SIDIS Backgrounds Study Updates

11/28/2017

ECAL Trigger Efficiency Curves with backgrounds for SIDIS configuration

➢ Beam on Target:

- 11 GeV e^- hit on He3 target
- Geant4 physics: hadron + standard EM + optical physics process
- Mark event time window information (30 ns window) based on the Rates: total time windows: 3553

➢ Merge backgrounds: (Rekitha's method)

- Geant4 physics: standard EM+ optical physics process
- Hall D: allnoeHallD, allnoeHallD_windown, allnoeHallD_winup
- All hadron and EM backgrounds are evenly distributed in time based on their rates: total time windows: 3555

SIDIS electron trigger

FAEC electron trigger

Radius(cm)	E Threshold (GeV)	Jin's cut (GeV)
90 - 105	5.0	shE-preshE>4.4
105 - 115	4.0	shE-preshE>3.5
115 - 130	3.0	shE-preshE>2.6
130 - 150	2.0	shE-preshE>1.6
150 - 200	1.0	shE>0.9

Radius(cm)	6+1 Cluster Threshold (MeV)
90 - 105	990.09
105 - 115	762.60
115 - 130	557.97
130 - 150	355.25
150 - 200	170.87

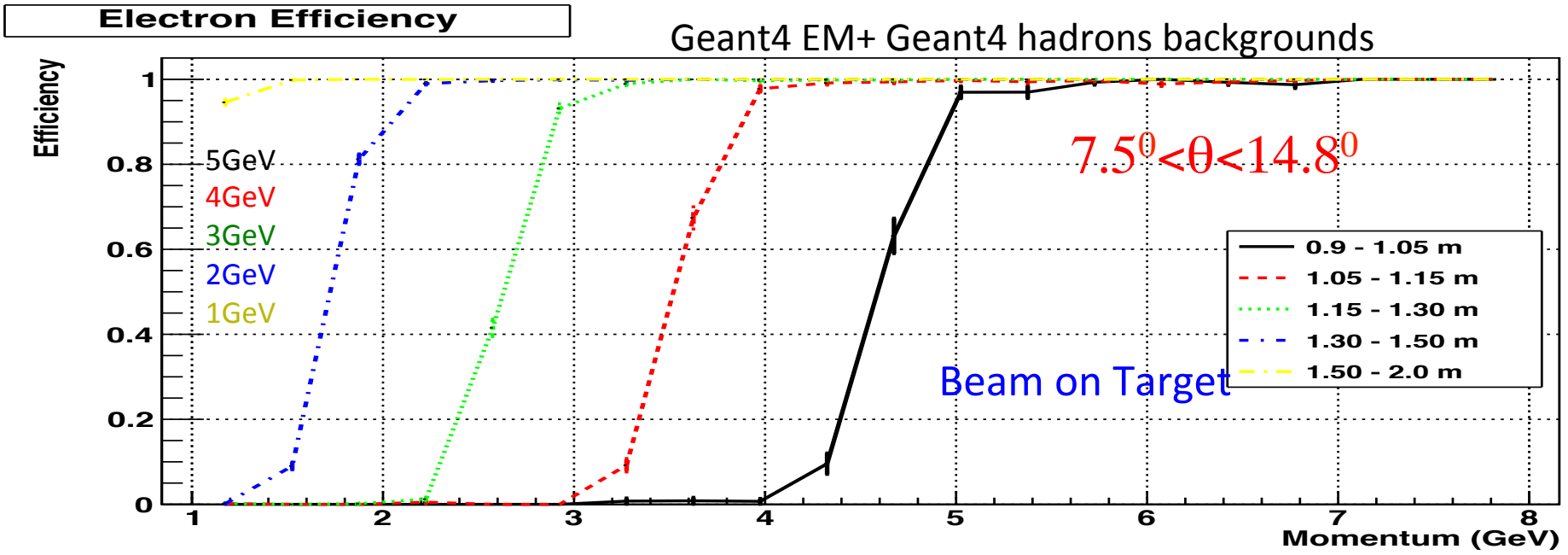
6p1 E_{dep} in ECAL

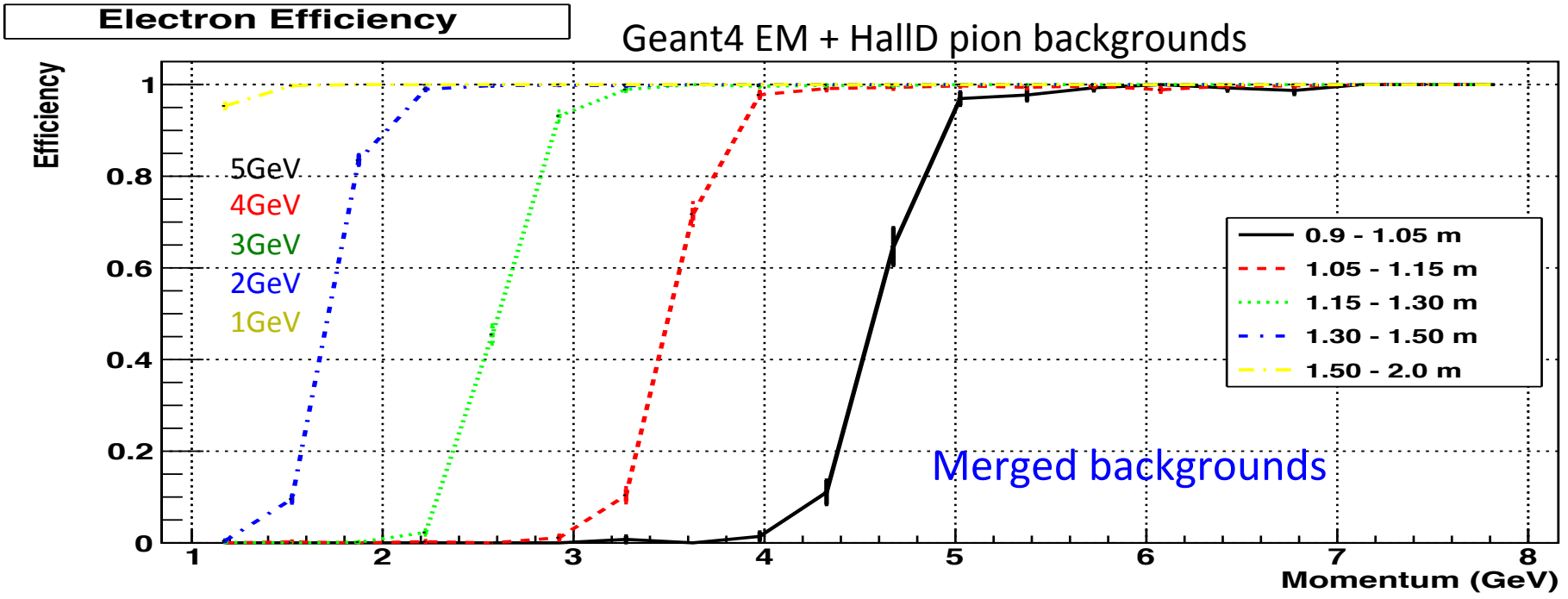
LAEC electron trigger

Radius(cm)	P Threshold (GeV)
90 - 105	3.0
105 - 115	3.0
115 - 130	3.0

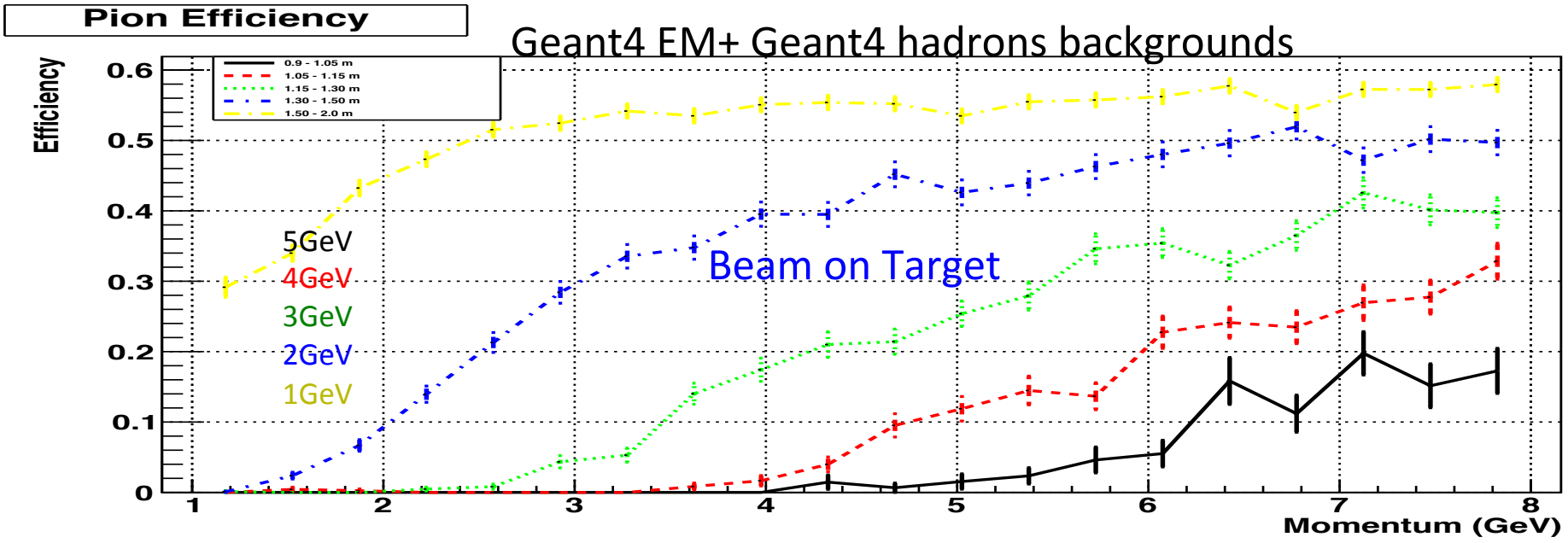
Radius(cm)	6+1 Cluster Threshold (MeV)
90 - 105	571.50
105 - 115	571.90
115 - 130	531.60

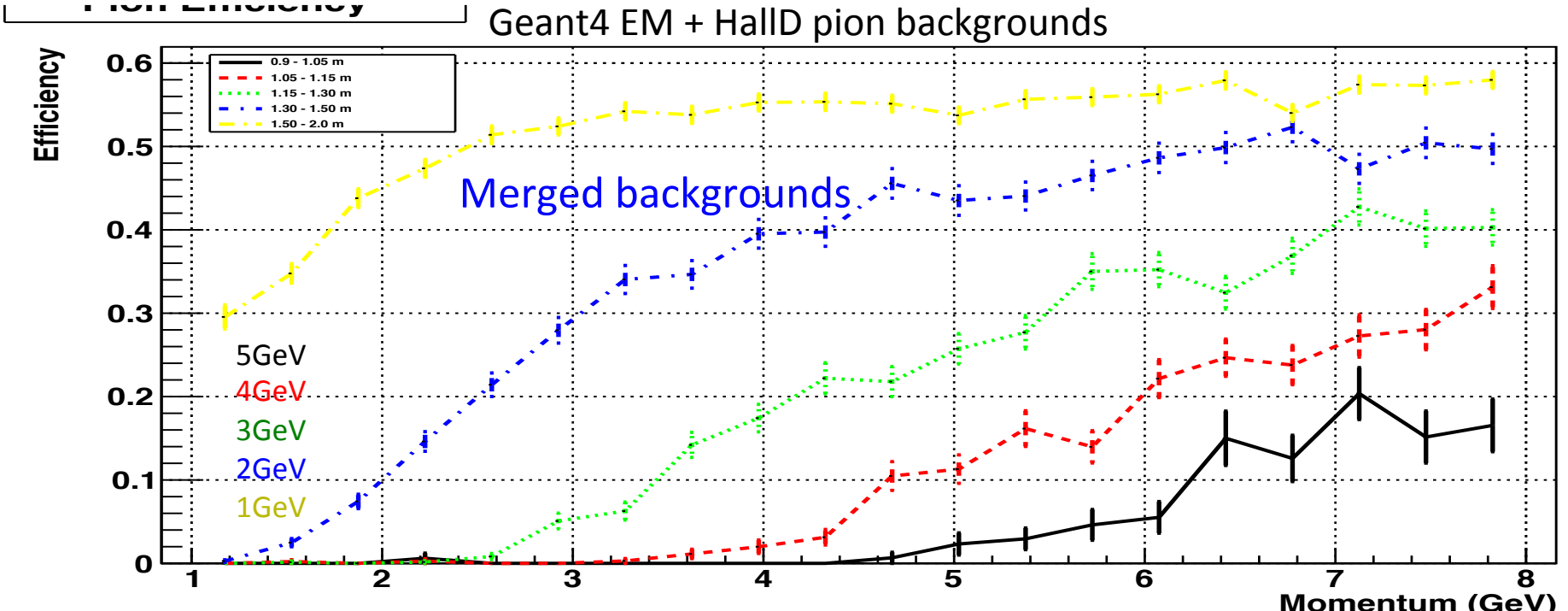
ECAL Trigger Response Curves for SIDIS configuration at FAEC





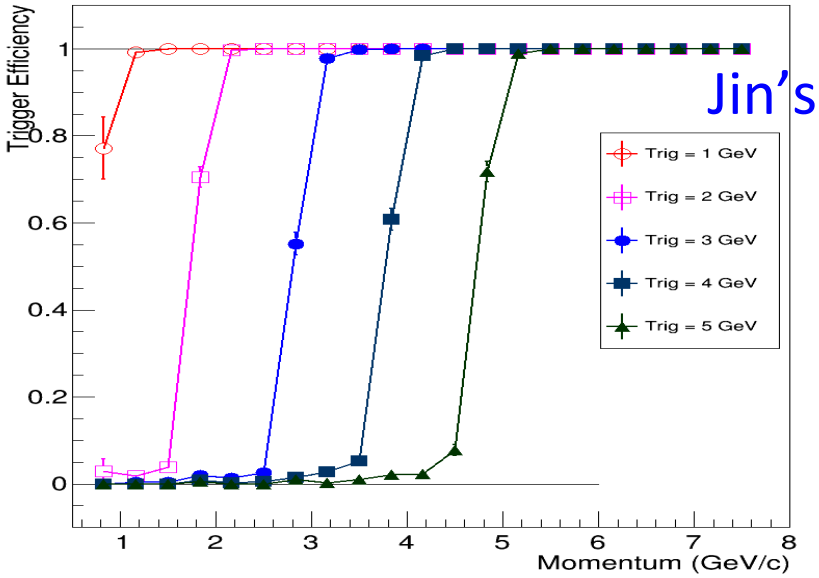
ECAL Trigger Response Curves for SIDIS configuration at FAEC





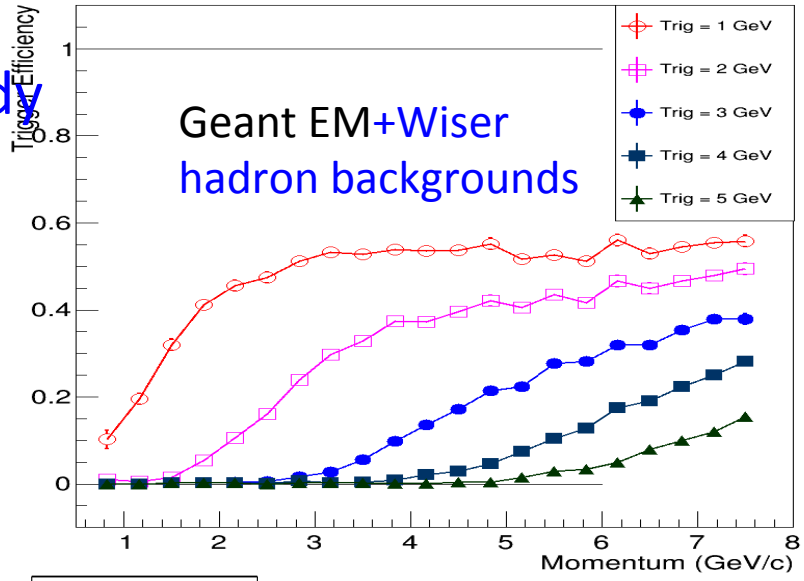
SIDIS FAEC Electron and Pion Efficiency Curves

Electron

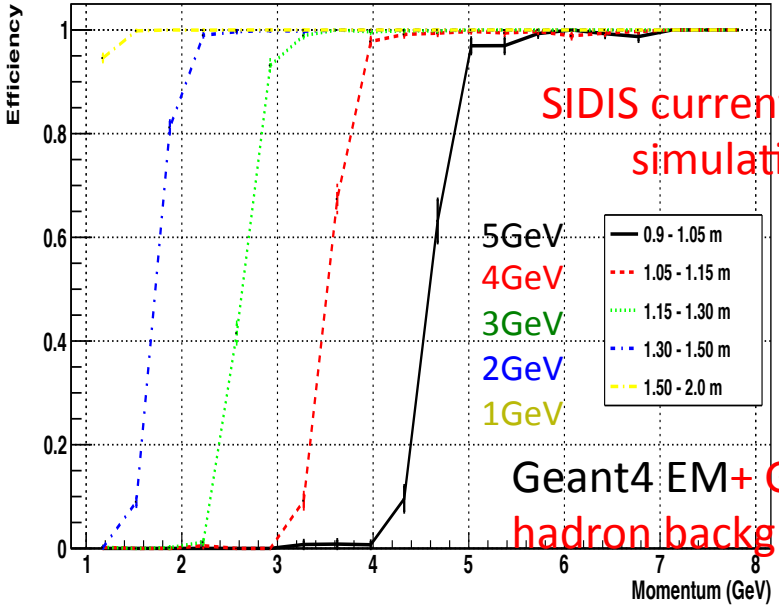


Jin's study

Pion



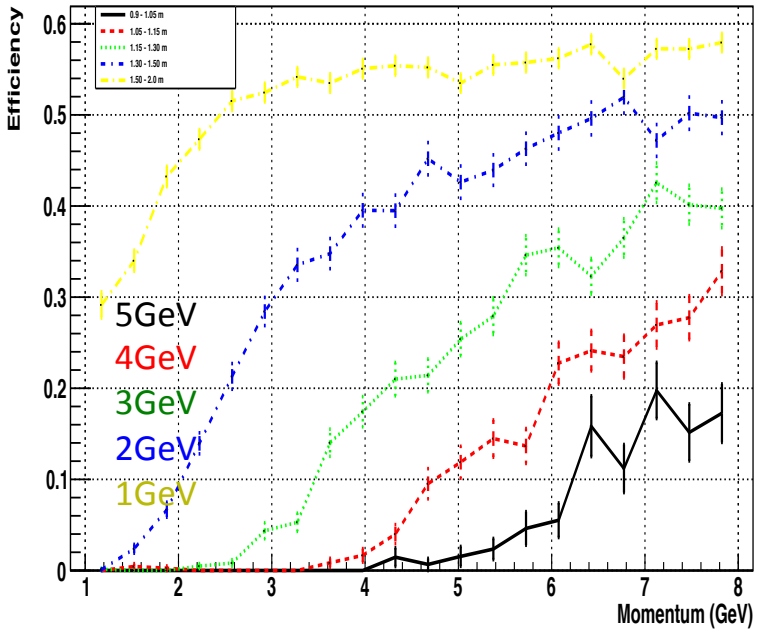
Geant EM+Wiser hadron backgrounds



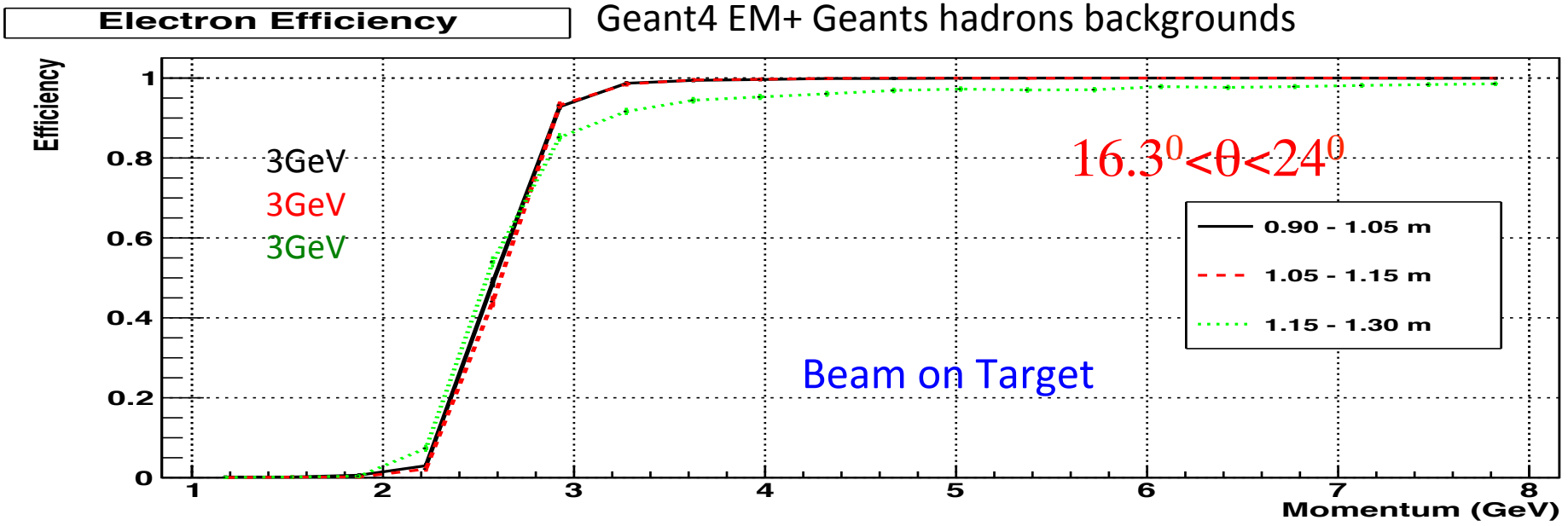
SIDIS current GEMC simulation

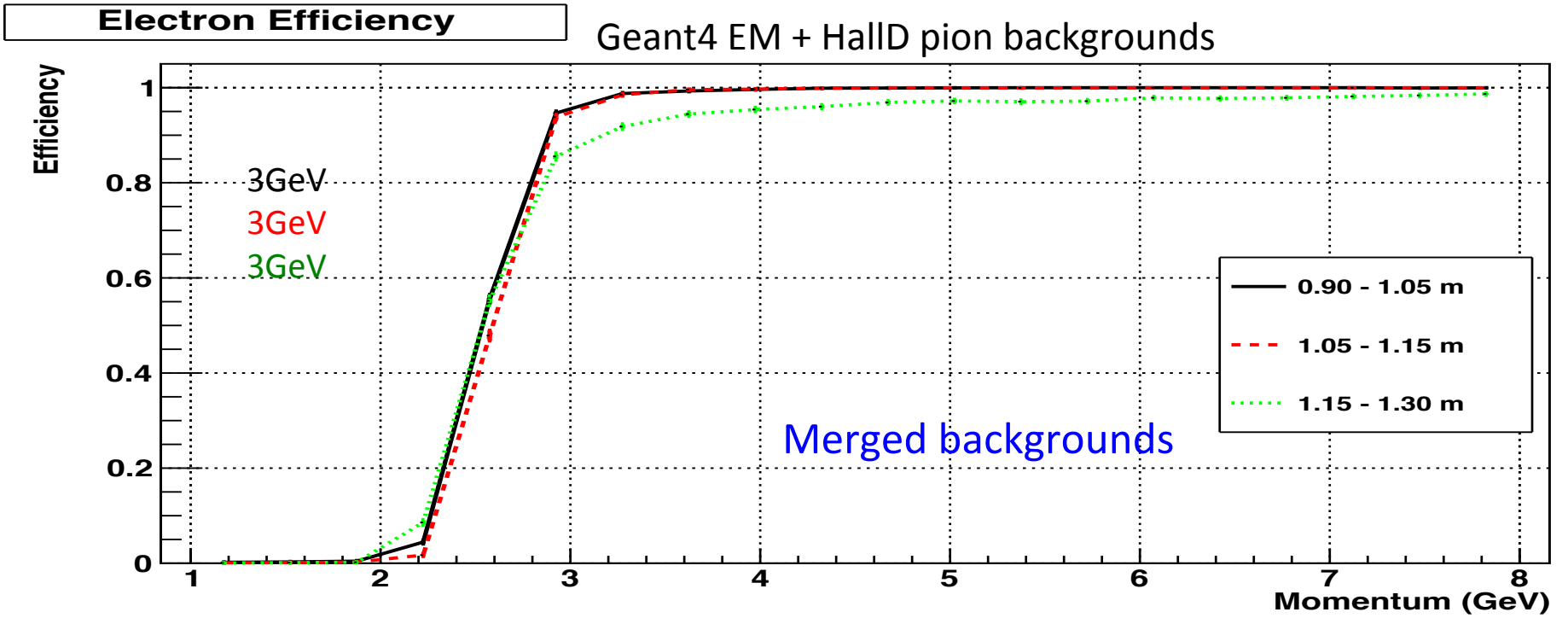
Geant4 EM+ Geant4 hadron backgrounds

Pion Efficiency

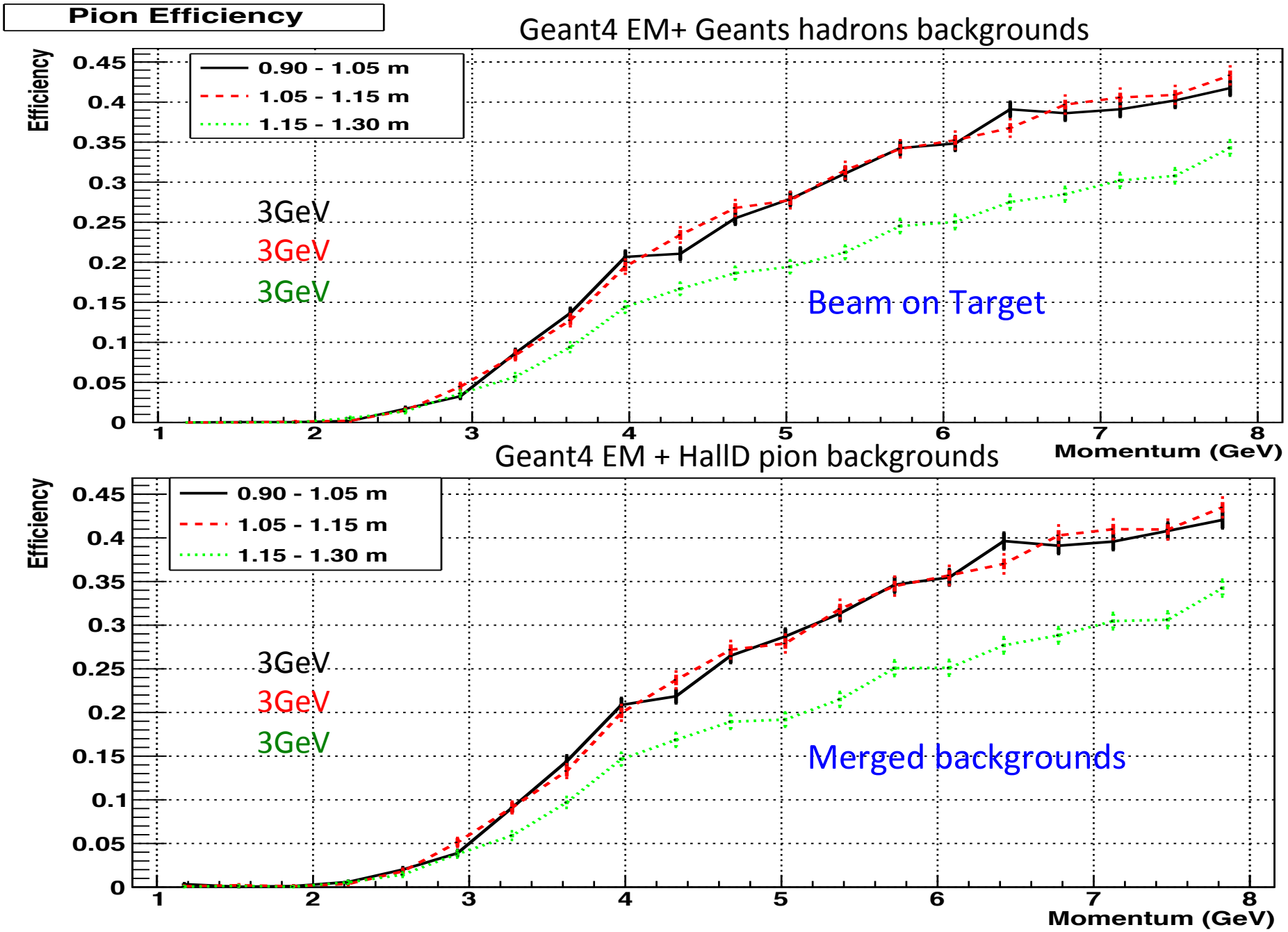


ECAL Trigger Response Curves for SIDIS configuration at LAEC

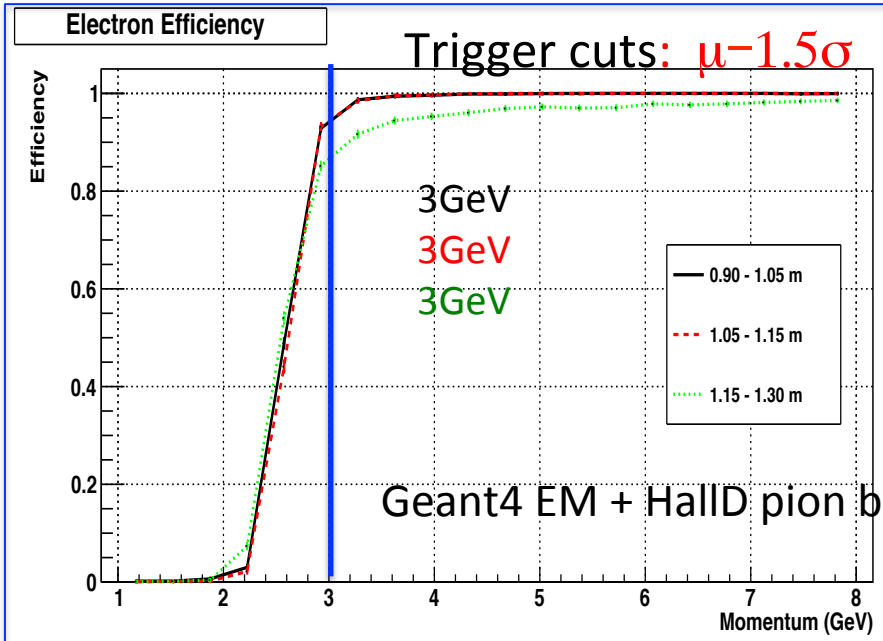




ECAL Trigger Response Curves for SIDIS configuration at LAEC



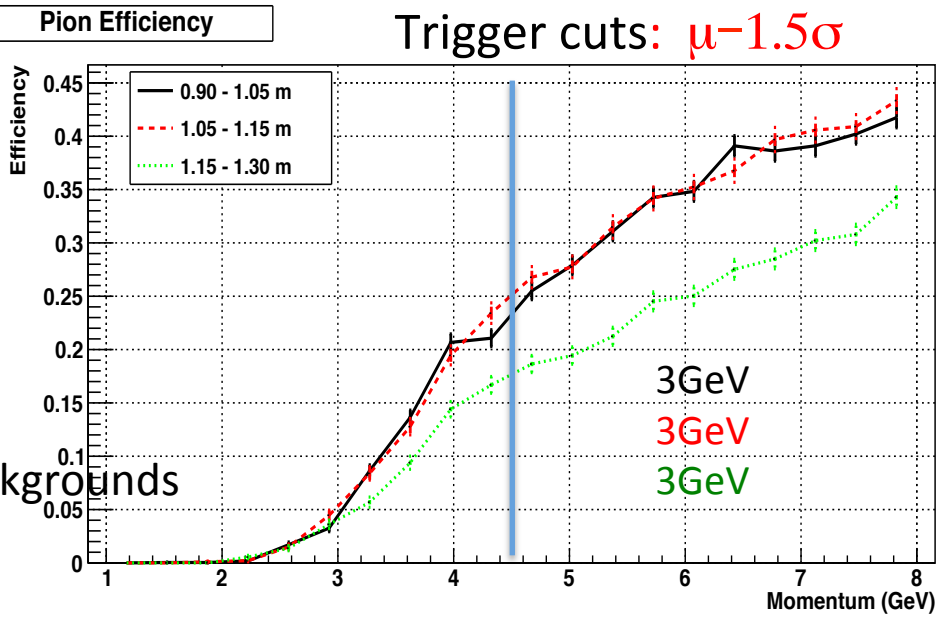
SIDIS pion Efficiency Curves for LAEC



Trigger cuts: μ−1.5σ

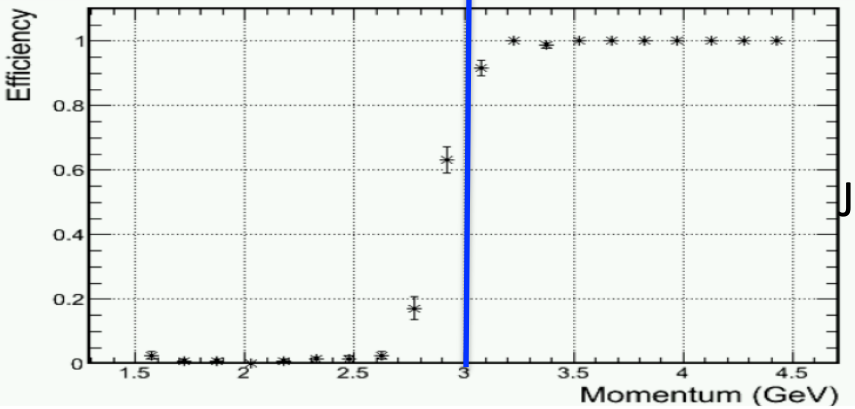
3GeV
3GeV
3GeV

Geant4 EM + HallD pion backgrounds



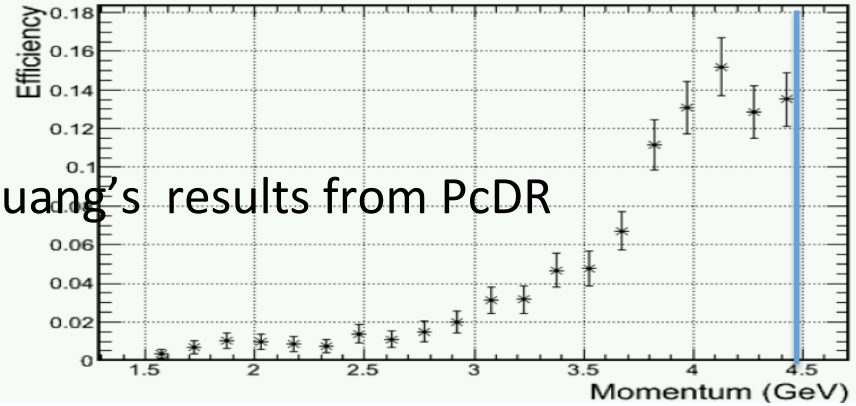
Trigger cuts: μ−1.5σ

3GeV
3GeV
3GeV



(a) Electron

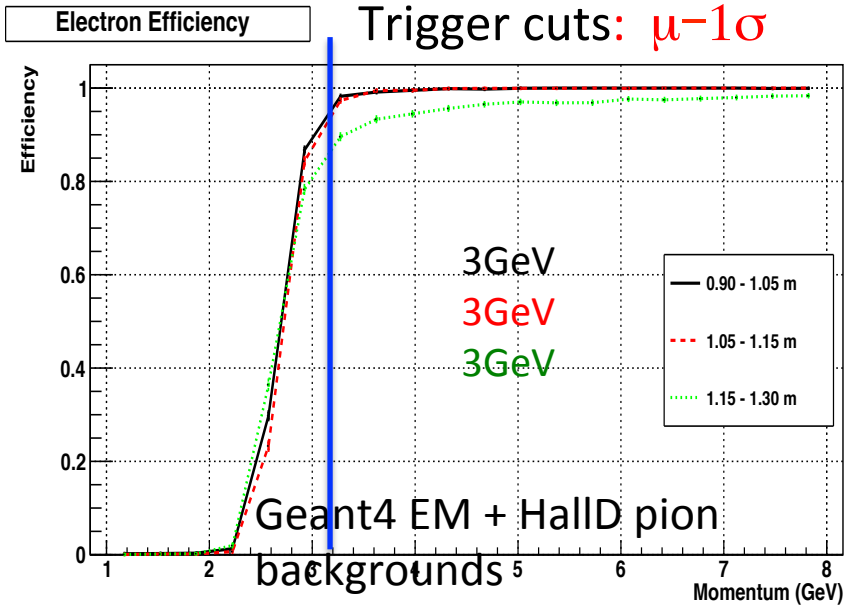
Jin Huang's results from PcDR

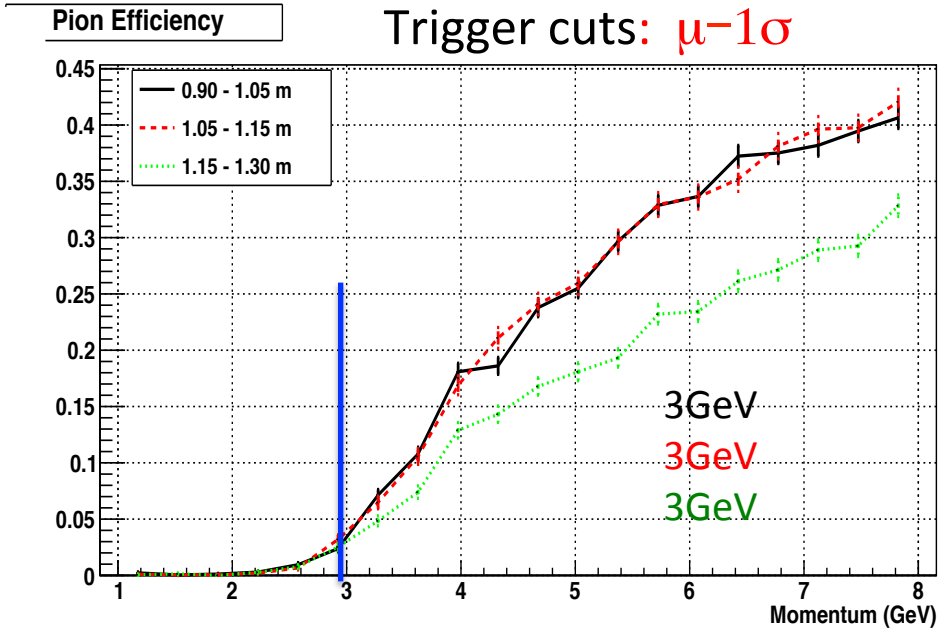


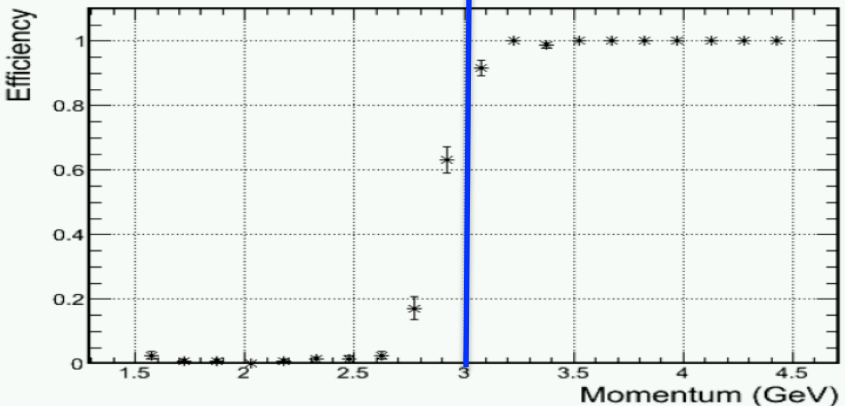
(b) Pion

Figure 102: Trigger efficiency for electrons (a) and pions (b) for the SIDIS large angle calorimeter. The target trigger threshold is approximately $P_e = 3$ GeV/c. Only the (high-background) inner-radius region is shown here.

SIDIS pion Efficiency Curves for LAEC







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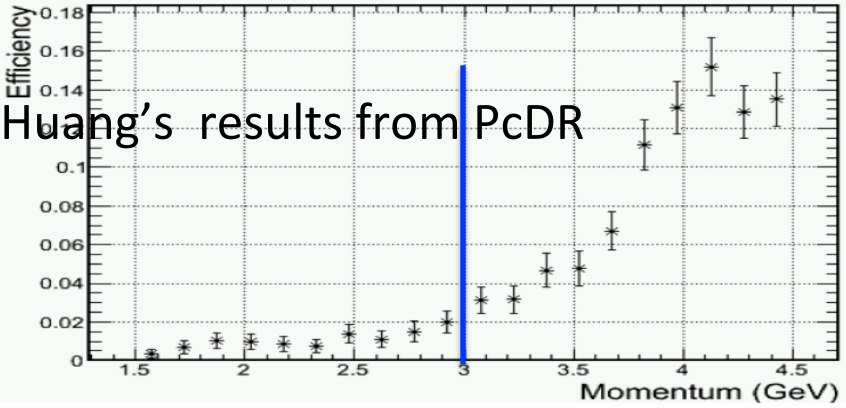


(b) Pion

Figure 102: Trigger efficiency for electrons (a) and pions (b) for the SIDIS large angle calorimeter. The target trigger threshold is approximately $P_e = 3$ GeV/c. Only the (high-background) inner-radius region is shown here.

Summary and Outlook

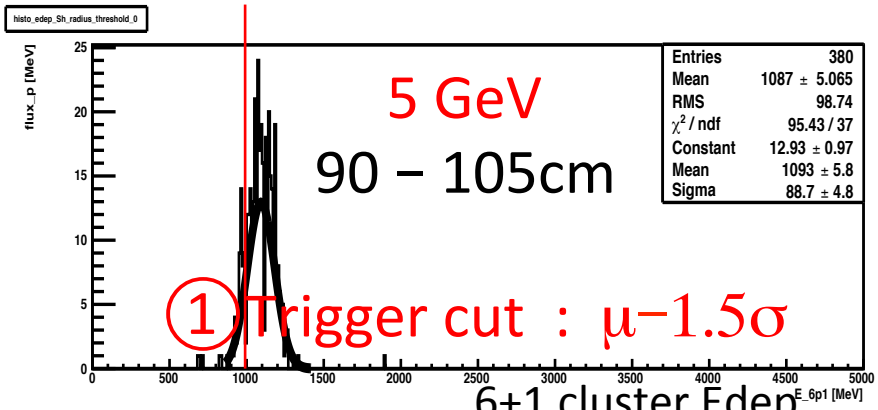
- The ECAL trigger response curves from the SIDIS configuration with both merged backgrounds (Geant4 EM+HallD hadrons) and beam on target simulation backgrounds are consistent with previous Jin's simulation result. And the comparison shows that the current GEMC simulation result has a little better π^- rejection .

- The corresponding SIDIS trigger response functions are updated at:
  https://jlabsvn.jlab.org/svnroot/solid/subsystem/ec/triggerfile_GEMCYe/

Any comments and suggestions ?

Back up

SIDIS 6+1 cluster energy FAEC θe [7.5, 14.85]



6+1 cluster Edep