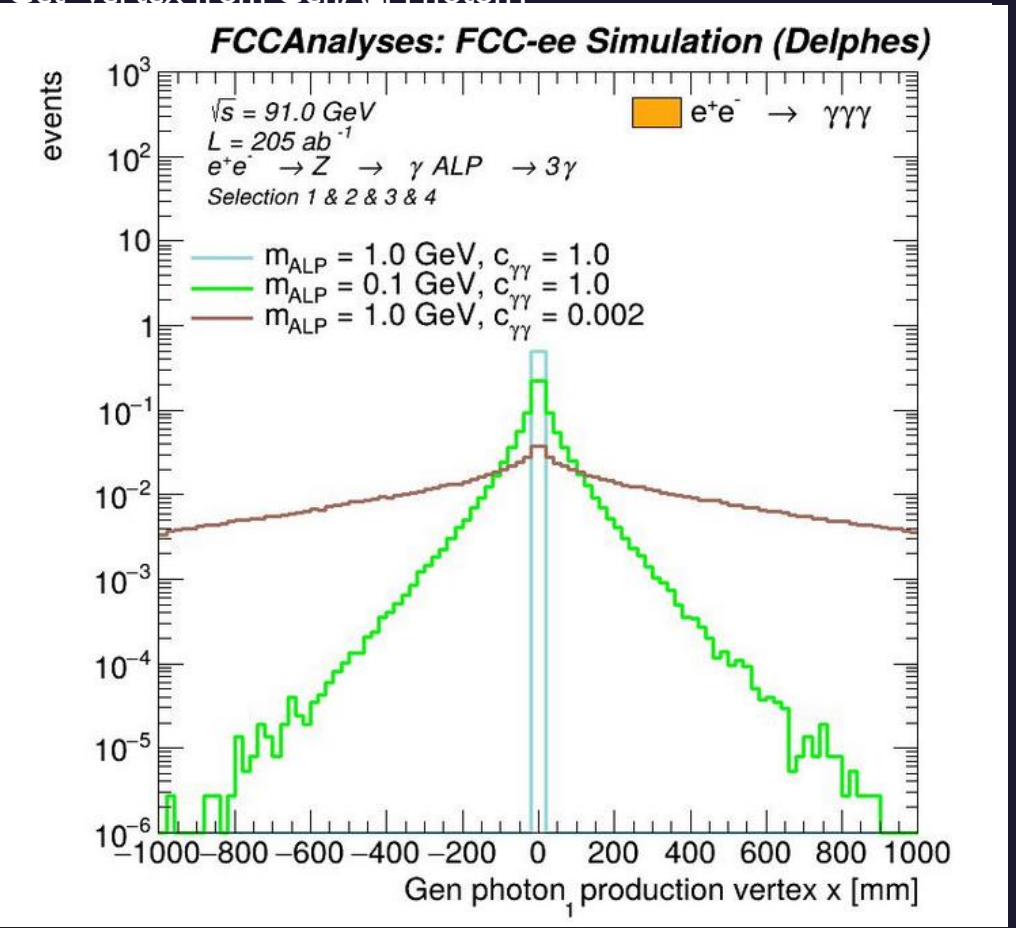
Gen photon_1 production vertex

Get_vertex from GenALPPhoton[



--> Even here peaking around 0. So making cuts on CalorimeterHit time would remove majority of the signal

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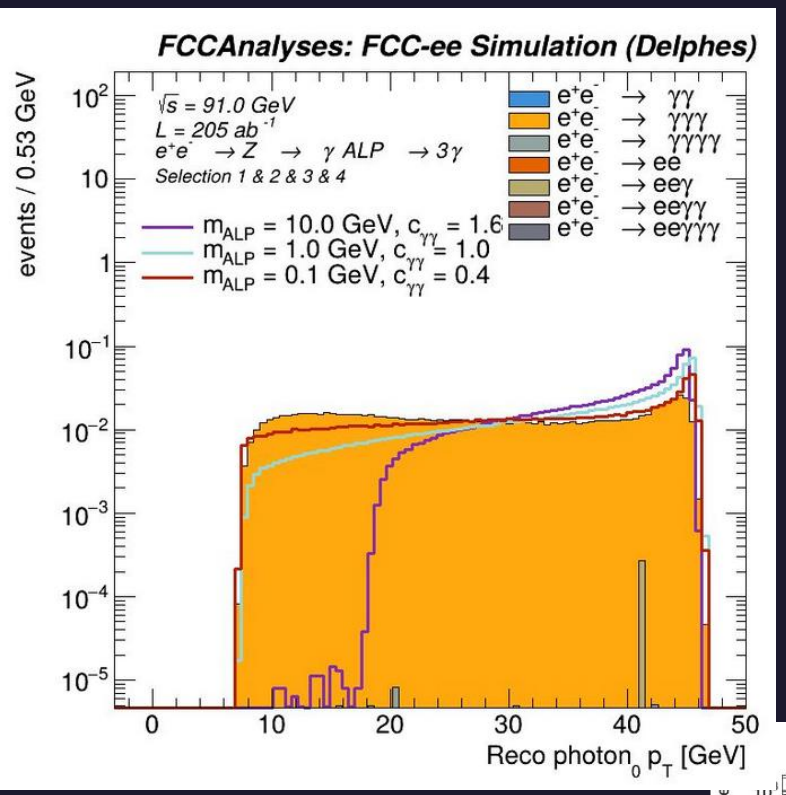
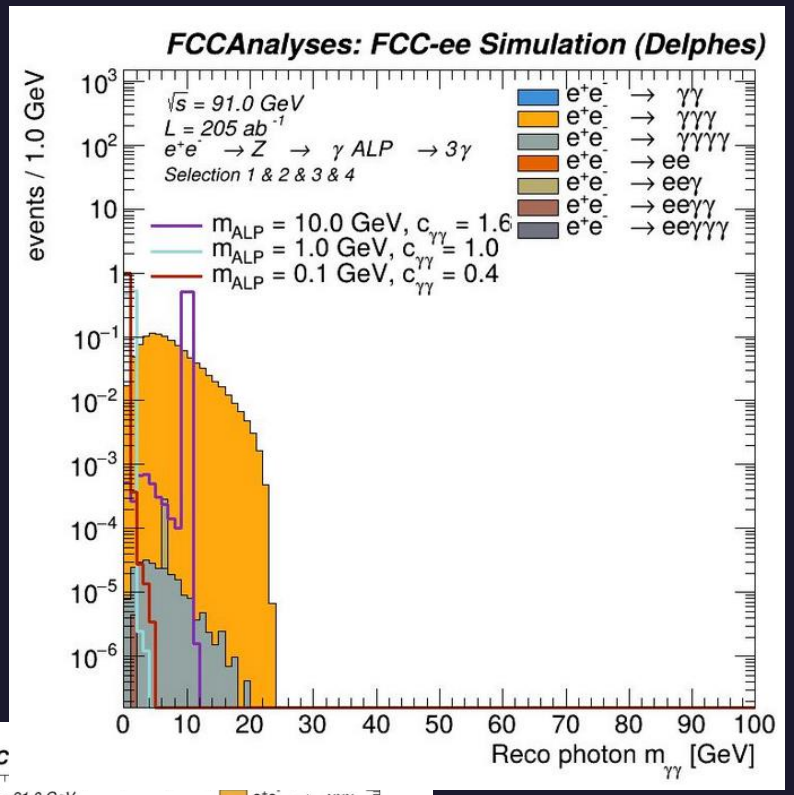
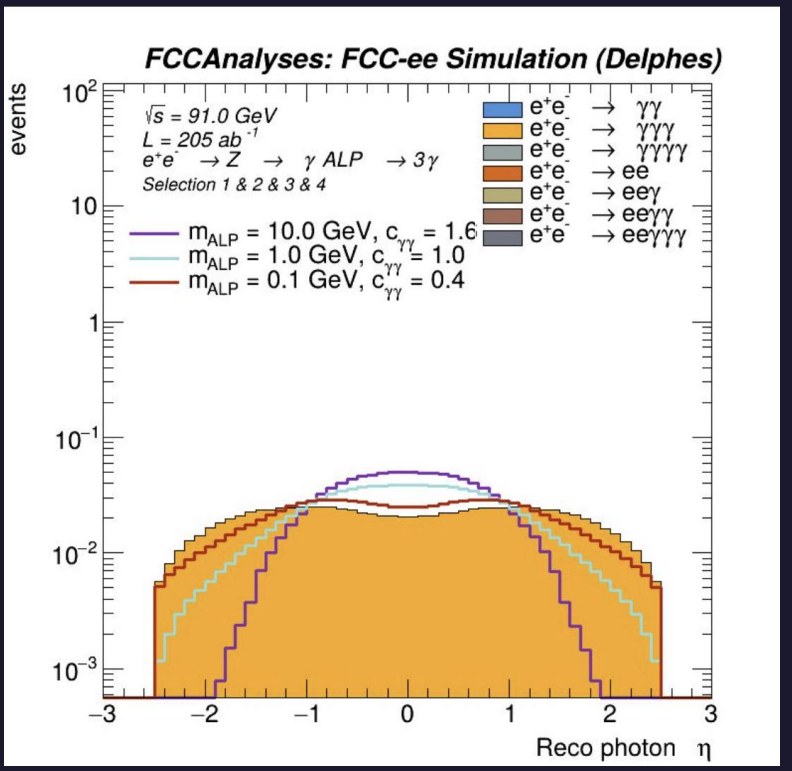
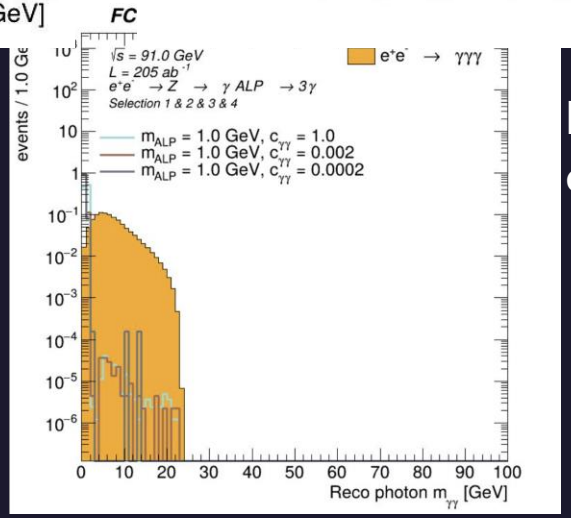
Further selections?









Reco mass of the 2 photons decaying from the ALP

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