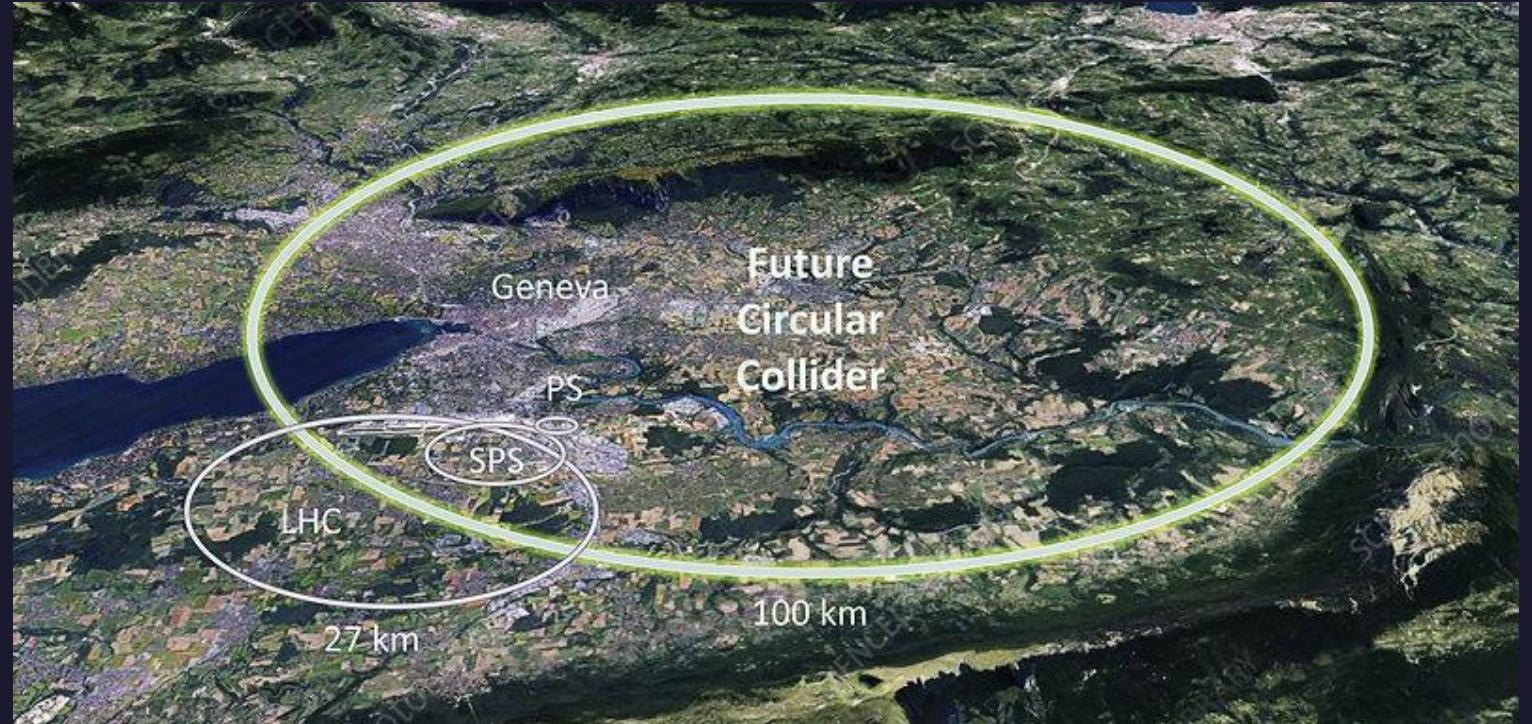


Long-lived axion-like particles at the FCC-ee

Weekly meeting with Juliette



Elnura Bakhishova

HELMHOLTZ

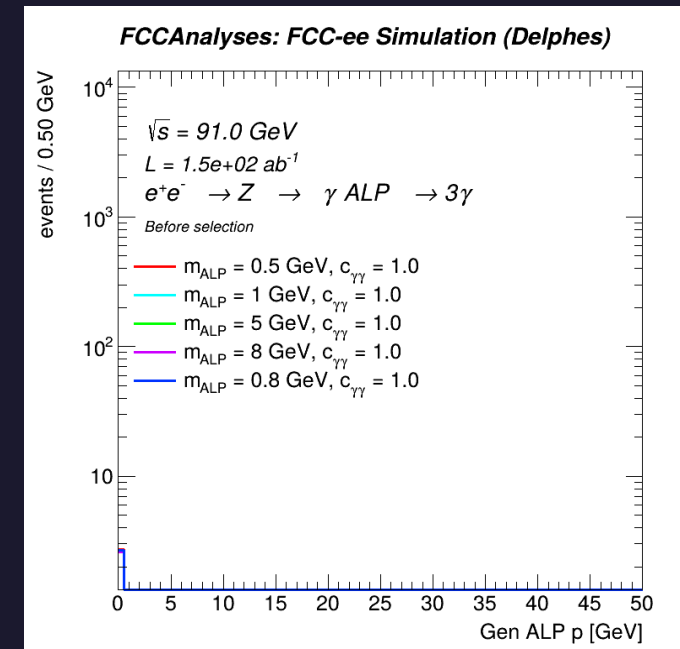
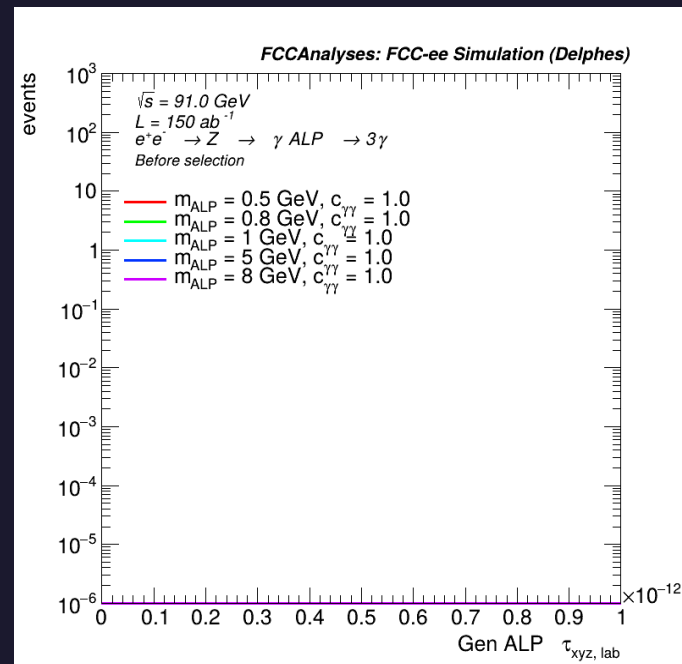
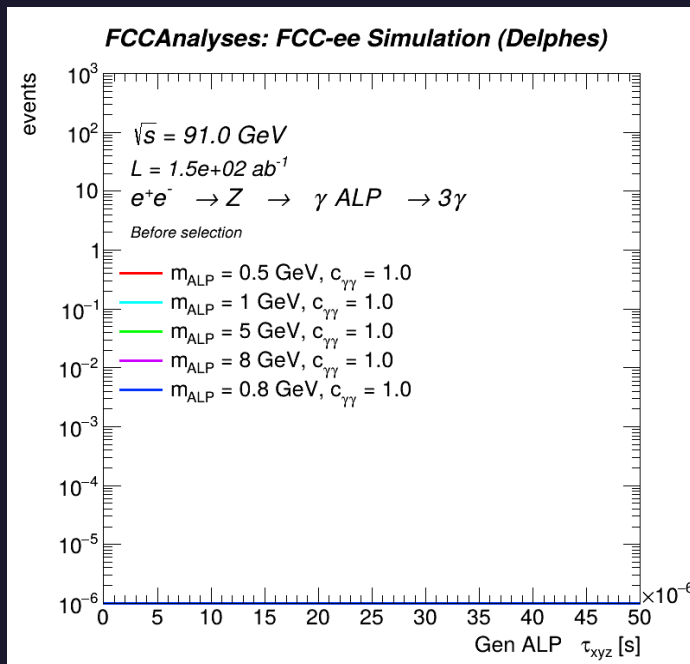
04.12.24



Progress

- Fixed normalization in do_plot.py and other plot display issues
- Worked on issue from last time: had no lifetime and momentum values for the ALP, decay length L_{xyz} was however fine

Output for momenta after running first analysis step were of order $\sim E-315$



Progress

Troubleshooting steps:

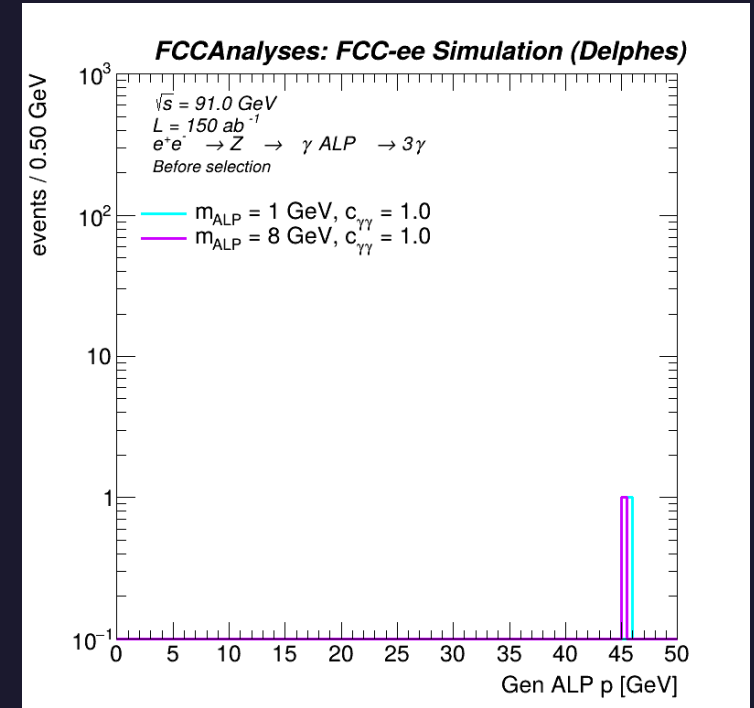
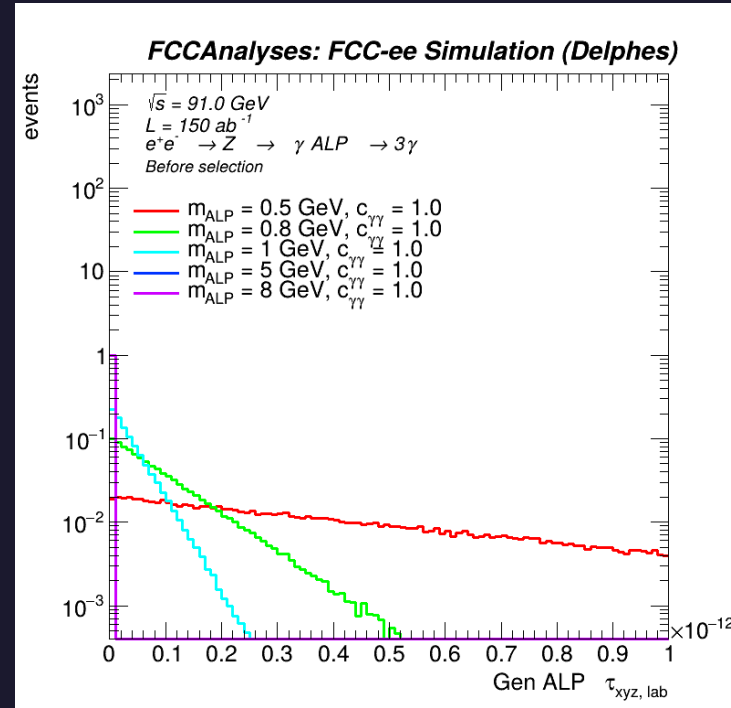
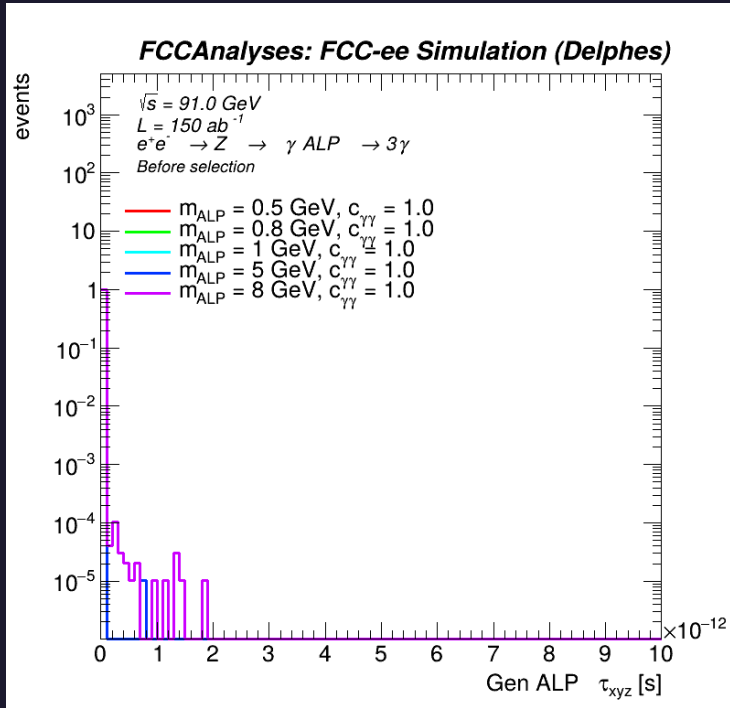
- 1) Check MadGraph output file (xxx.lhe) from Merlin --> momenta looked fine there
- 2) Issue appears after 1st analysis step (Pythia/Delphes) --> sth must have changed until that step
- 3) Check Pythia output by running PythiaDelphes for arbitrary xxx.lhe file from Merlin --> this creates new root files for the sample
- 4) Run 1st analysis step specifically for the new root file: error appears

```
-run analysis_stage1_new.py:  
-ERROR: no existing column _MCRecoAssociations_rec.index  
                        _MCRecoAssociations_sim.index  
-adjust names in analysis_stage1_new.py: _MCRecoAssociations_from.index  
                        _MCRecoAssociations_to.index
```

This part of the analysis seems to have changed in Pythia/Delphes which caused different outputs in the root file

- 5) Run 1st analysis step specifically for the new root file with adjusted code: runs successfully and have correct ALP momenta now

Progress



With newly generated rootfile using same MG output file

Conclusion: From now on:

Run MadGraph outputs from Merlin through Pythia one by one & save the new root file outputs of the samples in my personal eos space

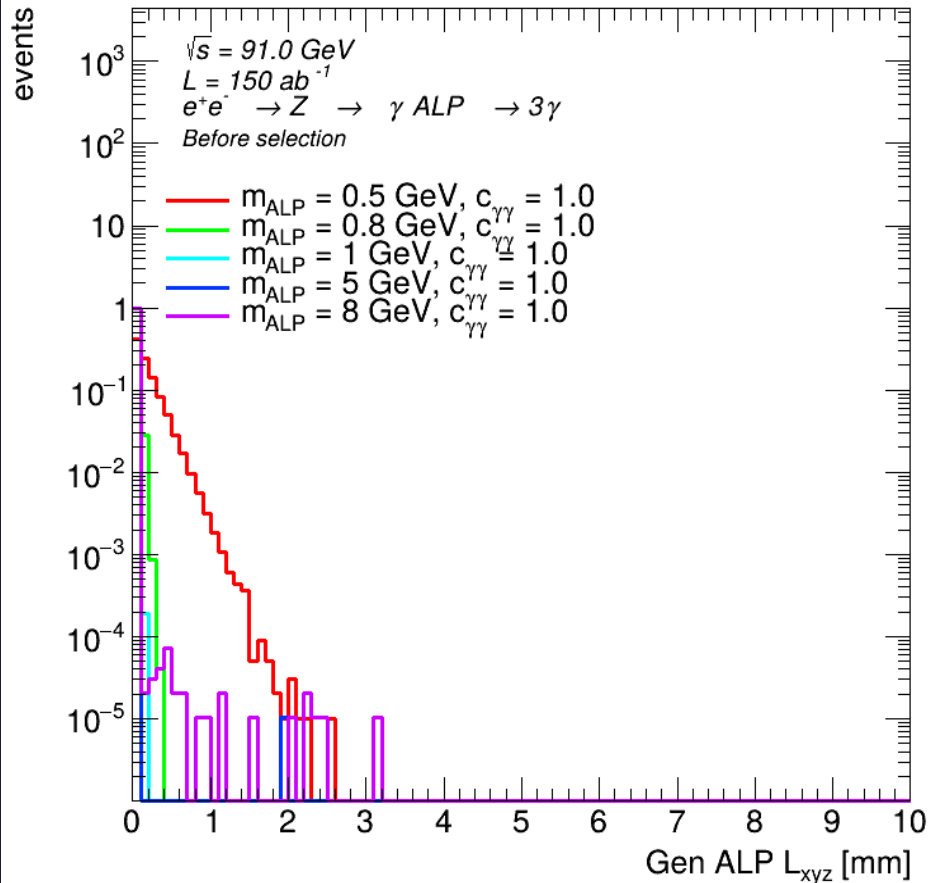
Use these new root files from now on for all following analysis steps

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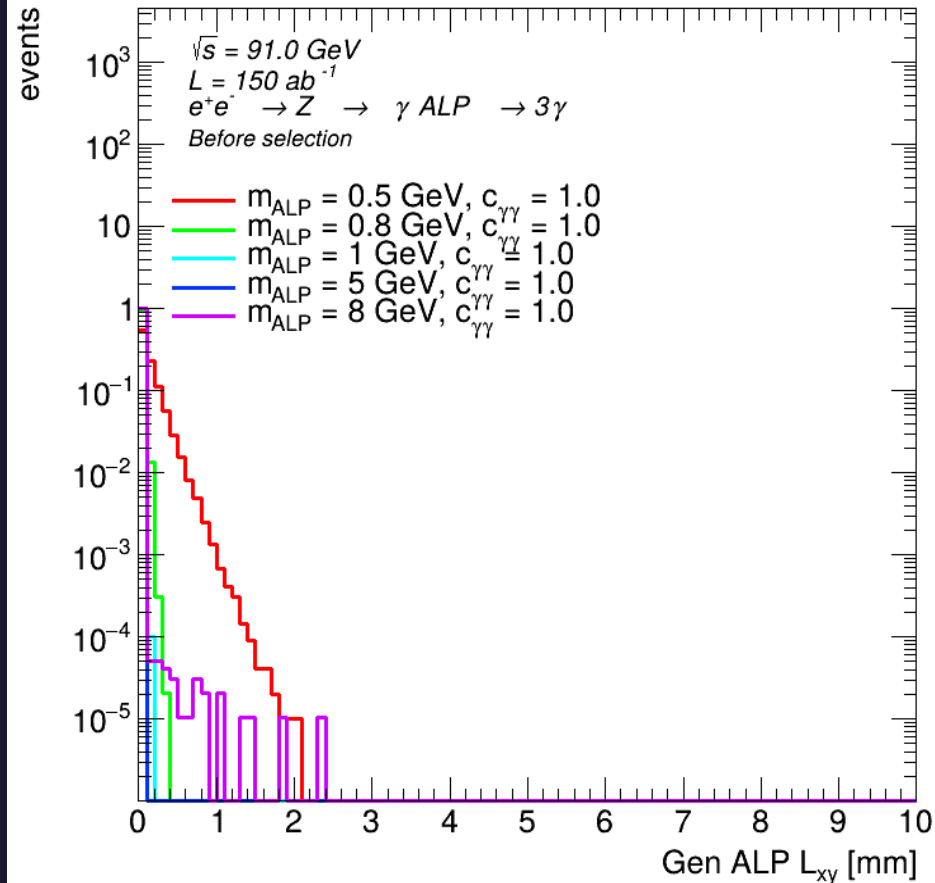
Comparison

FCCAnalyses: FCC-ee Simulation (Delphes)



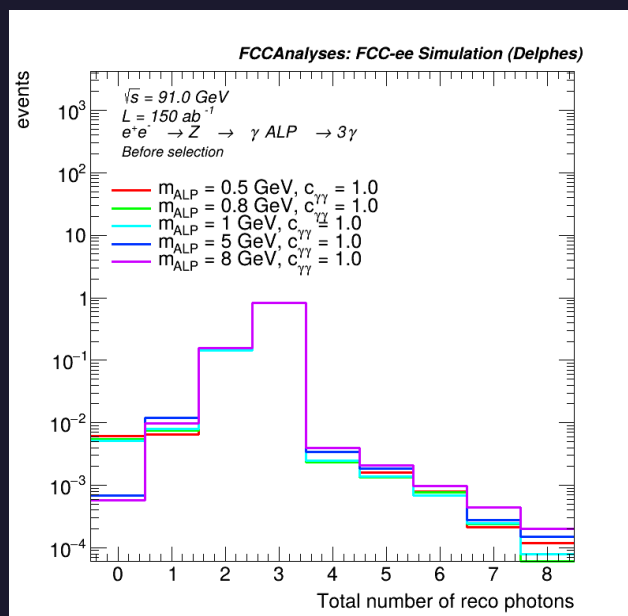
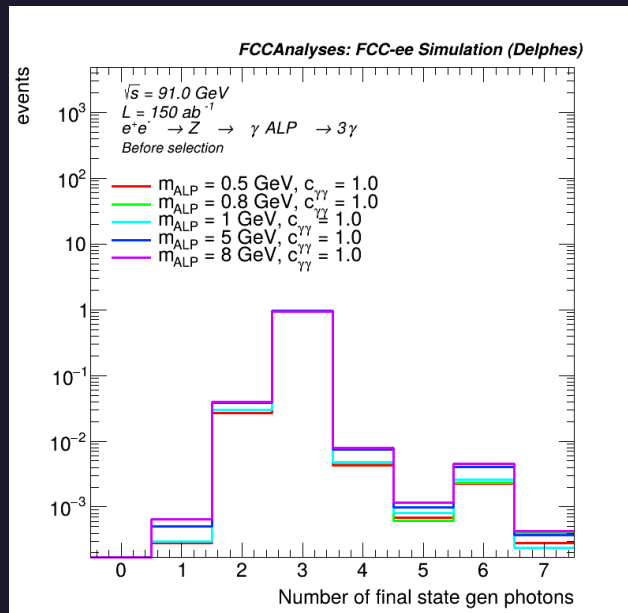
With Merlin's rootfile sample

FCCAnalyses: FCC-ee Simulation (Delphes)



With newly generated rootfile using same MG output file

With Merlin's rootfile sample

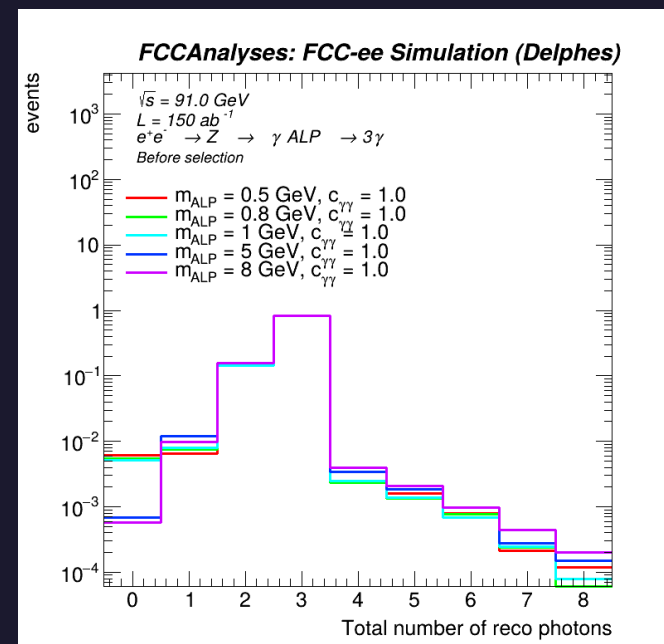
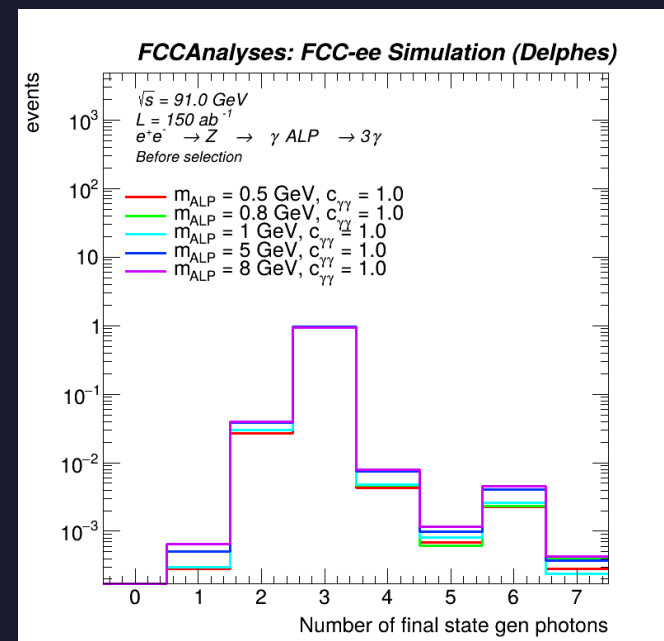


Comparison: # of photons

<----- Gen level ----->

<----- Recon level ----->

With newly generated rootfile using same MG output file



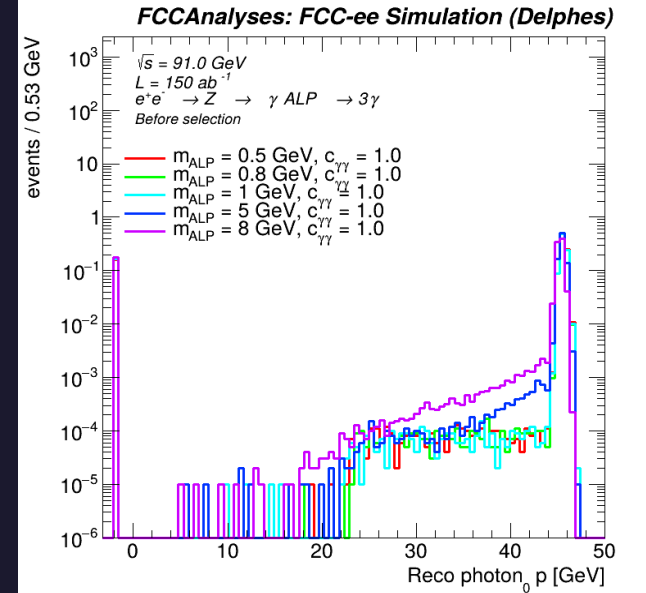
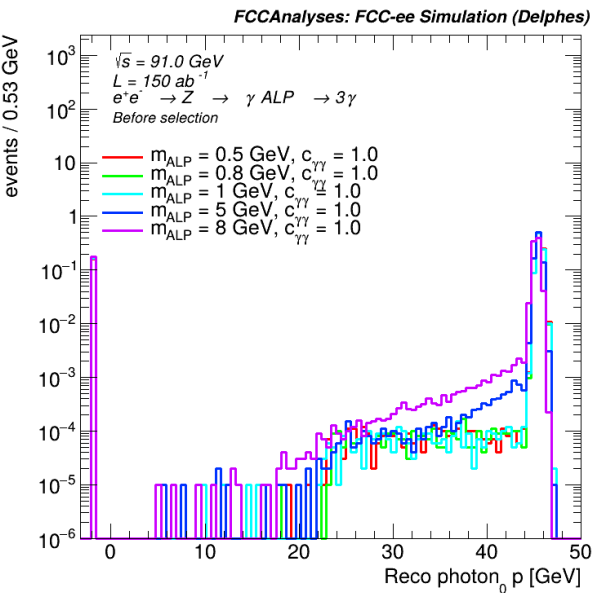
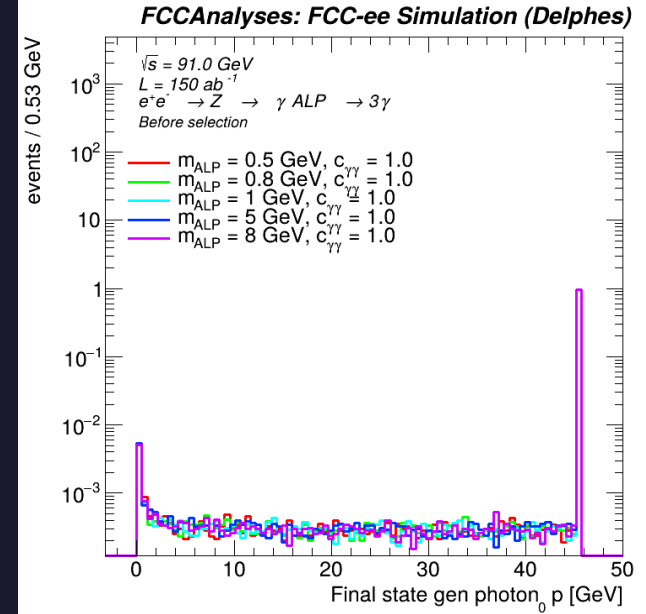
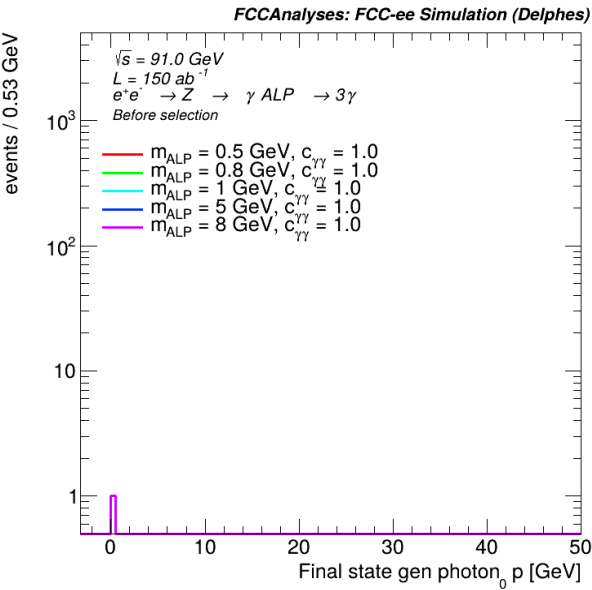
With Merlin's rootfile sample

Comparison: Photon momenta

With newly generated rootfile using same MG output file

<----- Gen level ----->

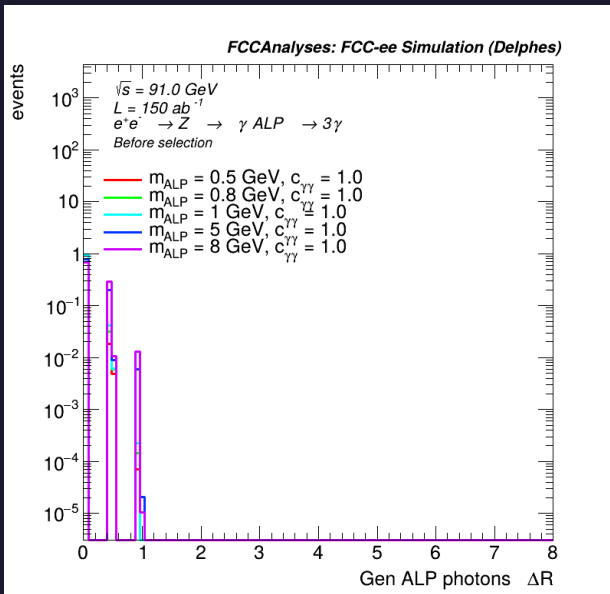
<----- Recon level ----->



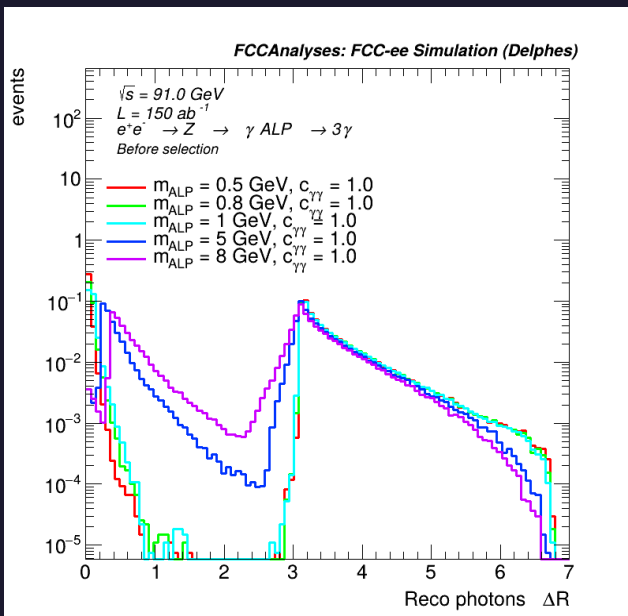
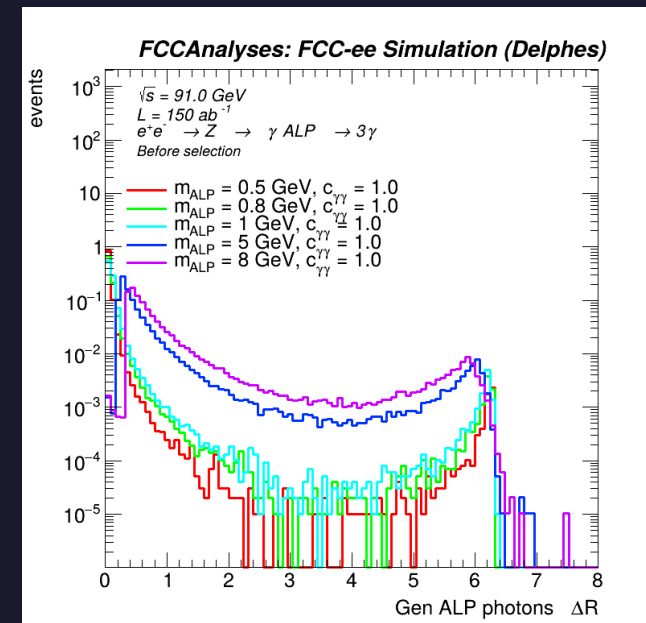
With Merlin's rootfile sample

Comparison: Delta R of photons

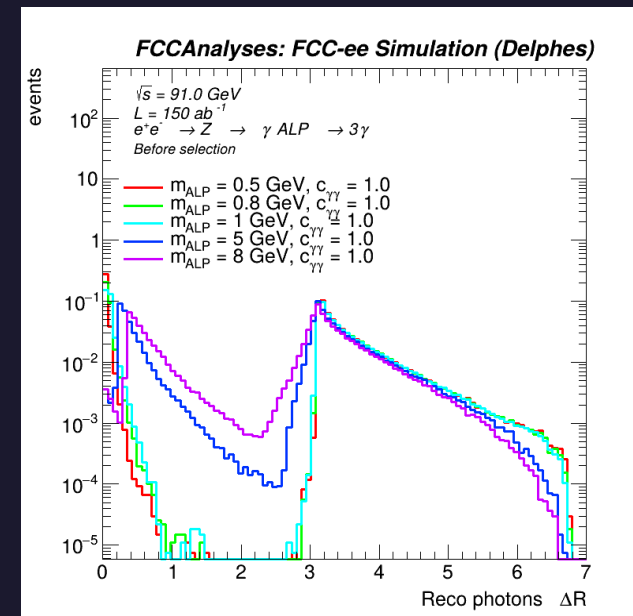
With newly generated rootfile using same MG output file



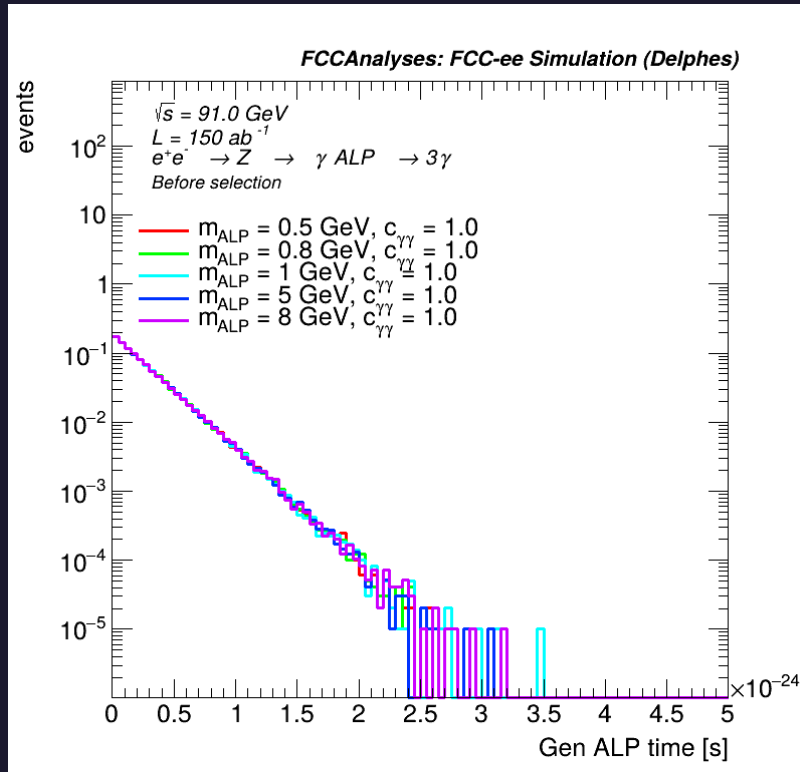
<----- Gen level ----->



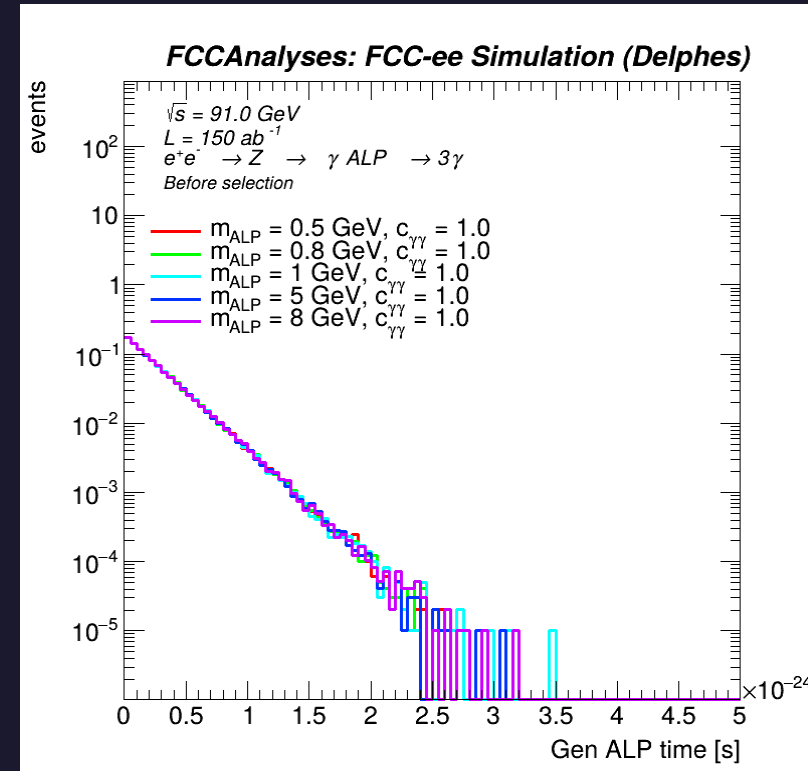
<----- Recon level ----->



Comparison: Z boson decay



With Merlin's rootfile sample



With newly generated rootfile using same MG output file