PVDIS Backgrounds Study Updates

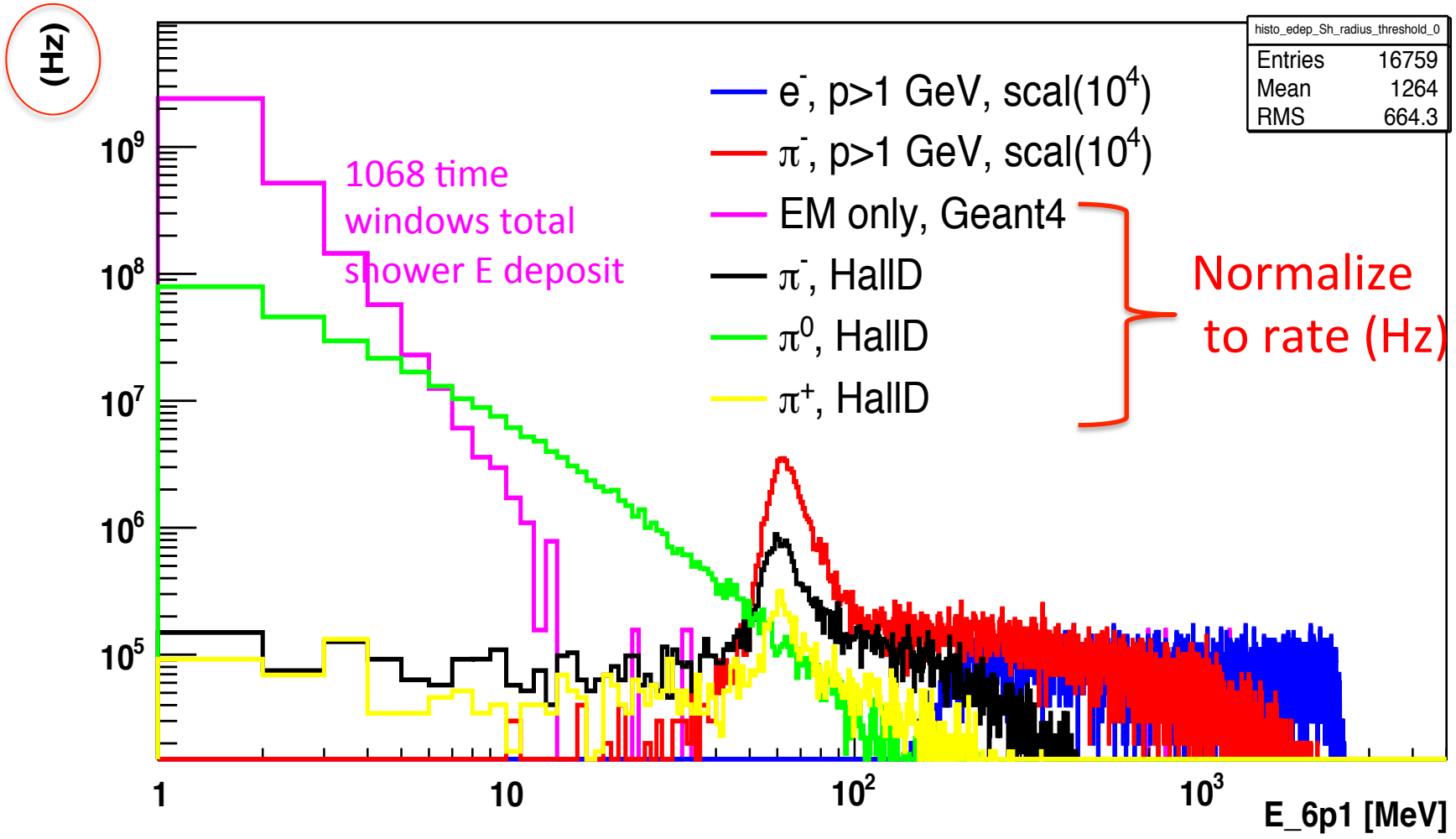
11/13/2017

Previous Problem

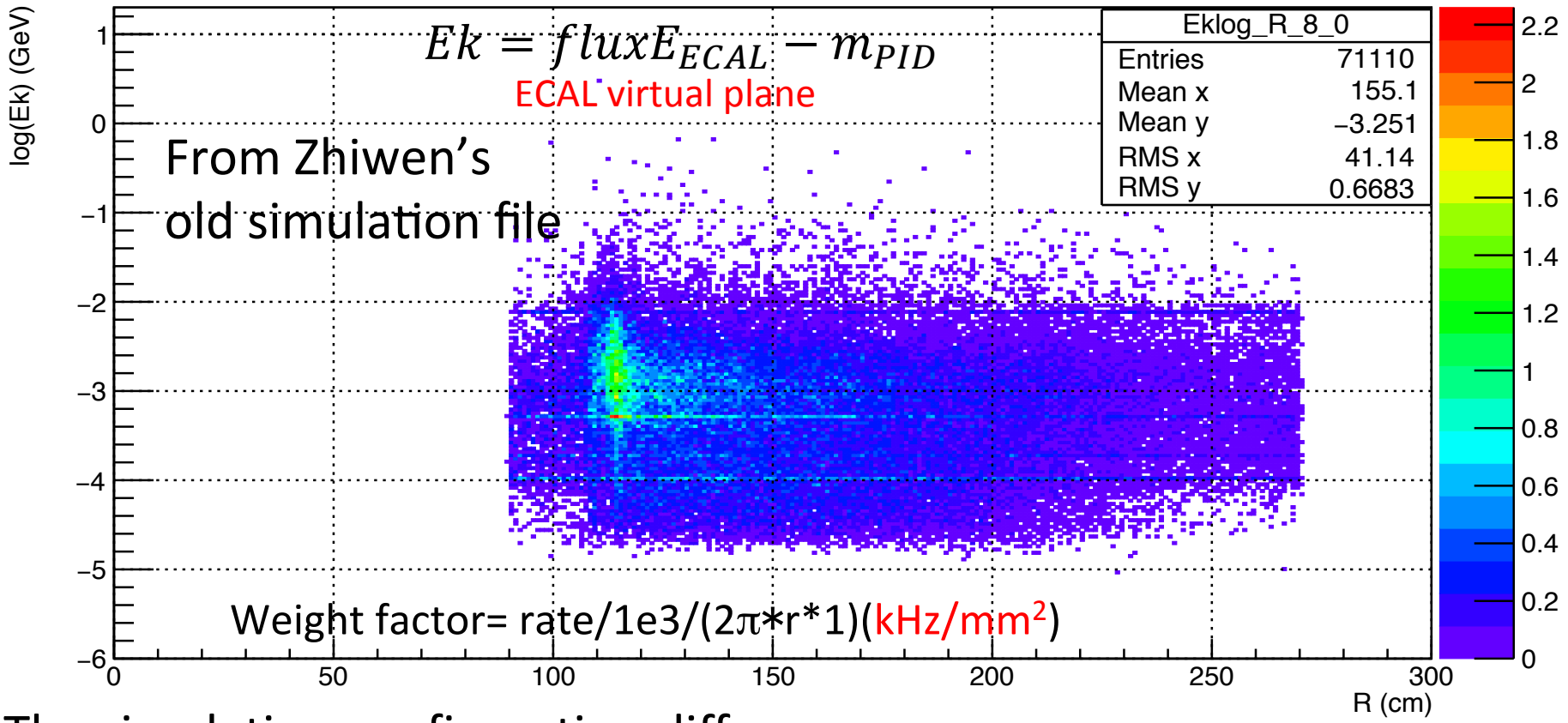
Shower Scintillator 6p1 cluster Deposit E for backgrounds

PVDIS configuration

R=120 cm



ECAL flux information

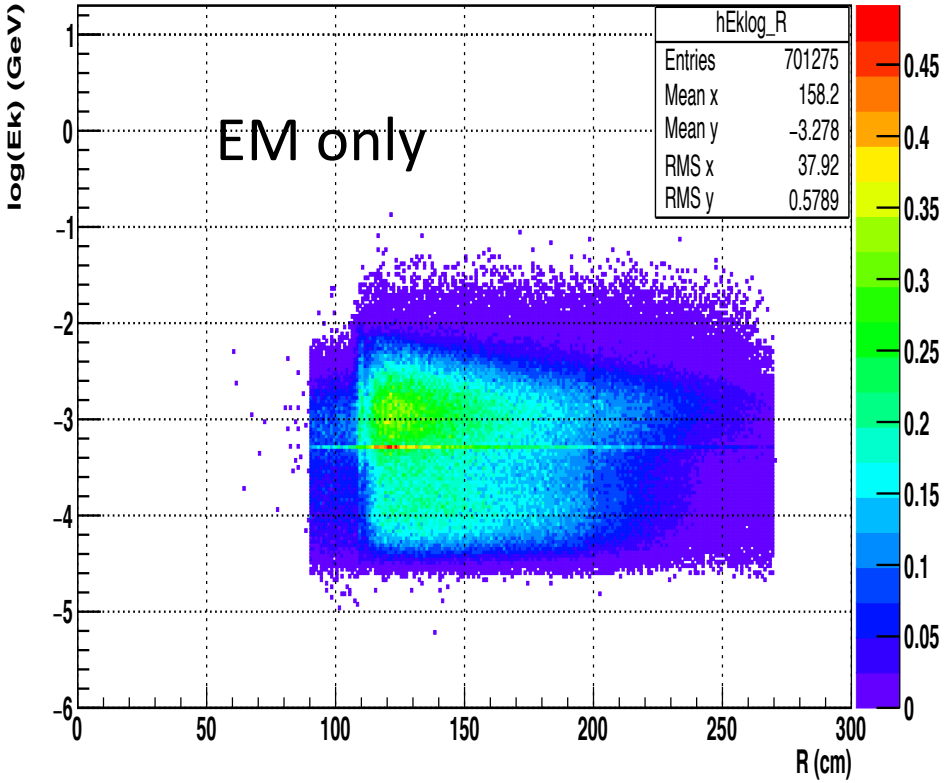


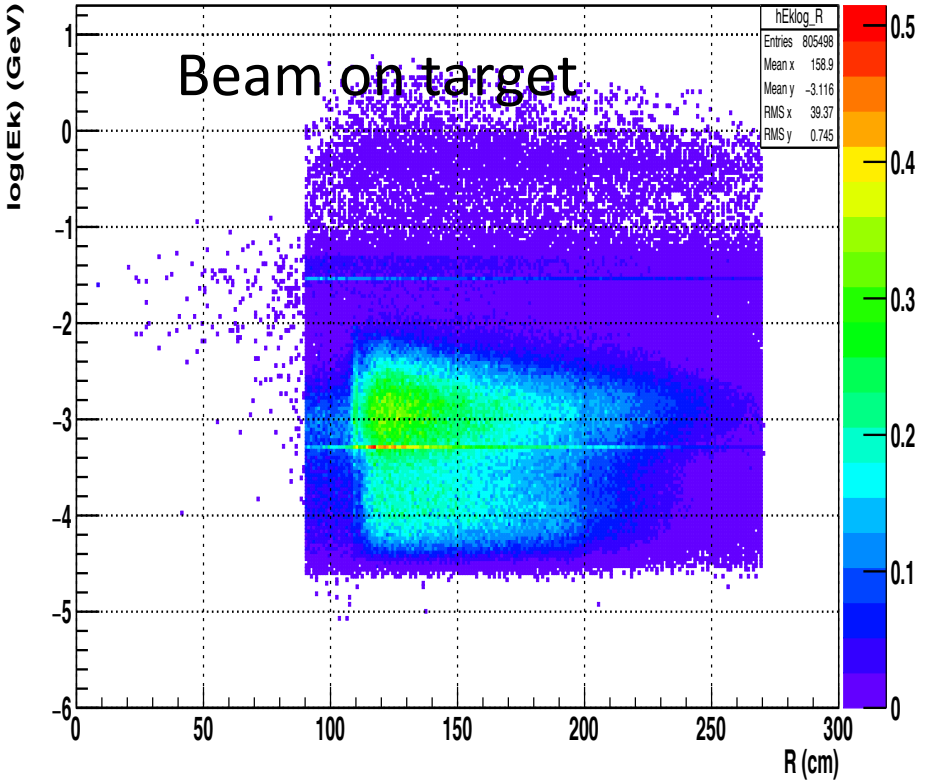
The simulation configuration differences:

- Baffle structure--- lead baffle and kryptonite for everything else
- GEM and LGC --- not update to the real material
- Different Geant version and potentially different physics list: Hadrons+EM

ECAL flux information

Current simulation configuration

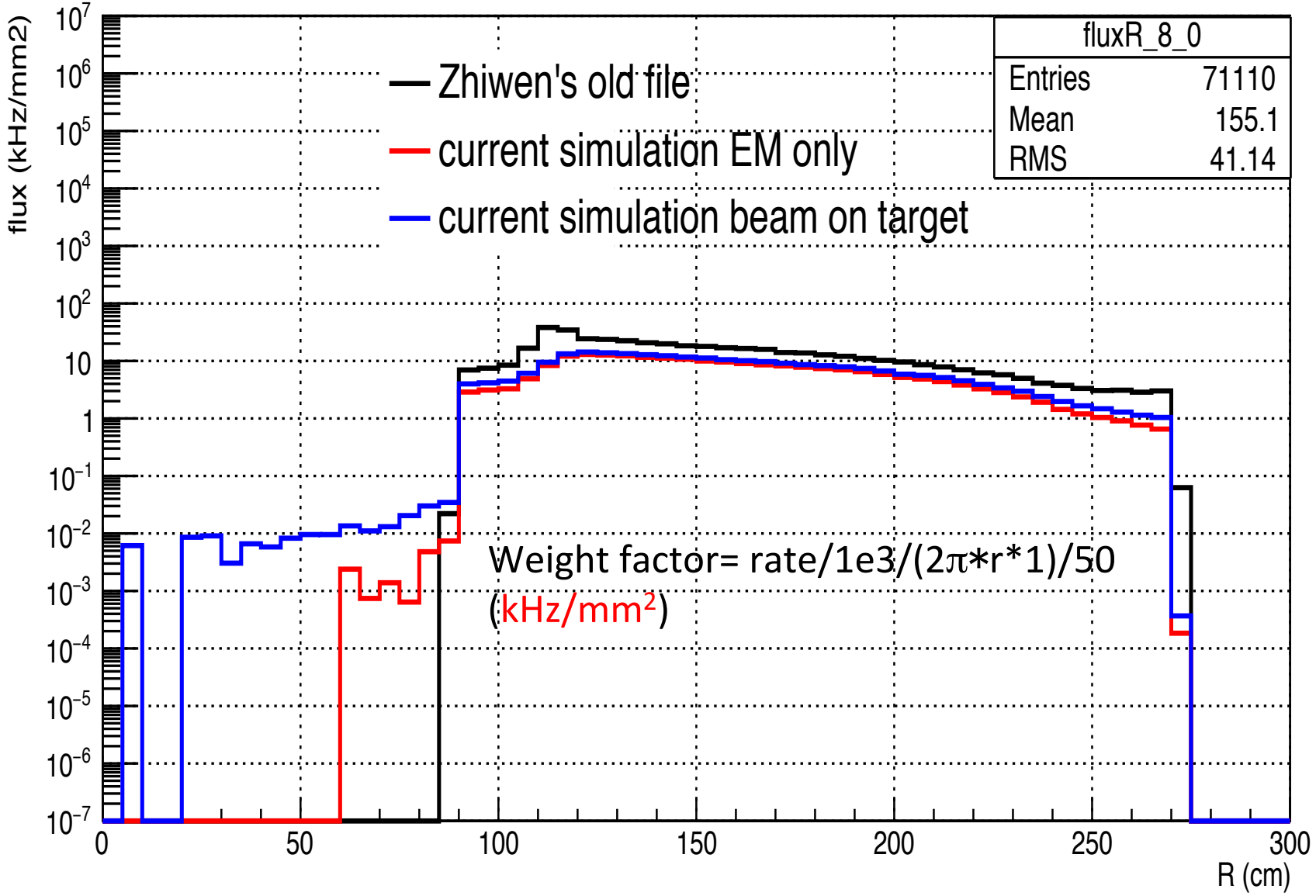




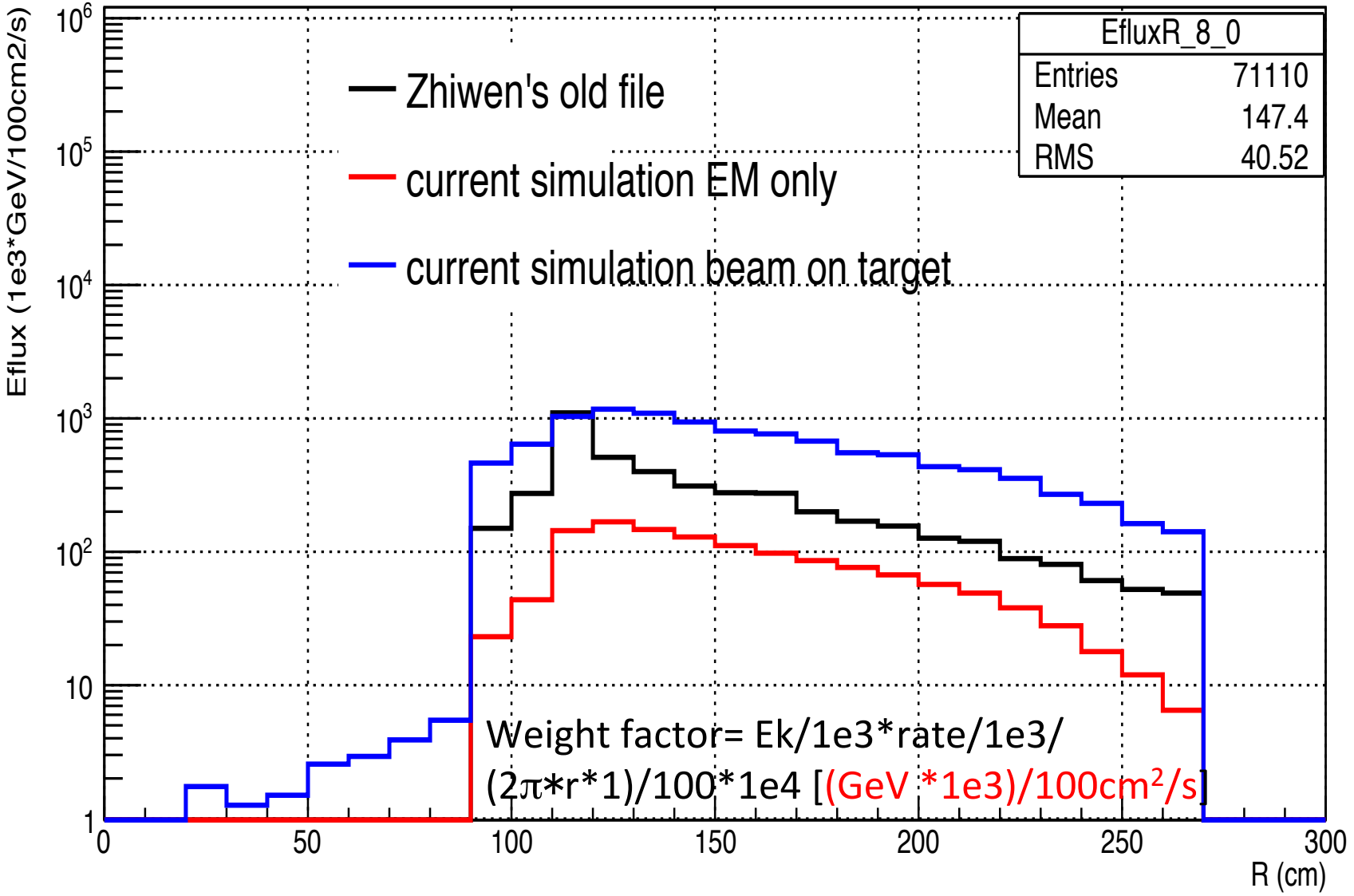
The simulation configuration differences:

- Current Baffle structure---after the adjusting by Rich.
- GEM and LGC--- current design structure and material.
- Geant4 version: Standard EM + Optical physics list

ECAL flux information comparison



ECAL flux information comparison



ECAL Trigger Efficiency Curves with backgrounds

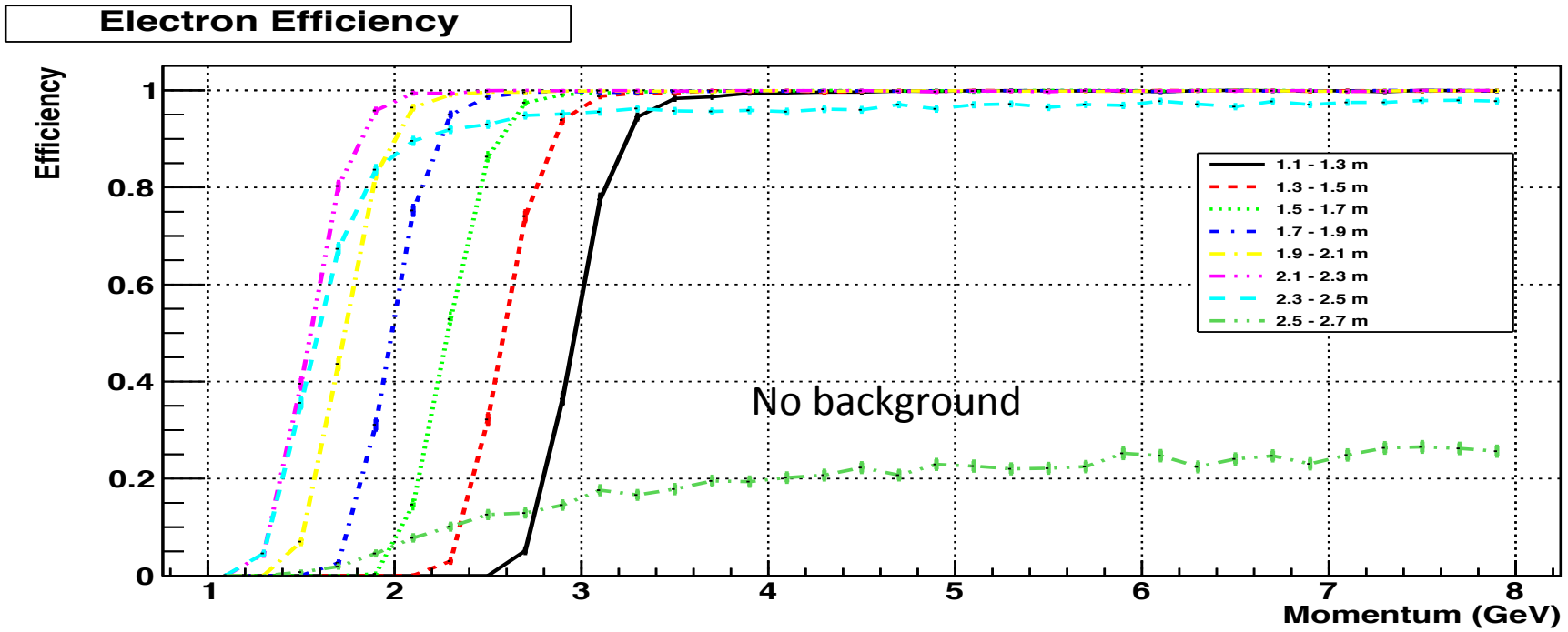
➢ Beam on Target:

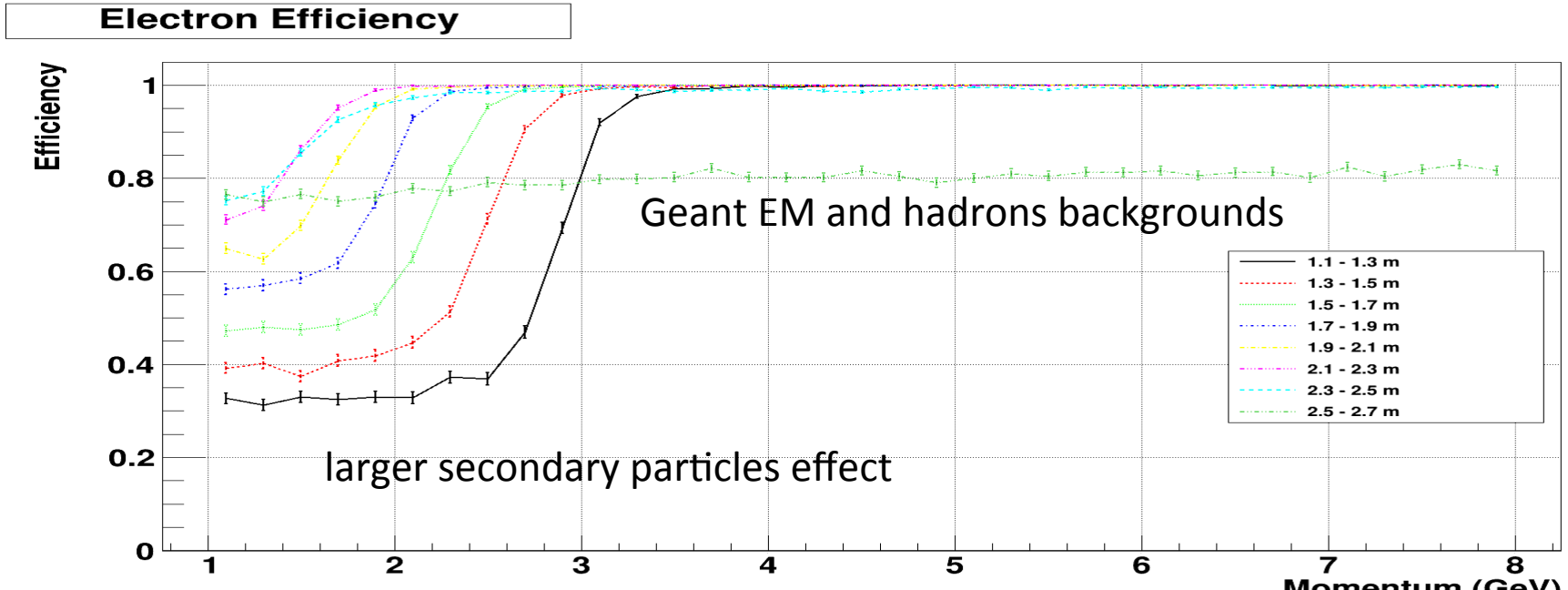
- 11 GeV e^- hit on deuterium target
- Geant4 physics: hadron + standard EM + optical physics process
- Mark event time window information (30 ns window) based on the Rates: total time windows: 1068

➢ Merge backgrounds: (Rekitha's method)

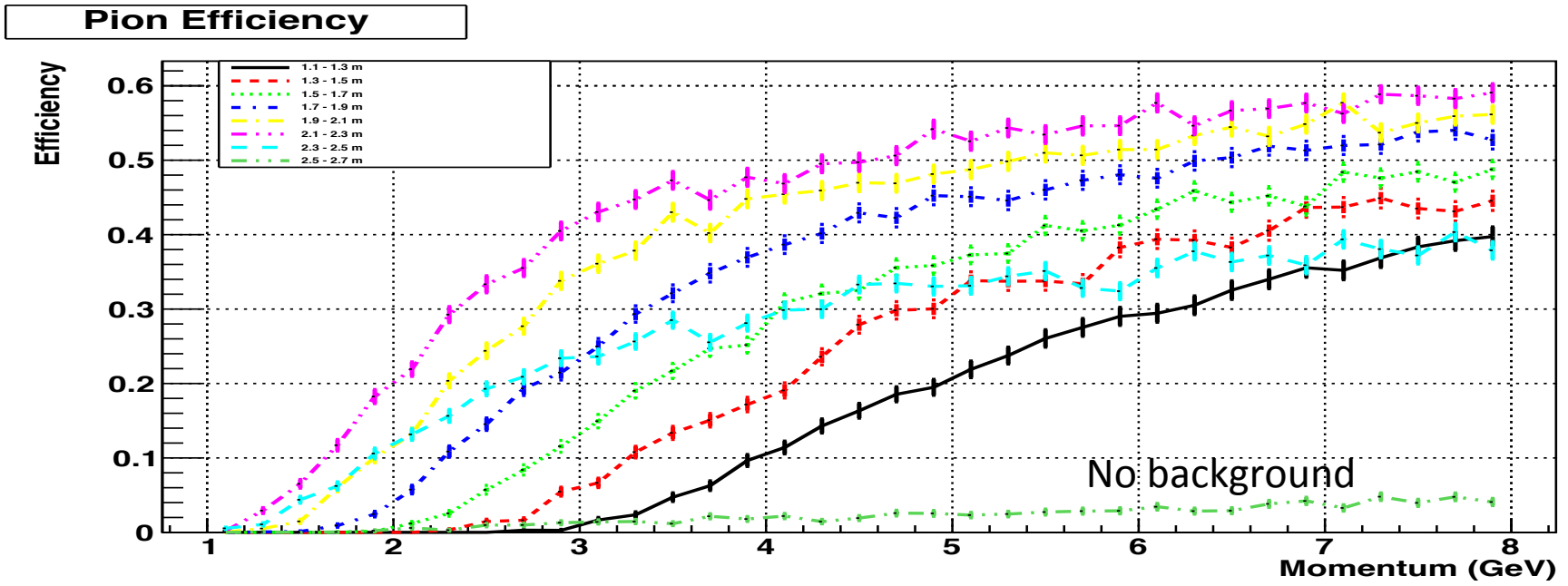
- Geant4 beam on target: standard EM+ optical physics process
- Hall D: π^-, π^0, π^+ simulation files
- All hadron and EM backgrounds are evenly distributed in time based on their rates.

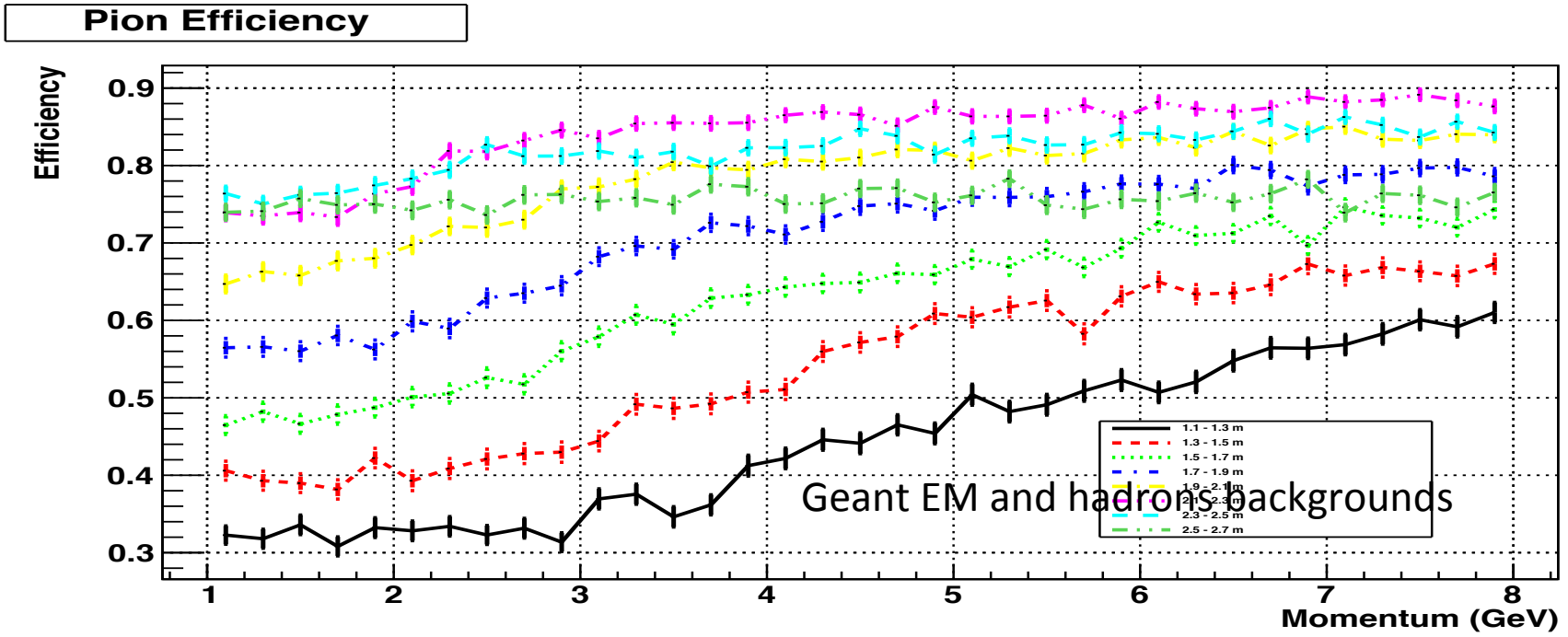
ECAL Trigger Response Curves for PVDIS configuration



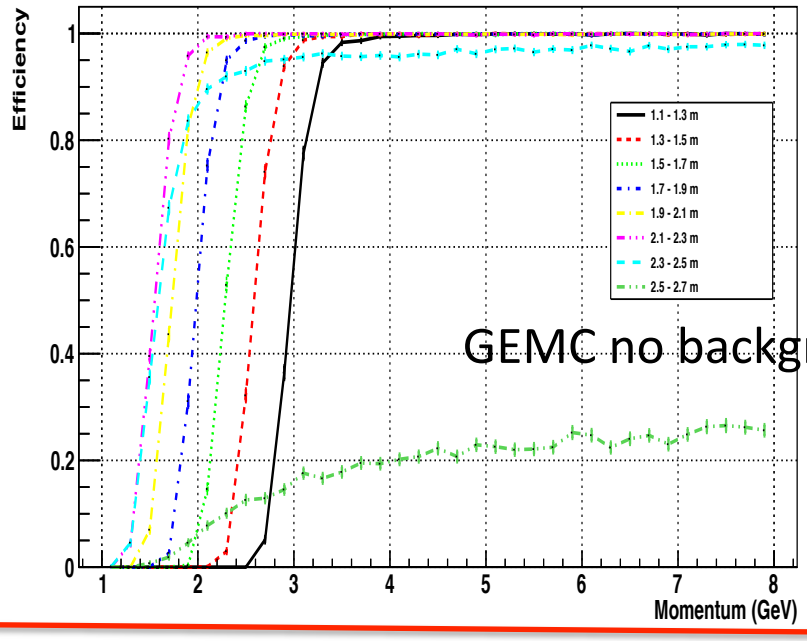


ECAL Trigger Response Curves for PVDIS configuration



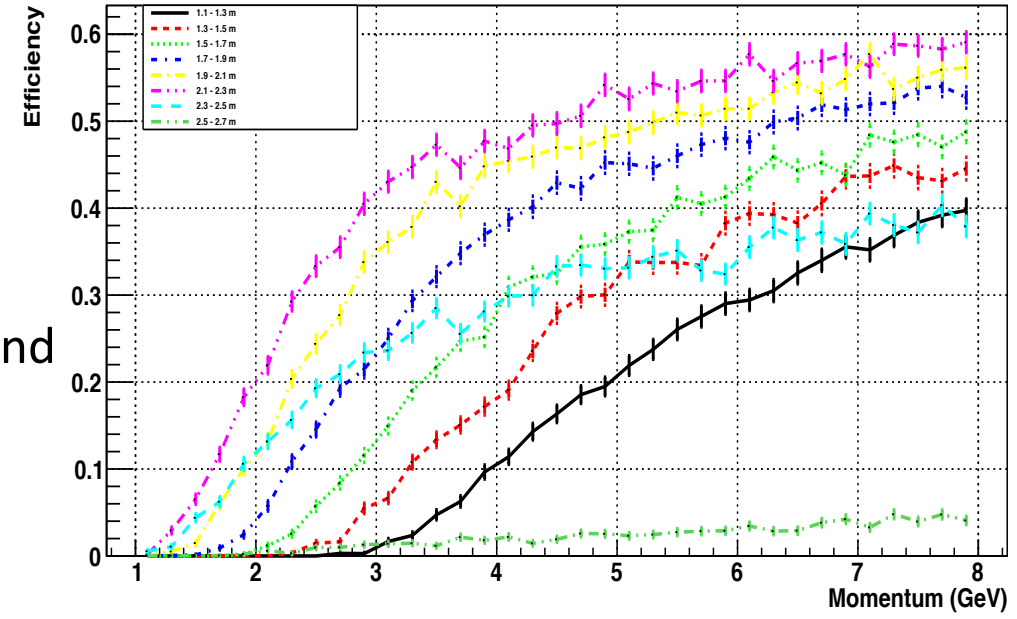


Electron Efficiency

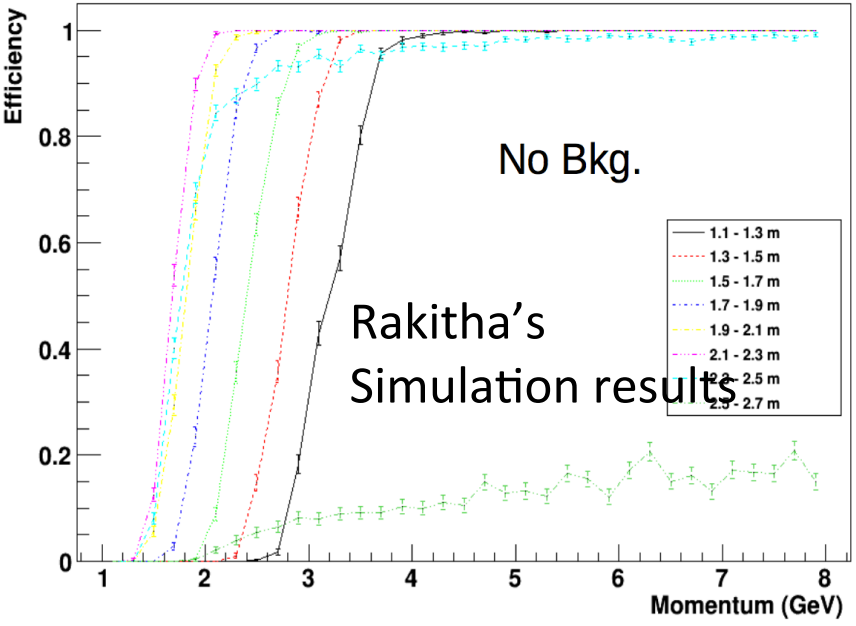


GEMC no background

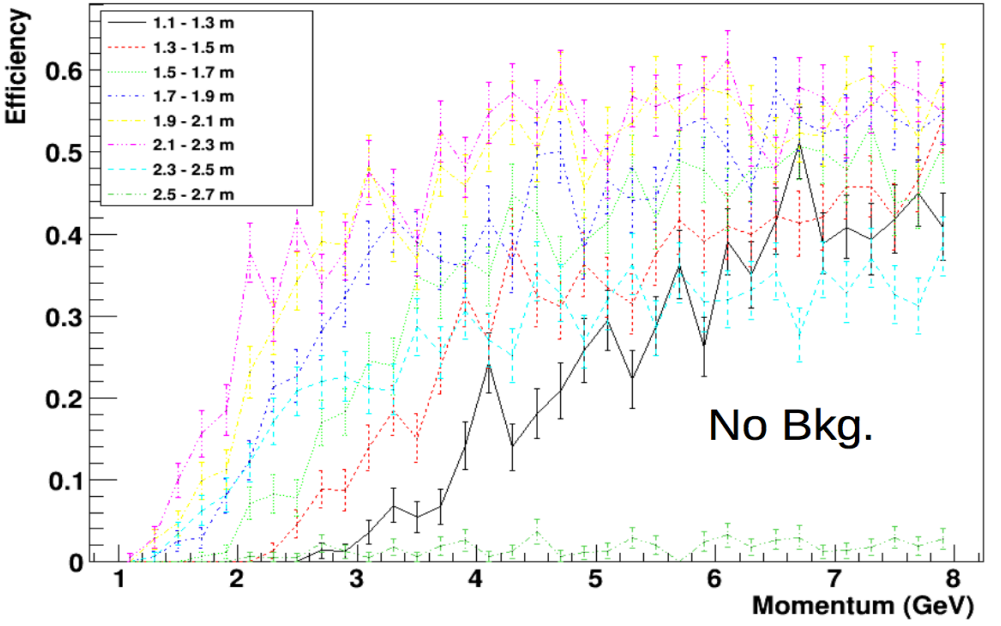
Pion Efficiency



Electron Efficiency



Pion Efficiency



Merge backgrounds

Rekitha's parameters

Particle	Total Rate (GHz)	(1e9/total rate) ΔT (ns)	Total Events	Time Windows
π^-	28.51	0.035	1e6	1170
π^0	27.35	0.037	1e6	1219
π^+	28.51	0.035	1e6	1170
e- beam (EM)	346.03	0.00289	12e6	1170

EC flux rate

Ye's parameters

Particle	Total Rate (GHz)	(1e9/total rate) ΔT (ns)	Total Events	Time Windows
π^-	28.8	0.035	5e6	5794
π^0	27.5	0.036	5e6	6056
π^+	28.8	0.035	5e6	5794
e- beam (EM)	109.5	0.00913	3.5e6 ?	1068

EC virtual plane rate

Total events hit on ECAL

Summary and Outlook

- It can not directly compare the EM background distributions with previous studies (Jin and Rakitha's results), since there are many differences on the detector geometry and material.

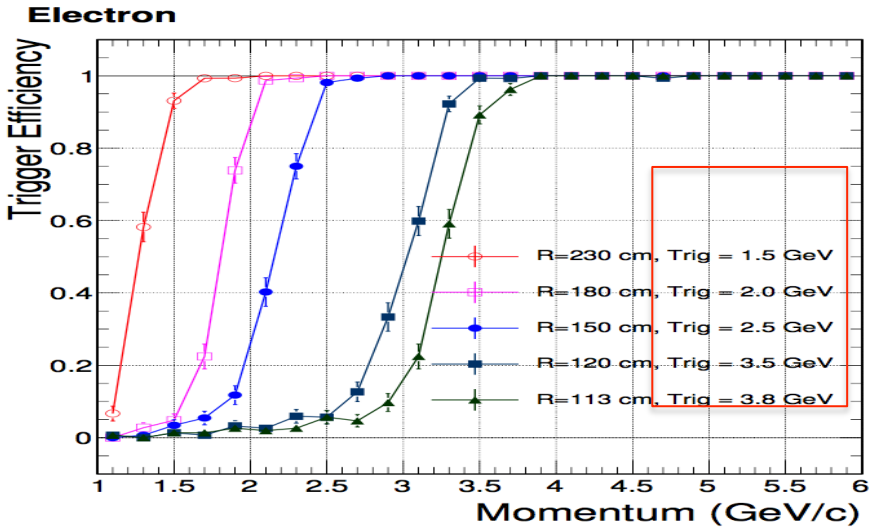
- The large offset of the trigger efficiency curves, which include the beam on target backgrounds, is due to more secondary particles that hit on other detectors.

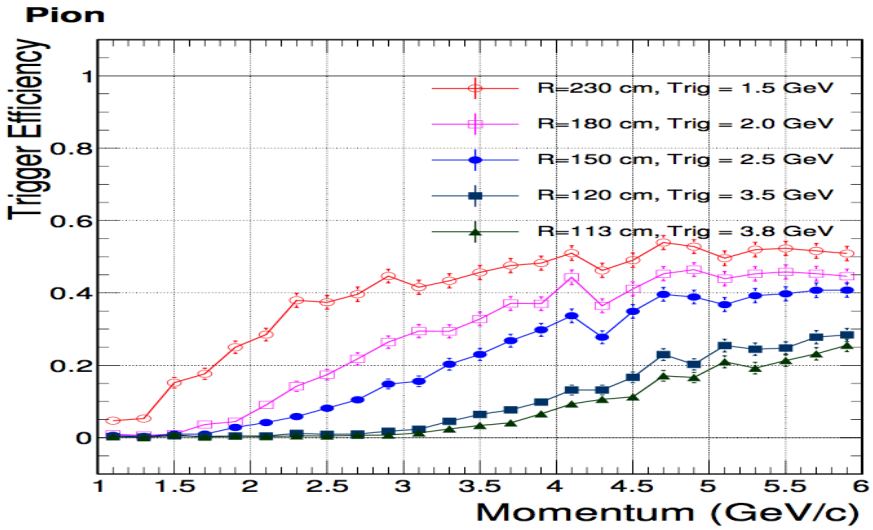
- Working on the merge background problems, will show the results later.

Any comments and suggestions ?

Back up

ECAL Trigger Response Curves for PVDIS configuration

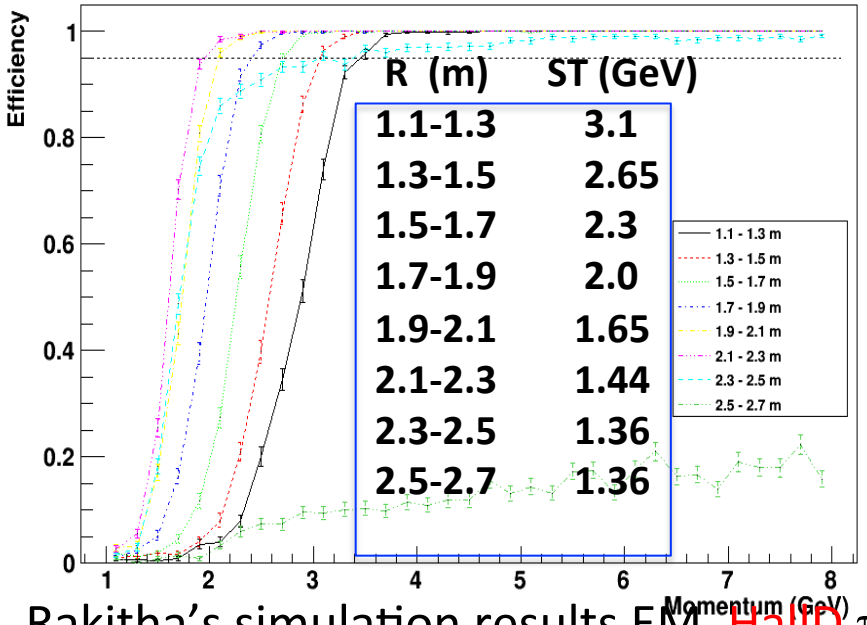




EM, Wiser π^-, π^0, π^+ Background

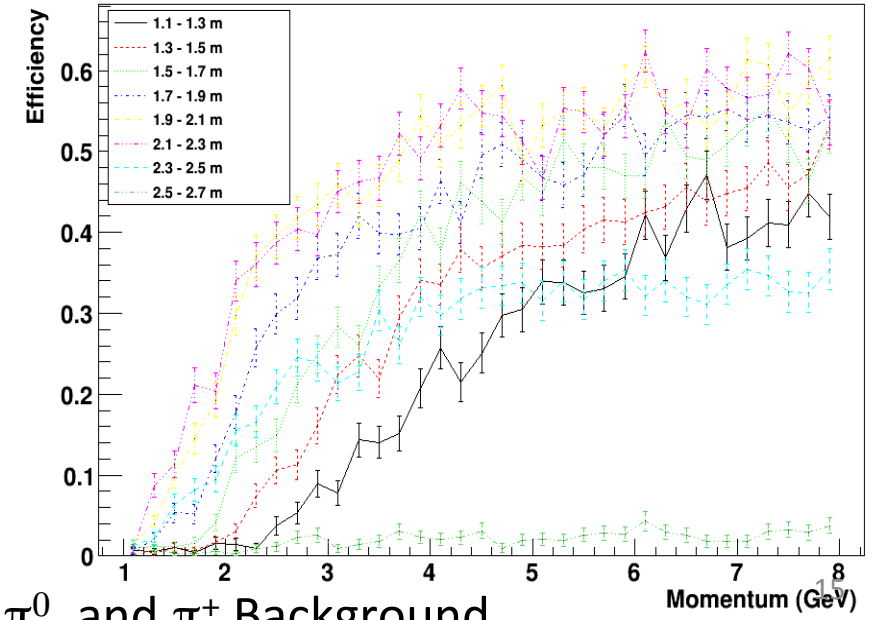
(b) Lower-radiation azimuthal region

Electron Efficiency

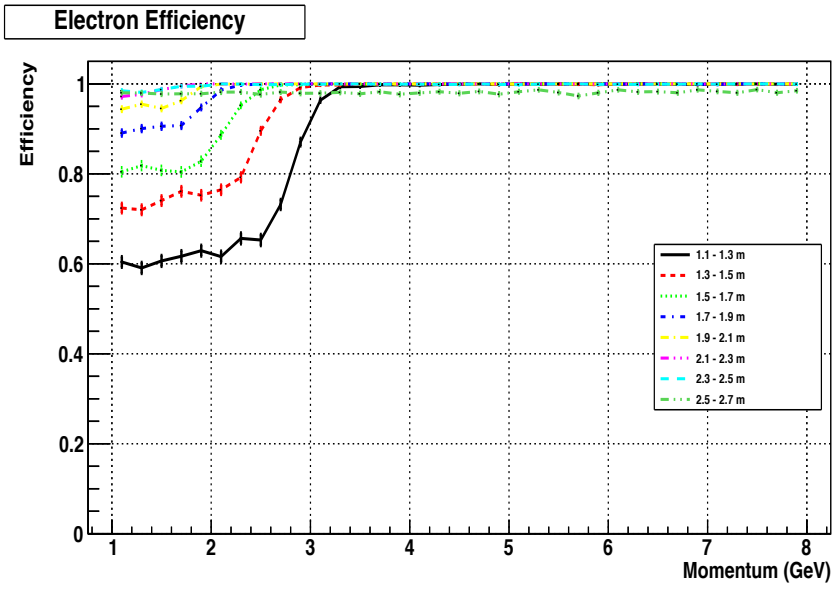


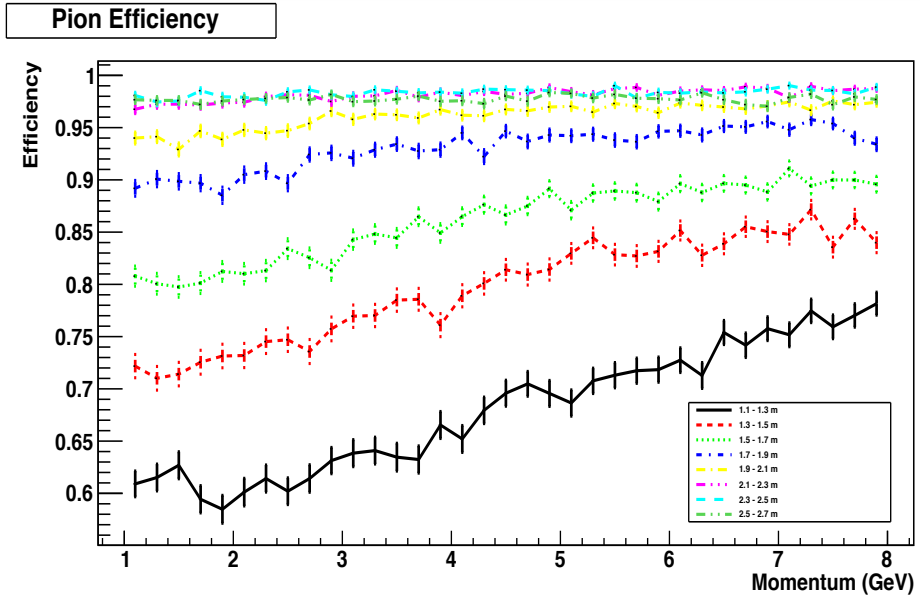
R (m)	ST (GeV)
1.1-1.3	3.1
1.3-1.5	2.65
1.5-1.7	2.3
1.7-1.9	2.0
1.9-2.1	1.65
2.1-2.3	1.44
2.3-2.5	1.36
2.5-2.7	1.36

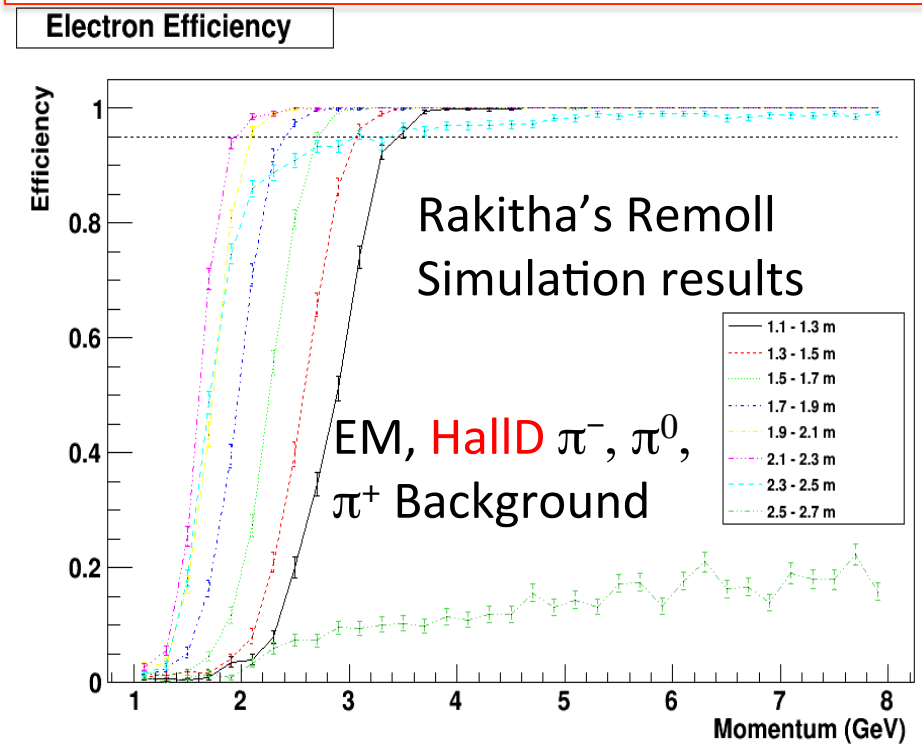
Pion Efficiency

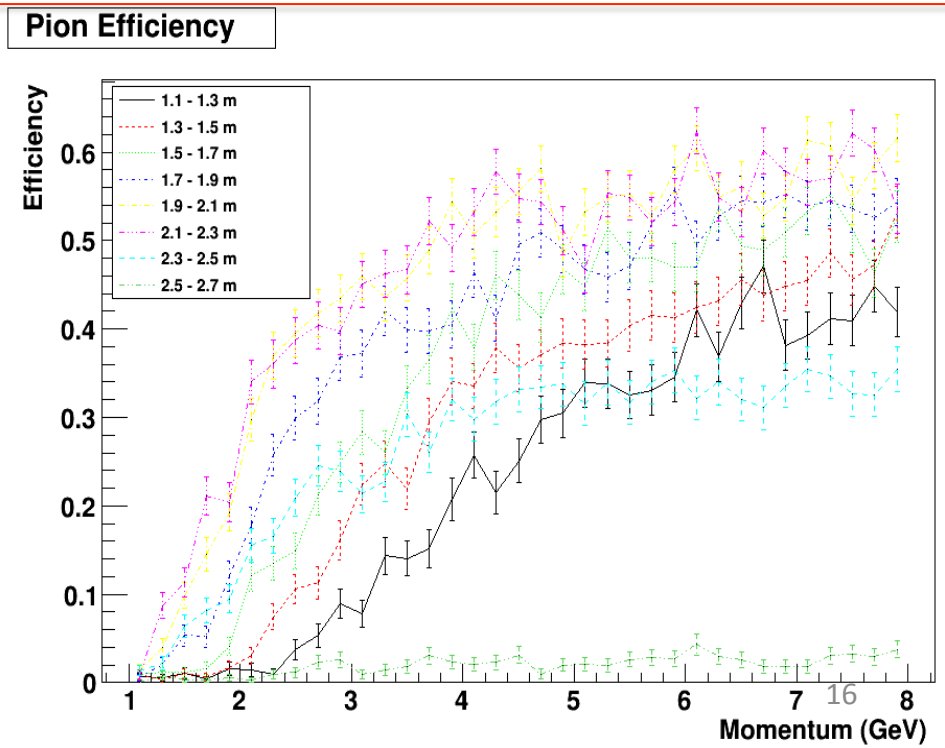


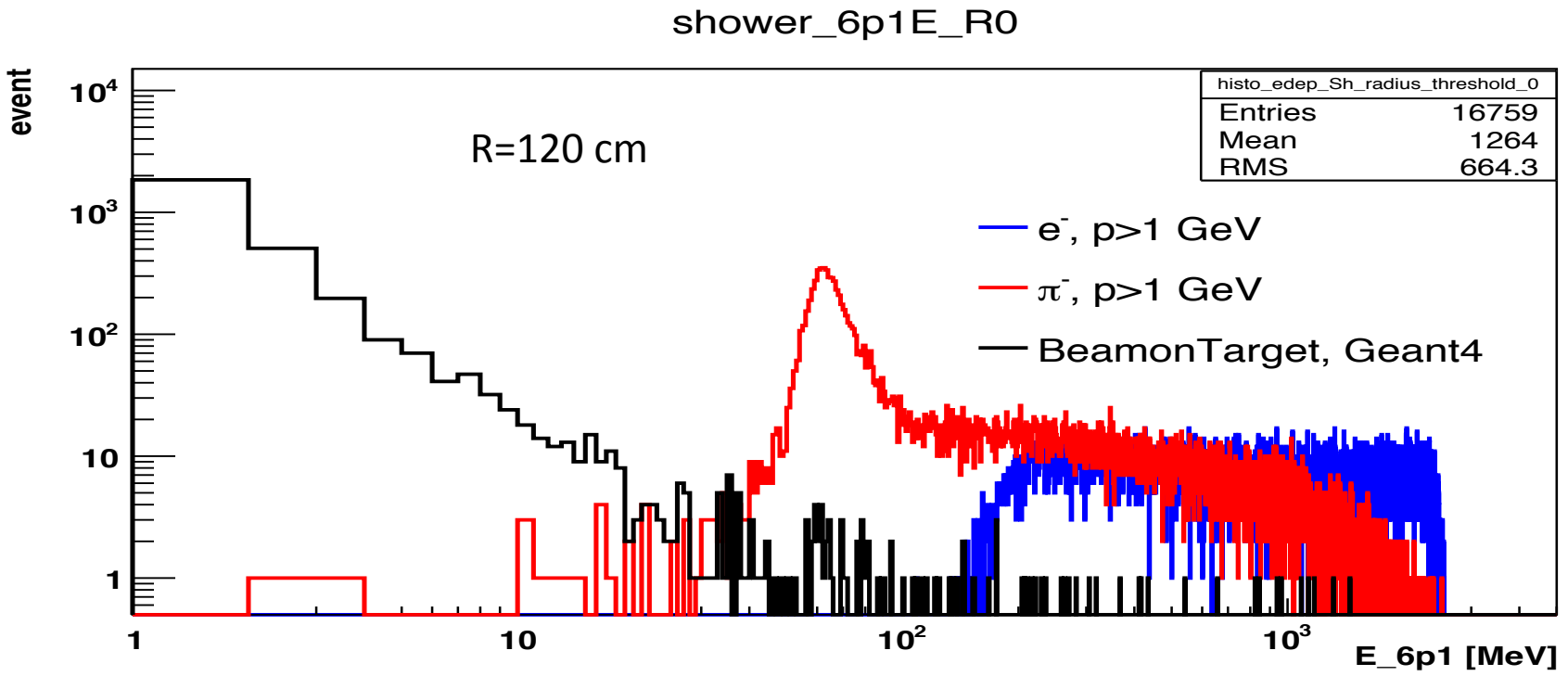
Rakitha's simulation results EM, HallD π^-, π^0, and π^+ Background

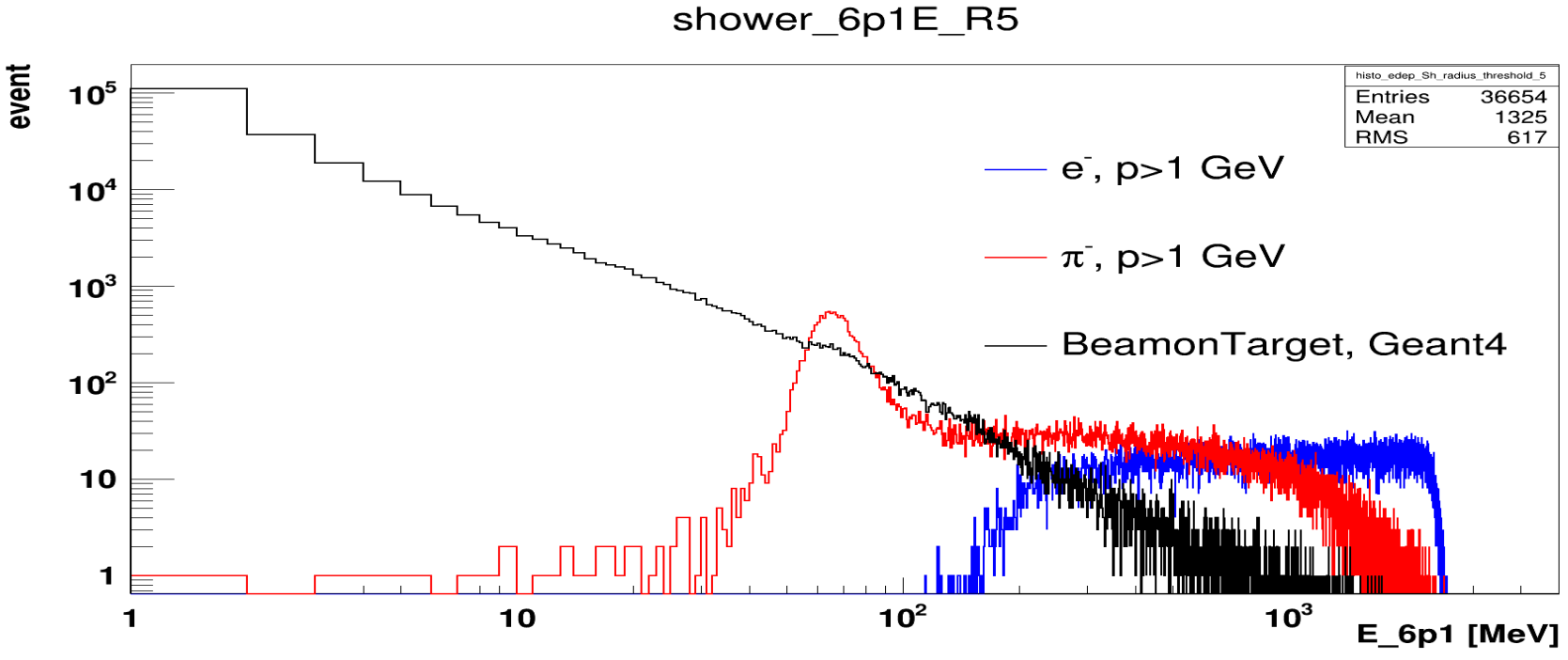

Electron Efficiency
Efficiency
Momentum (GeV)
1.1 - 1.3 m
1.3 - 1.5 m
1.5 - 1.7 m
1.7 - 1.9 m
1.9 - 2.1 m
2.1 - 2.3 m
2.3 - 2.5 m
2.5 - 2.7 m


Pion Efficiency
Efficiency
Momentum (GeV)
1.1 - 1.3 m
1.3 - 1.5 m
1.5 - 1.7 m
1.7 - 1.9 m
1.9 - 2.1 m
2.1 - 2.3 m
2.3 - 2.5 m
2.5 - 2.7 m


Electron Efficiency
Efficiency
Momentum (GeV)
Rakitha's Remoll
Simulation results
EM, HallD π^-, π^0,
π^+ Background
1.1 - 1.3 m
1.3 - 1.5 m
1.5 - 1.7 m
1.7 - 1.9 m
1.9 - 2.1 m
2.1 - 2.3 m
2.3 - 2.5 m
2.5 - 2.7 m


Pion Efficiency
Efficiency
Momentum (GeV)
1.1 - 1.3 m
1.3 - 1.5 m
1.5 - 1.7 m
1.7 - 1.9 m
1.9 - 2.1 m
2.1 - 2.3 m
2.3 - 2.5 m
2.5 - 2.7 m


shower_6p1E_R0
event
R=120 cm
histo_edep_Sh_radius_threshold_0
Entries 16759
Mean 1264
RMS 664.3
e⁻, p>1 GeV
π⁻, p>1 GeV
BeamonTarget, Geant4
E_6p1 [MeV]


shower_6p1E_R5
event
histo_edep_Sh_radius_threshold_5
Entries 36654
Mean 1325
RMS 617
e⁻, p>1 GeV
π⁻, p>1 GeV
BeamonTarget, Geant4
E_6p1 [MeV]