SPD update

Sanghwa Park

The issues we have

- We haven't managed to reproduce the previous study (for both FASPD and LASPD)

- Changes from the previous study:
  - collimator configuration
  - using HallD generator (issue remains when using wiser with the current configuration)

- Specification:
  - 5mm FASPD, r (96, 210) [cm]
  - 2cm LASPD, r (80, 135) [cm]

Reminder

- Rejection factor = Total events / (total Edep> cut)

- Total Edep on SPD is obtained by

  Edep from forward going pi0 decay photons

  + Edep from EM contribution/#Segments

  + Edep from backscattering

- EM contribution is obtained for the entire SPD plane (average effect), and summed for total # of electrons and photons within a given time window

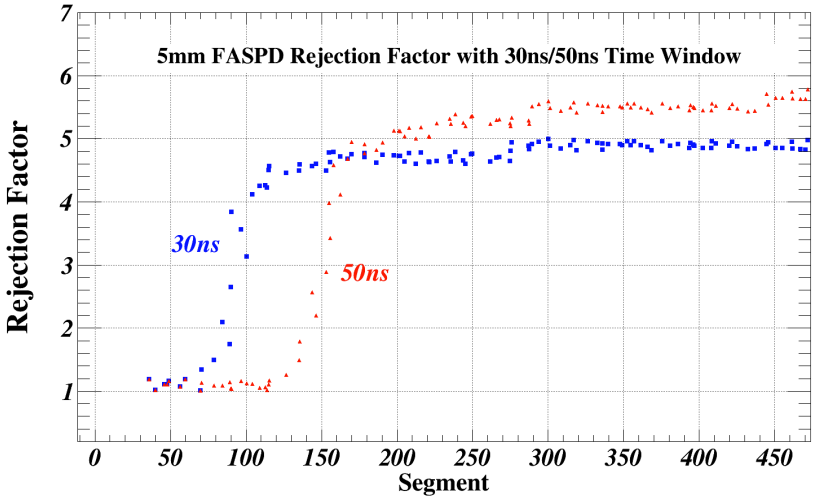
- This study does not take into account correlations. This should be carried out later on.

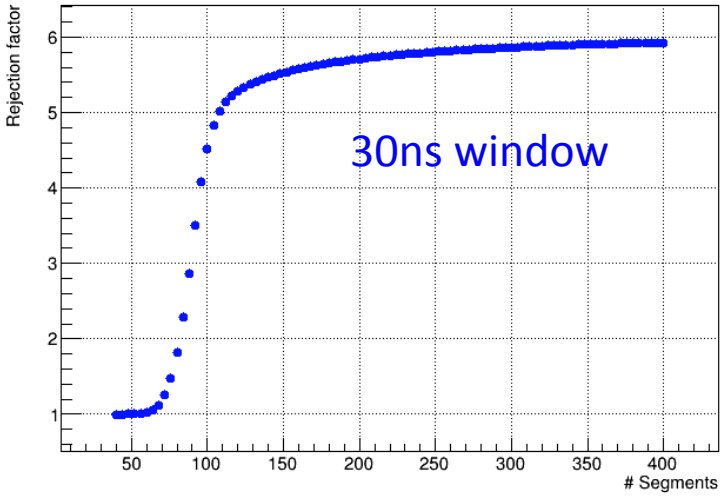
What we know so far

- We can reproduce Zhihong's results if we use his tree output file
- There are differences between Zhihong's tree output and my output (using the latest MC)
- The energy deposit distributions from forward going pi0 decay photons are similar
- The differences are mainly:
  - different integrated rates
  - different photon Edep distribution
  - significant difference in the back scattering contribution (report today)

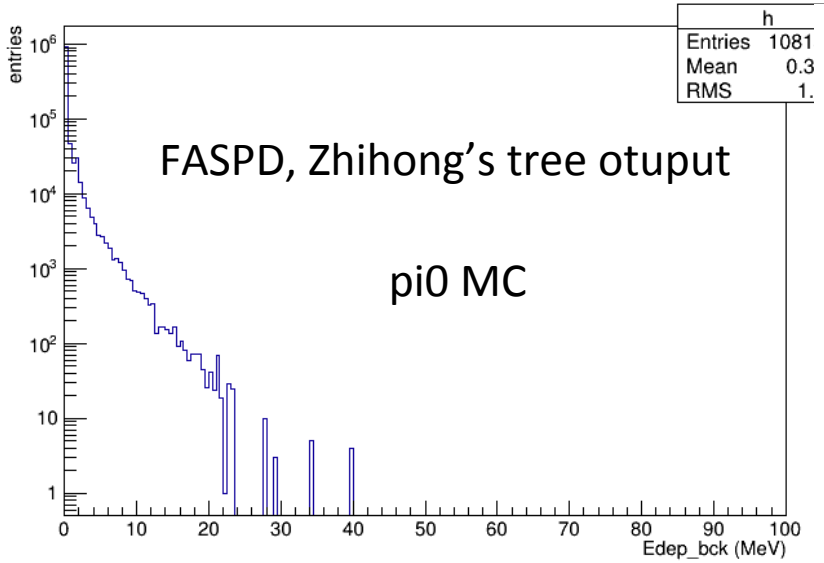
Check with outputs available from the previous study

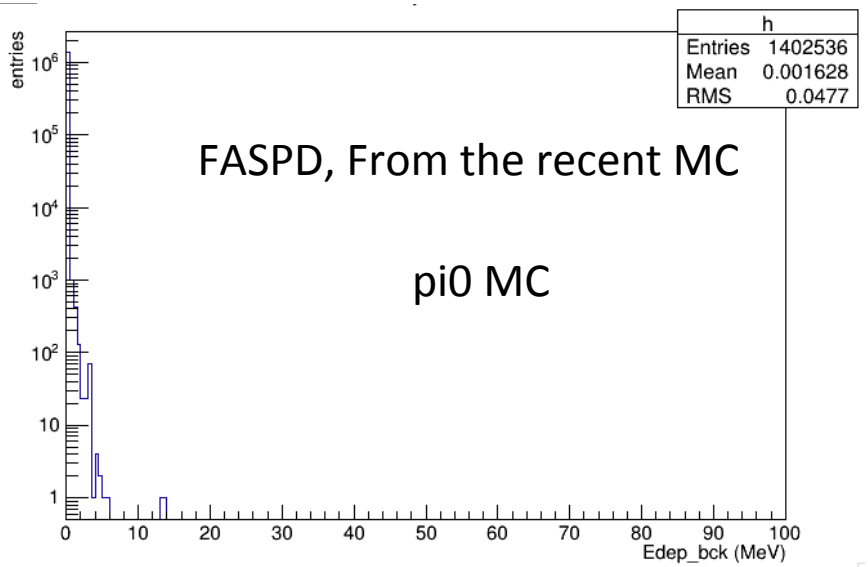
- Raw simulation output files that were used for the previous study are not available.
- Limited xcheck with some analysis outputs for FASPD.





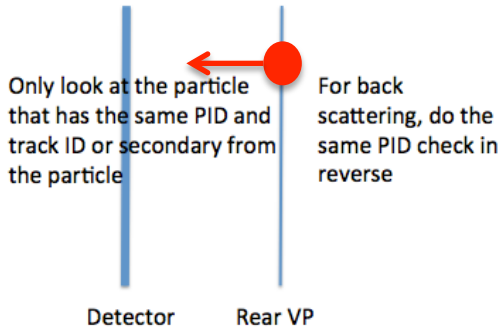
- We still do not see much dominant backscattering contribution from the recent work
- early problem with almost zero backscattering contribution solved. (fed by wrong tree (flux) instead of spd tree from the simulation output)
- We do still have smaller backscattering contribution





Check all backward particles (FASPD)

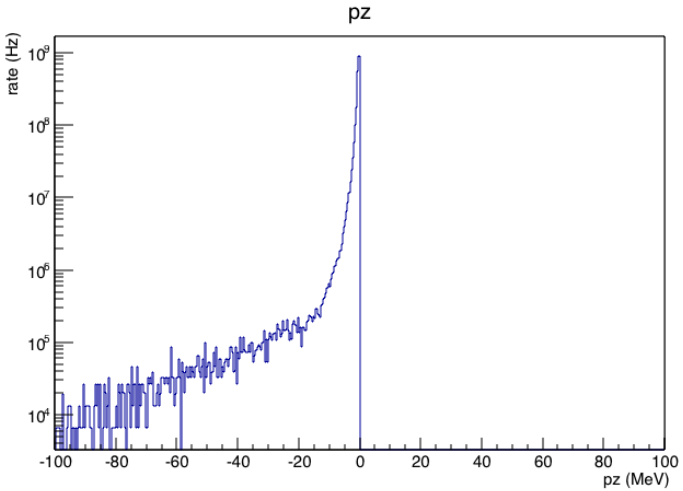
- Checked all backward particles and energy deposit on the FASPD.
  1) pz checked at the virtual rear plane (1mm virtual plane right behind of the FASPD), and only select ones with pz < 0



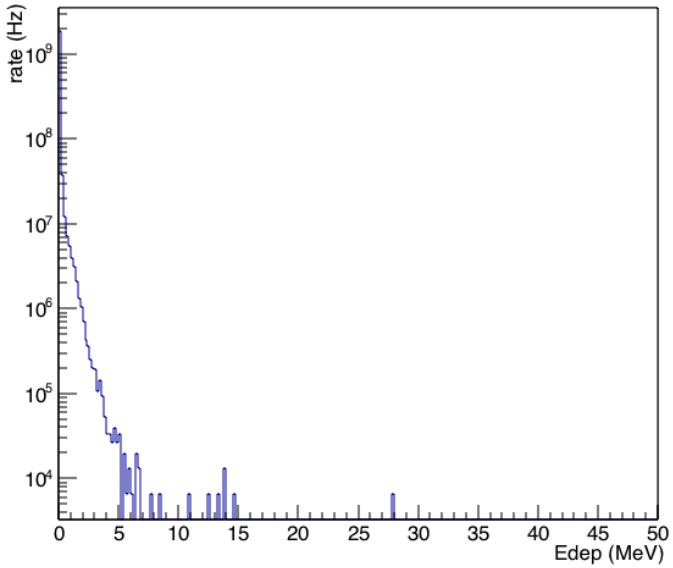
  2) Checked PID and track ID at FASPD for each backward particle from the rear virtual plane.

  3) Sum energy deposit in the FASPD for the particle/secondary.

- Processed for 1M pi0.



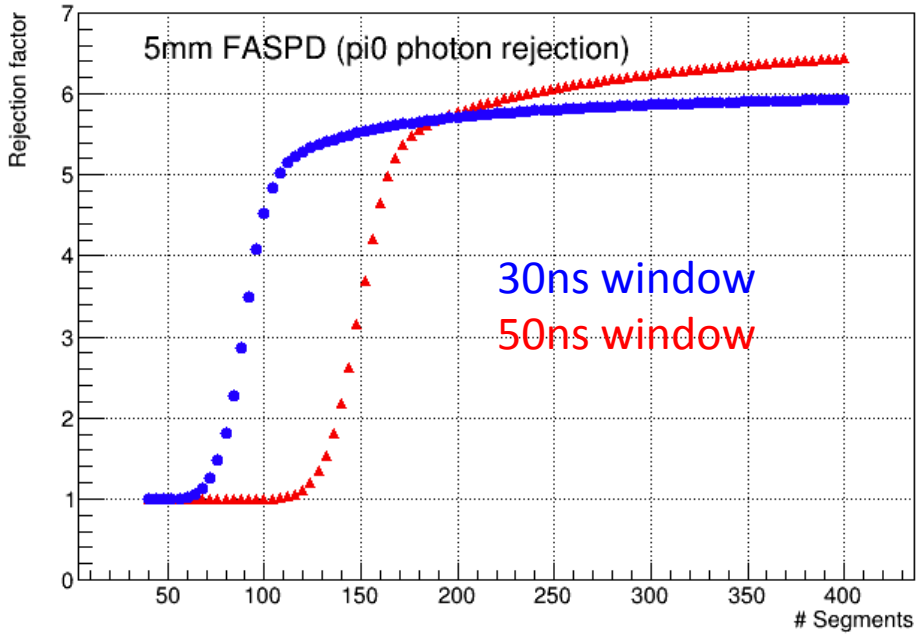
Edep from backward

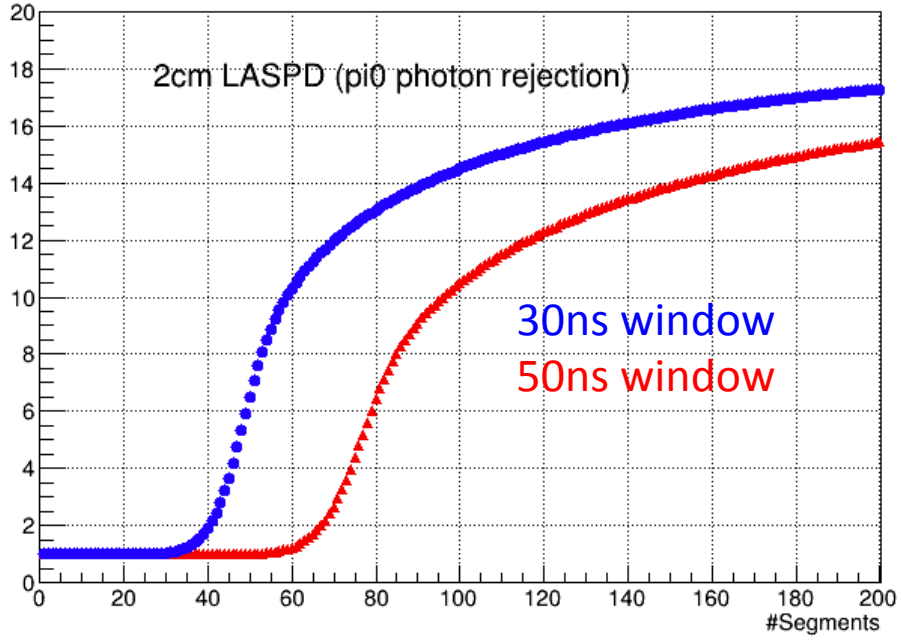


- Current pi0 simulation does not have the Edep distribution reaching to higher Edep region as the previous study
- Simulation for the current study uses the different collimator. Checked pi0 simulation output with pure W collimator, but didn't really see much difference.
- Move on and get the result with the latest simulation. Probably we want to do our own study taking into account correlation and r-dependence, etc.

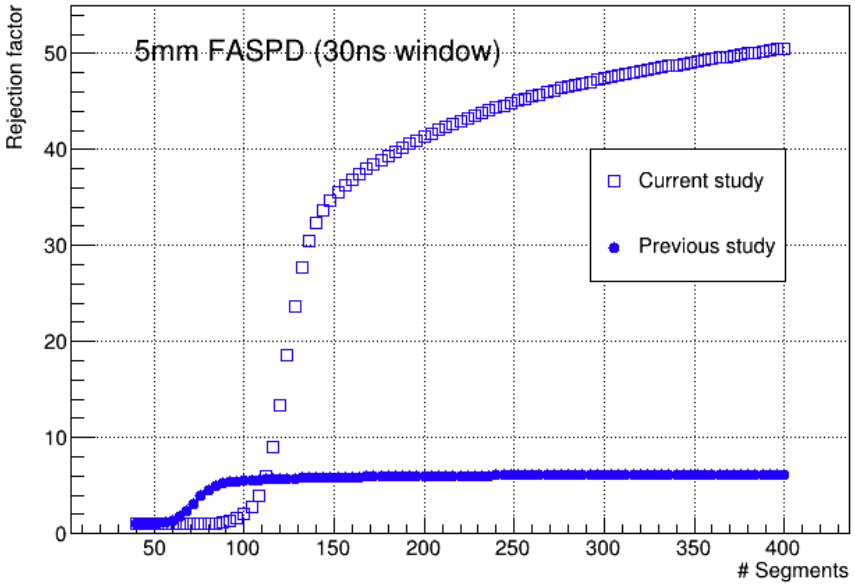
Zhihong's scan result

- plot using text output files from Zhihong's study
- Rejection factor = Total events / (total Edep> cut)



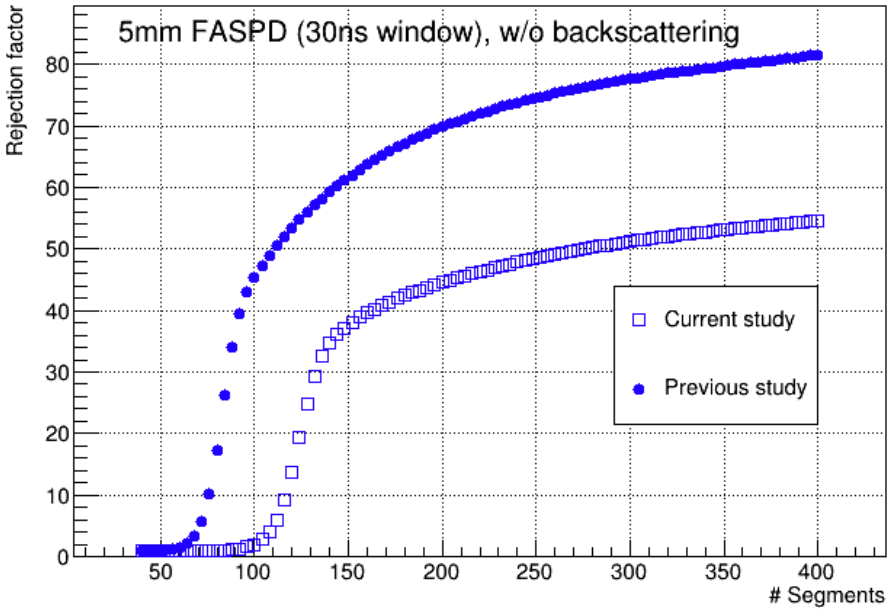


FASPD (30ns), Cut=0.86/2



↑ with backscattering contribution added.

total Edep = Edep_forward + EMBG/#Segments + Edep_back

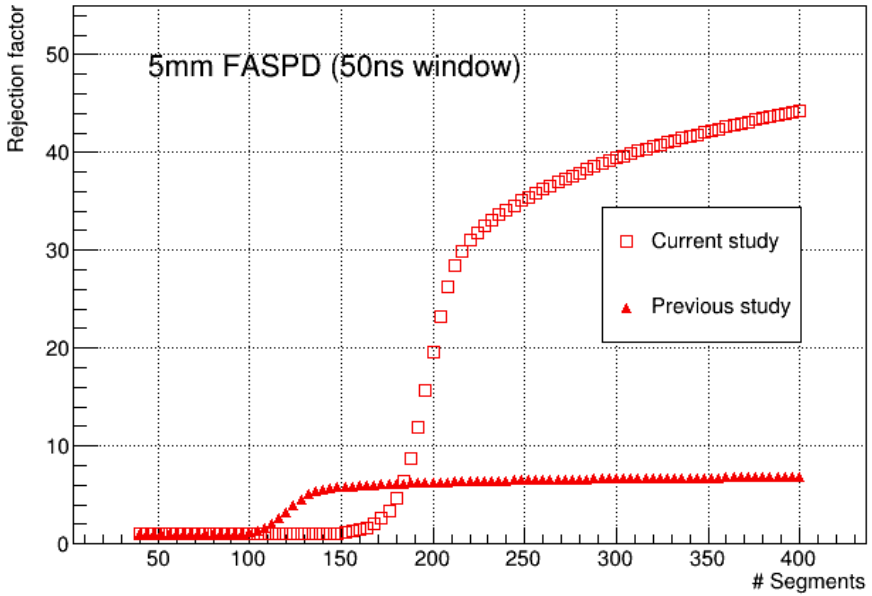


↑ without backscattering contribution added.

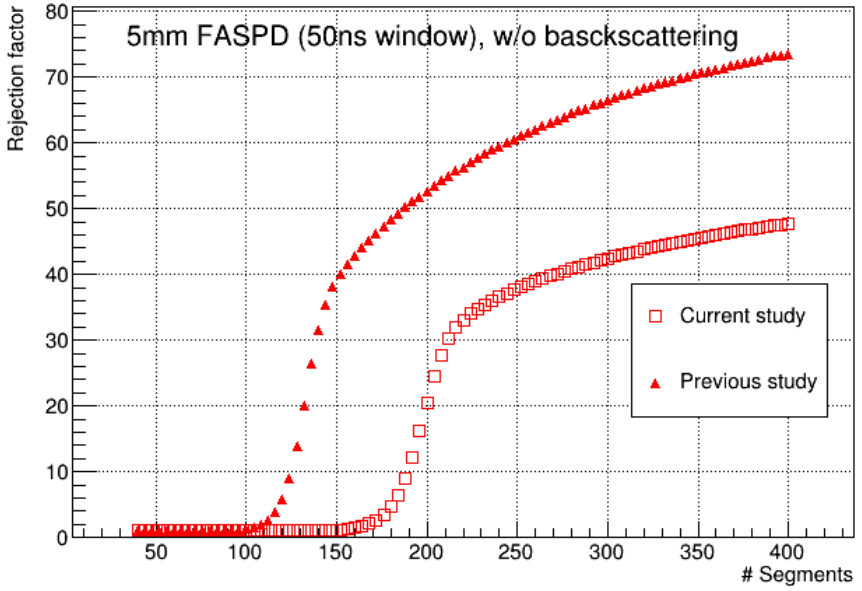
turn-on point is also quite different

FASPD (50ns), Cut=0.86/2

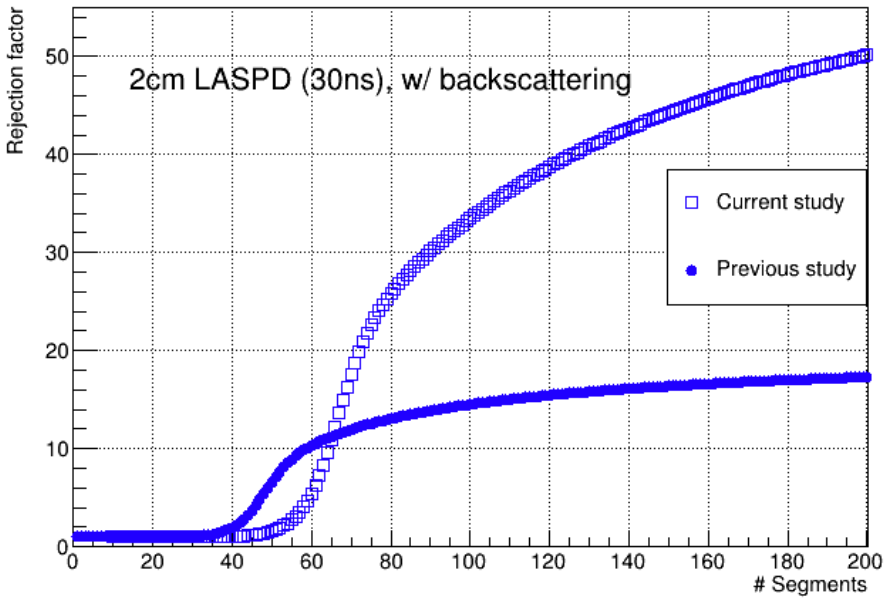
with backscattering contribution added

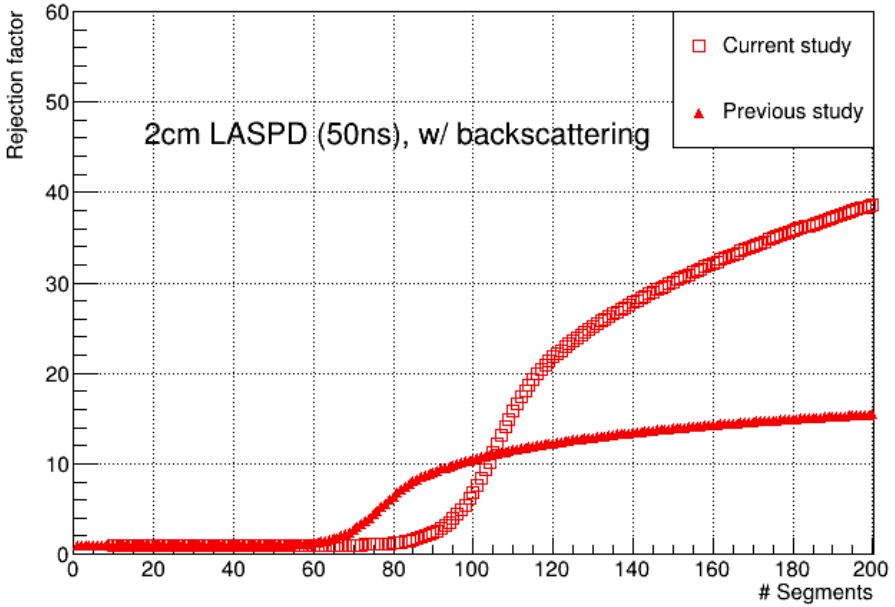


w/o backscattering contribution added



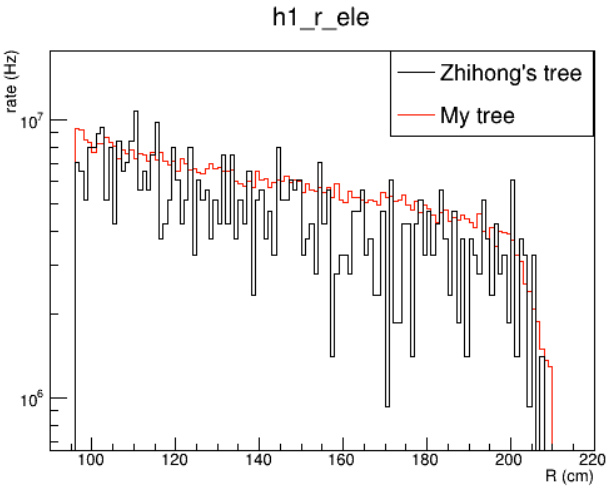
LASPD, Cut = 3.82/2

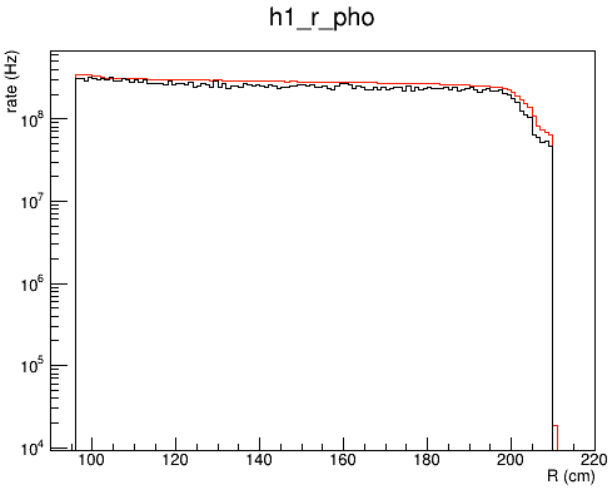


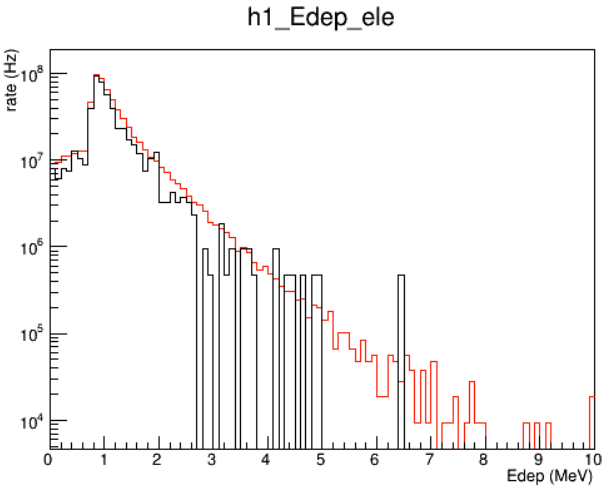


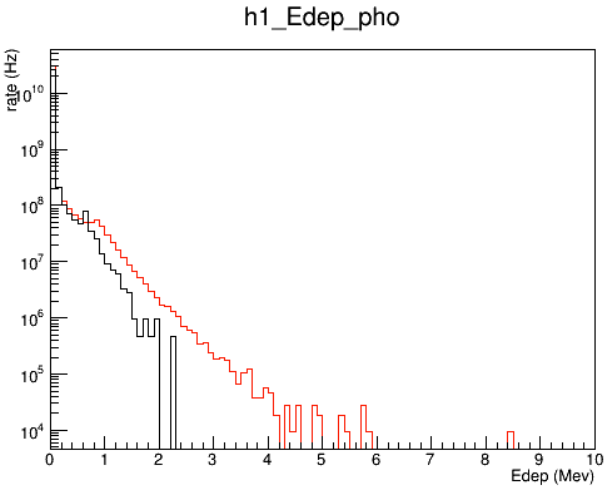
backup

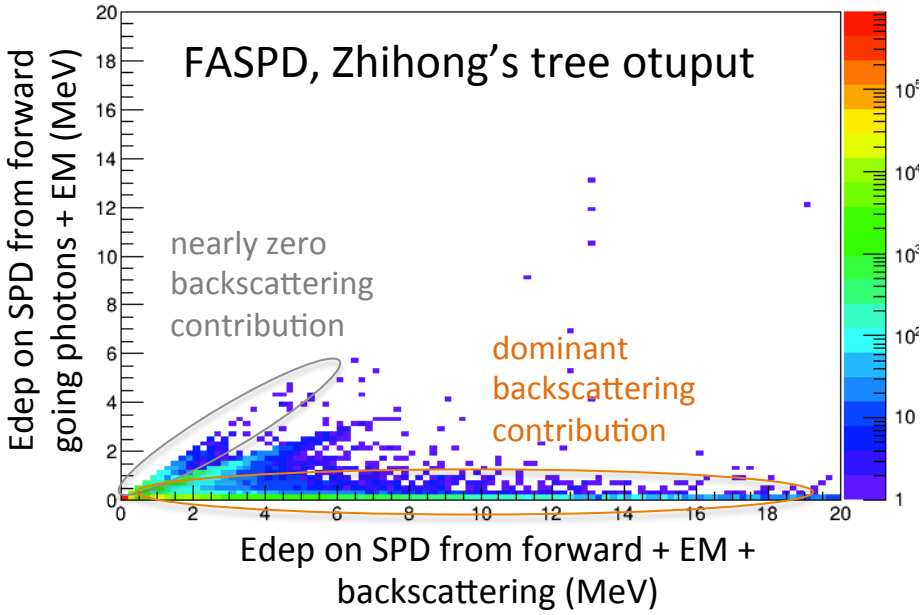
EM (FASPD)

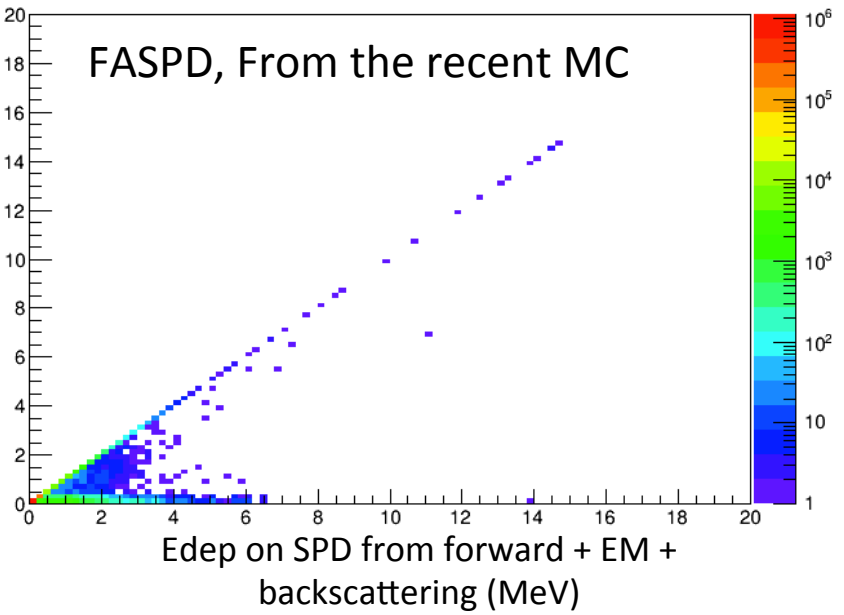

h1_r_ele
Zhihong's tree
My tree
rate (Hz)
R (cm)


h1_r_pho
rate (Hz)
R (cm)

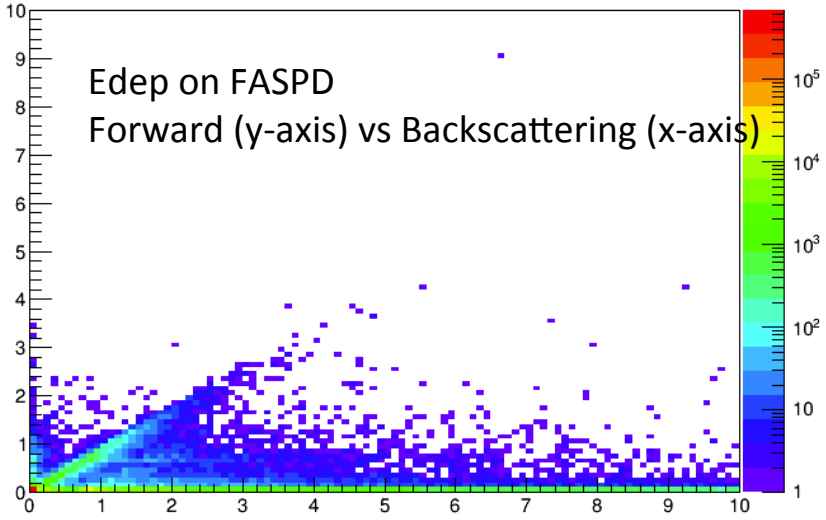

h1_Edep_ele
rate (Hz)
Edep (MeV)


h1_Edep_pho
rate (Hz)
Edep (Mev)


FASPD, Zhihong's tree otuput
nearly zero backscattering contribution
dominant backscattering contribution
Edep on SPD from forward going photons + EM (MeV)
Edep on SPD from forward + EM + backscattering (MeV)

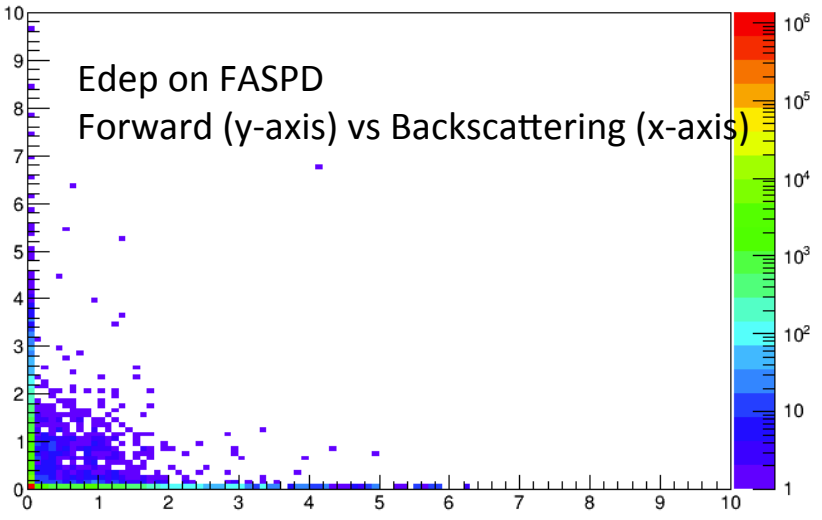

FASPD, From the recent MC
Edep on SPD from forward + EM + backscattering (MeV)

previous study



Edep from backscattering contribution (MeV)

current stutdy



Edep from backscattering contribution (MeV)

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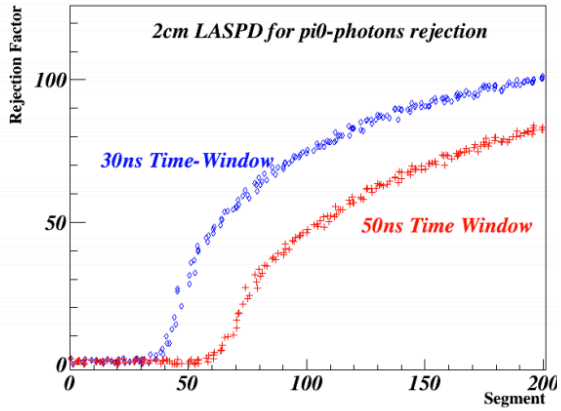
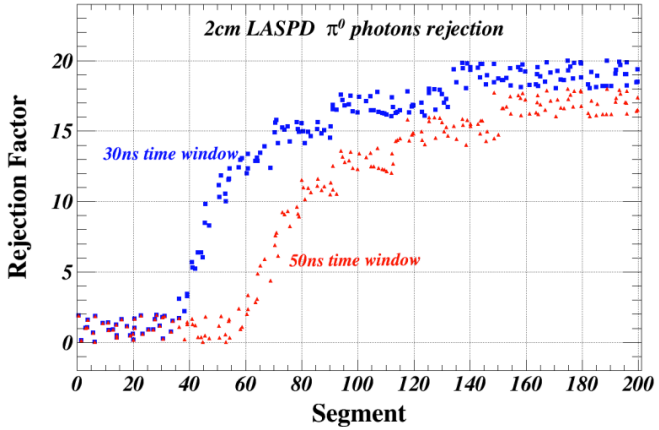
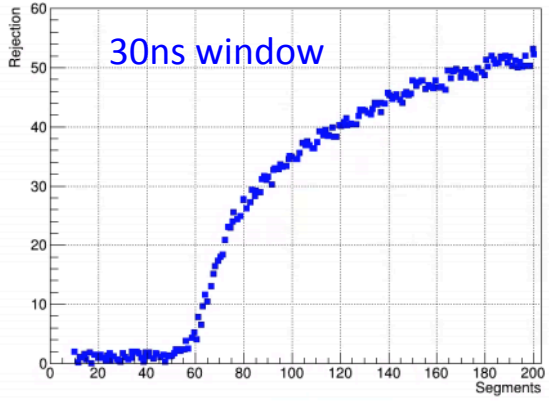
Adding the backward scattering





LASPD



https://userweb.jlab.org/~yez/Work/solid/new_spd_study.pdf