SIDIS hadronTrigger Rates

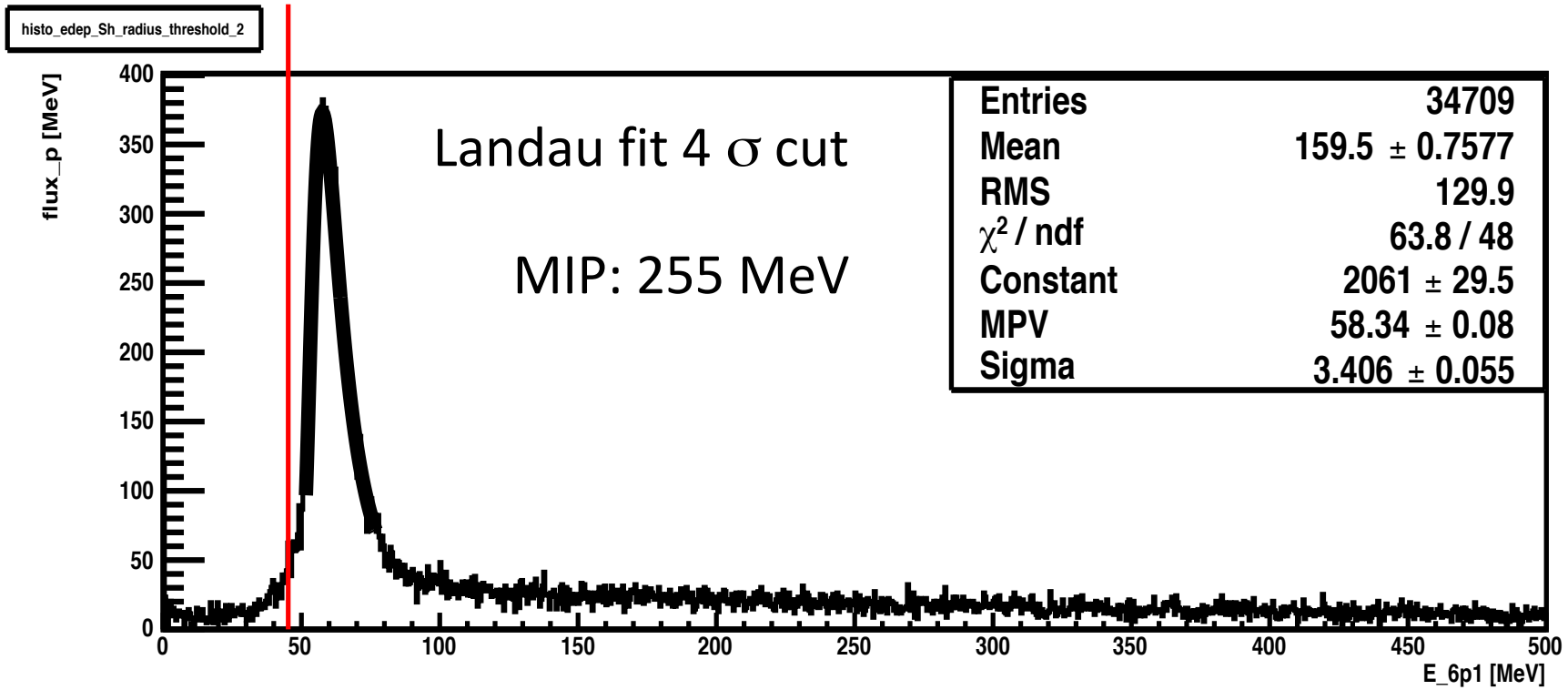
07/10/2018

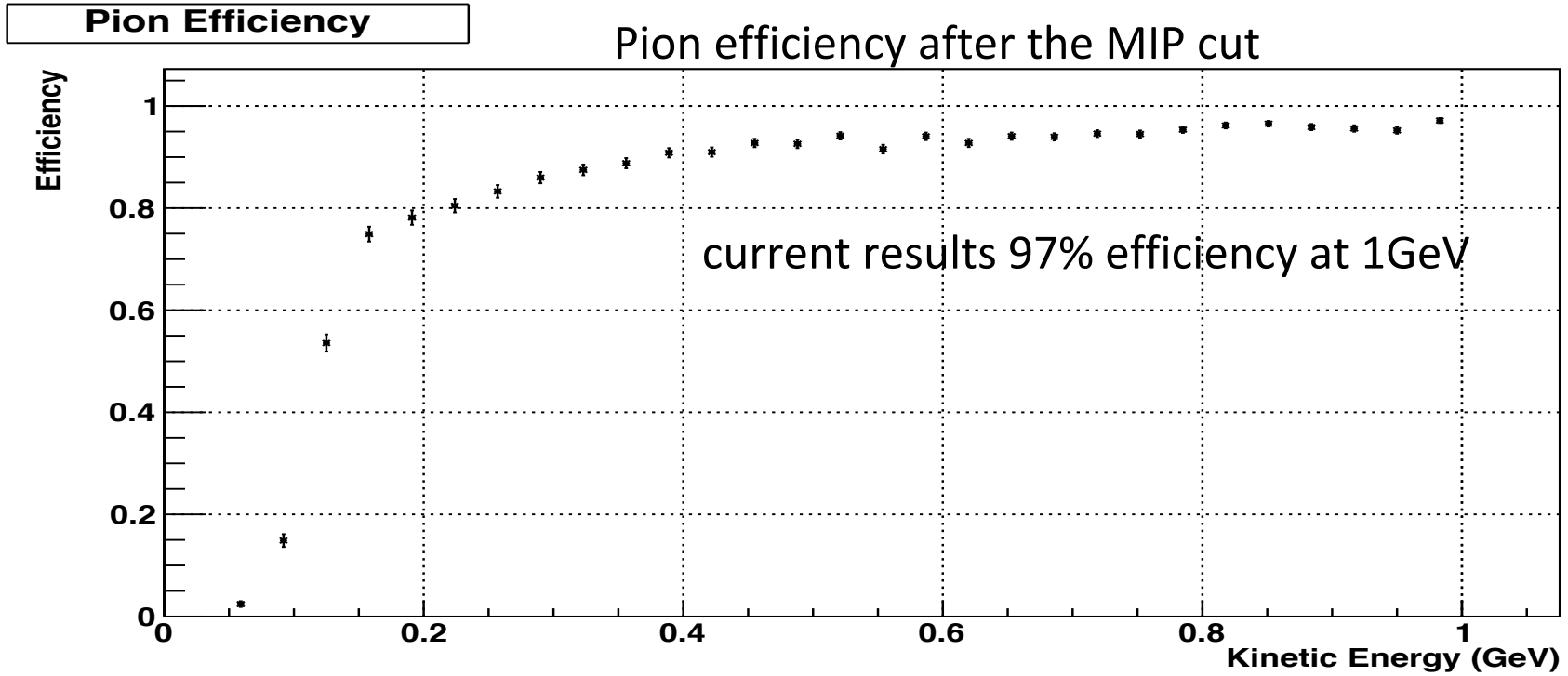
Introduction

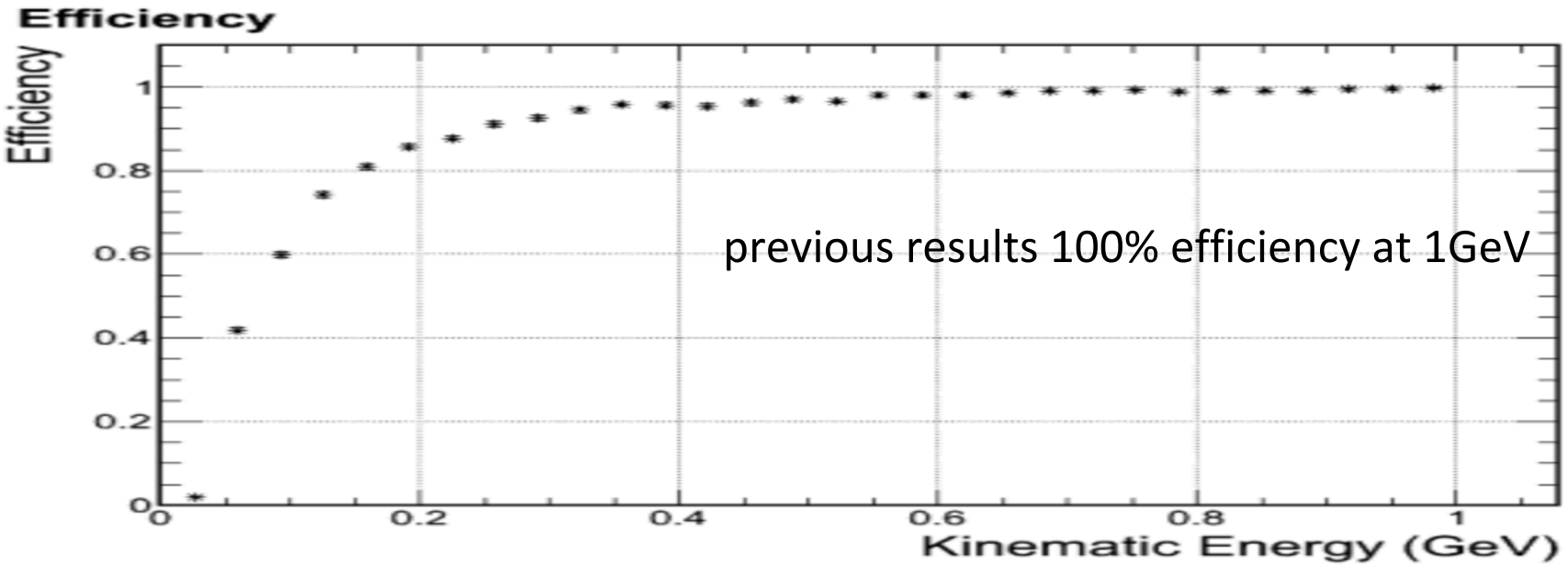
SIDIS configuration:

Hadron trigger: e^-, p, γ, π^-,

- SIDIS hadron trigger curves are generated from the MIP cut

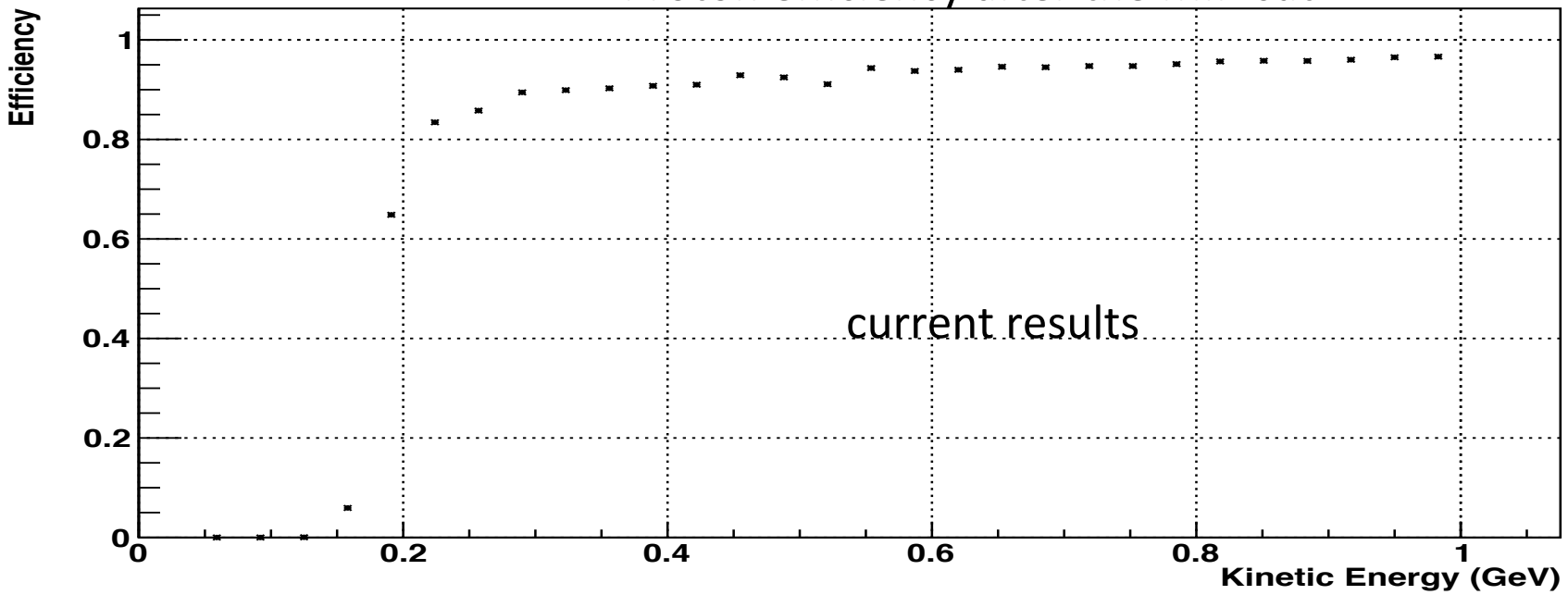


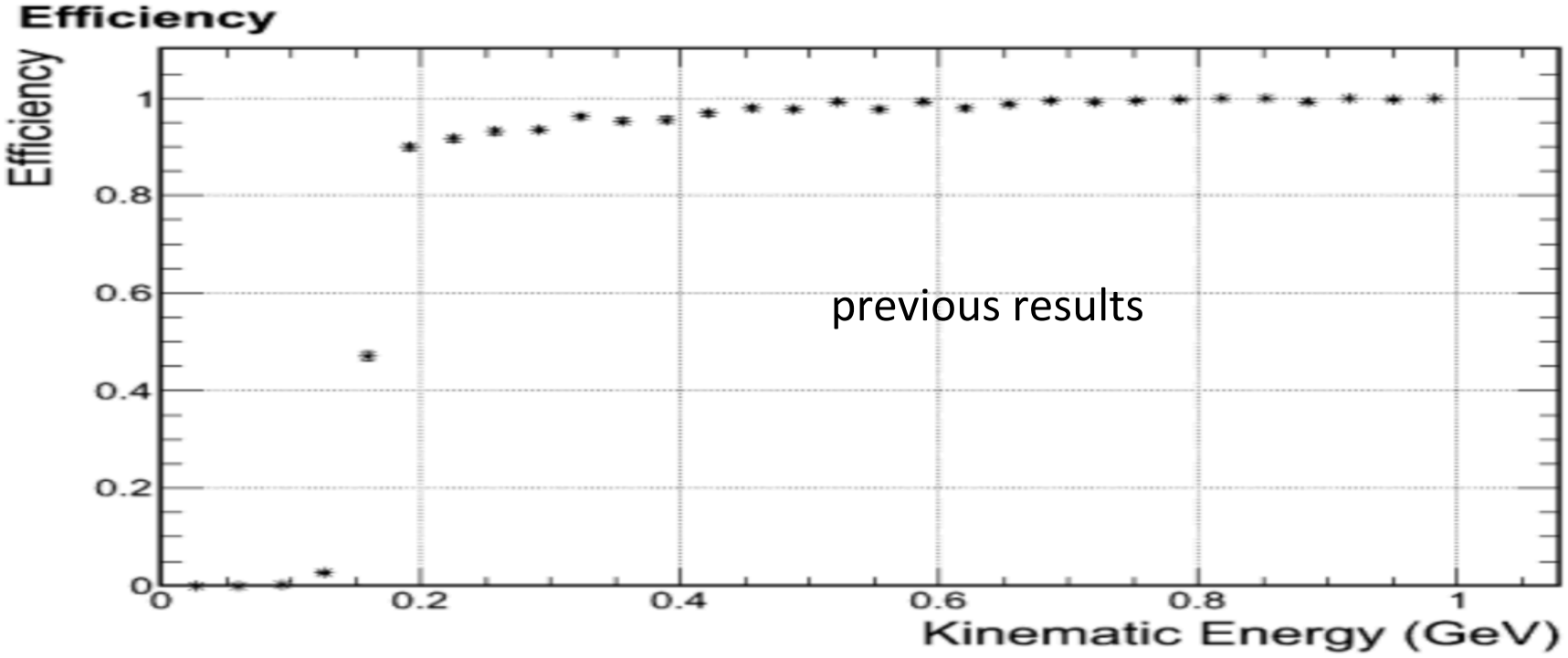

Pion Efficiency
Pion efficiency after the MIP cut
Efficiency
current results 97% efficiency at 1GeV
Kinetic Energy (GeV)


Efficiency
Efficiency
previous results 100% efficiency at 1GeV
Kinematic Energy (GeV)

Proton Efficiency

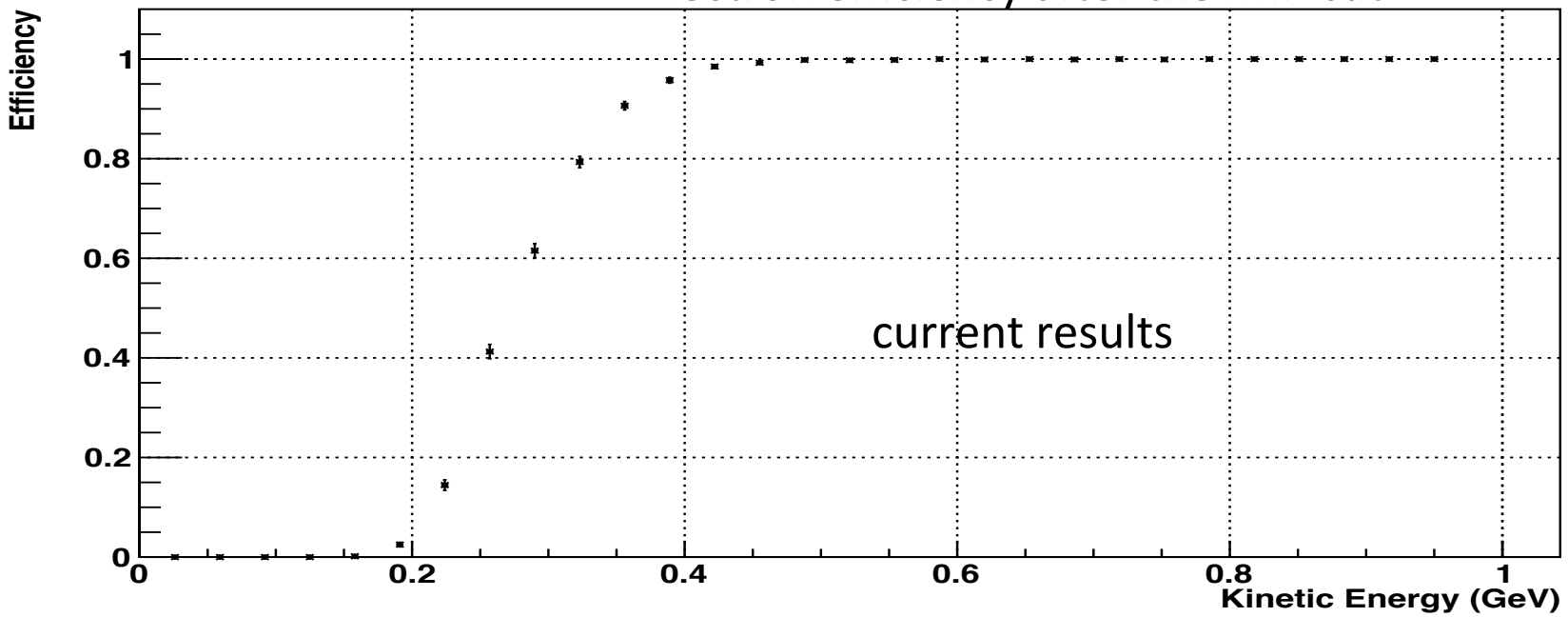
Proton efficiency after the MIP cut

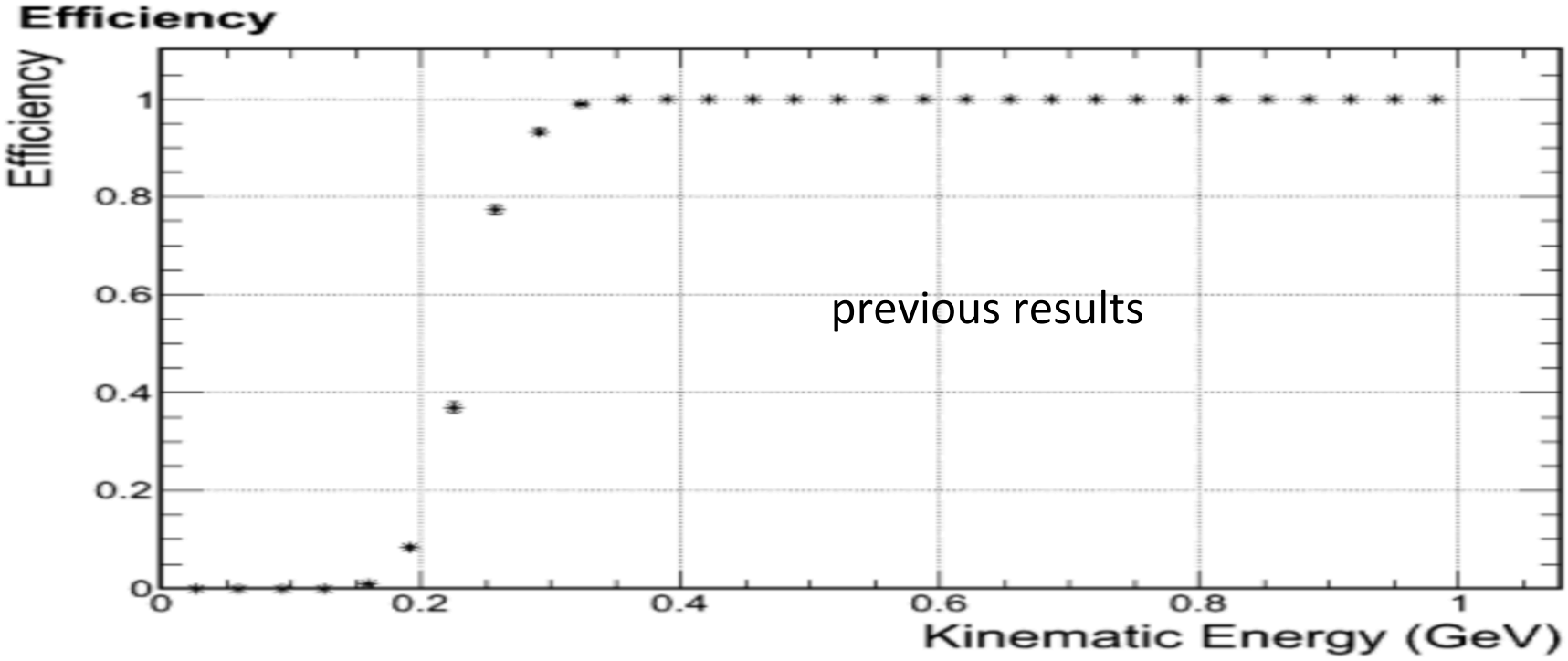


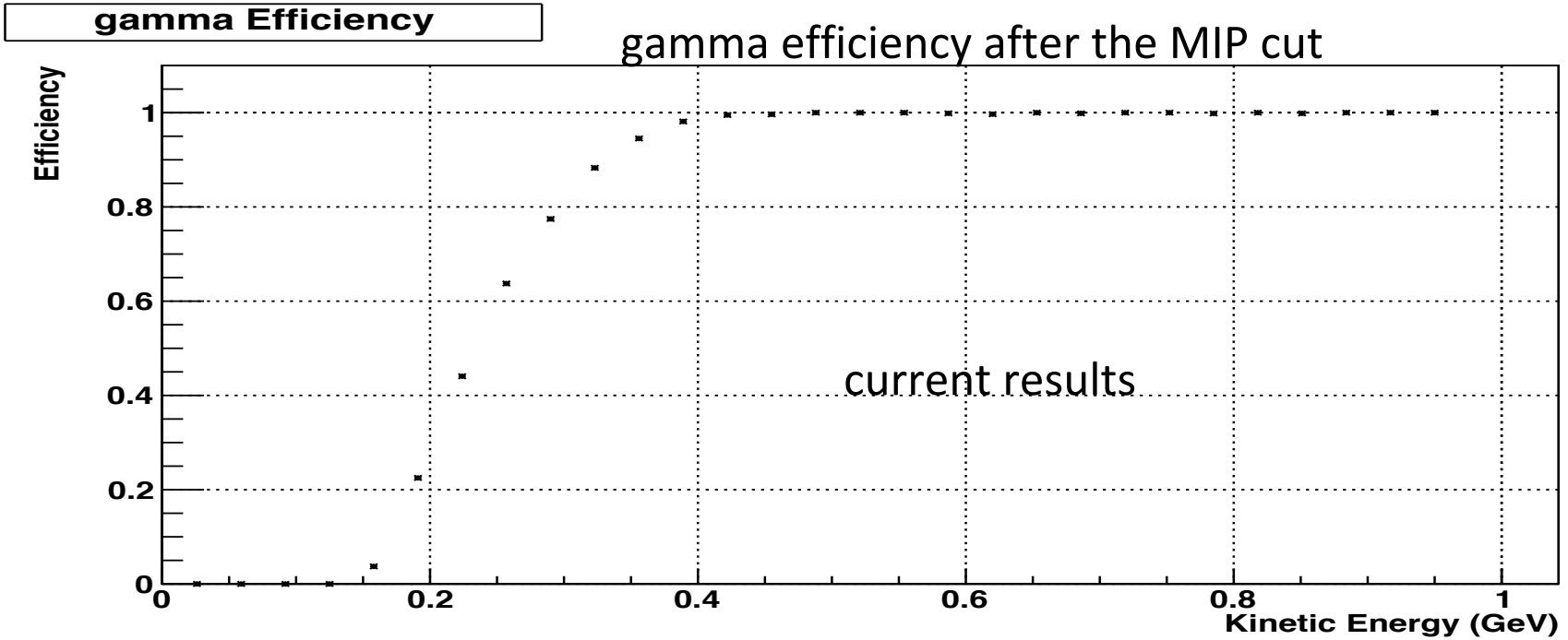


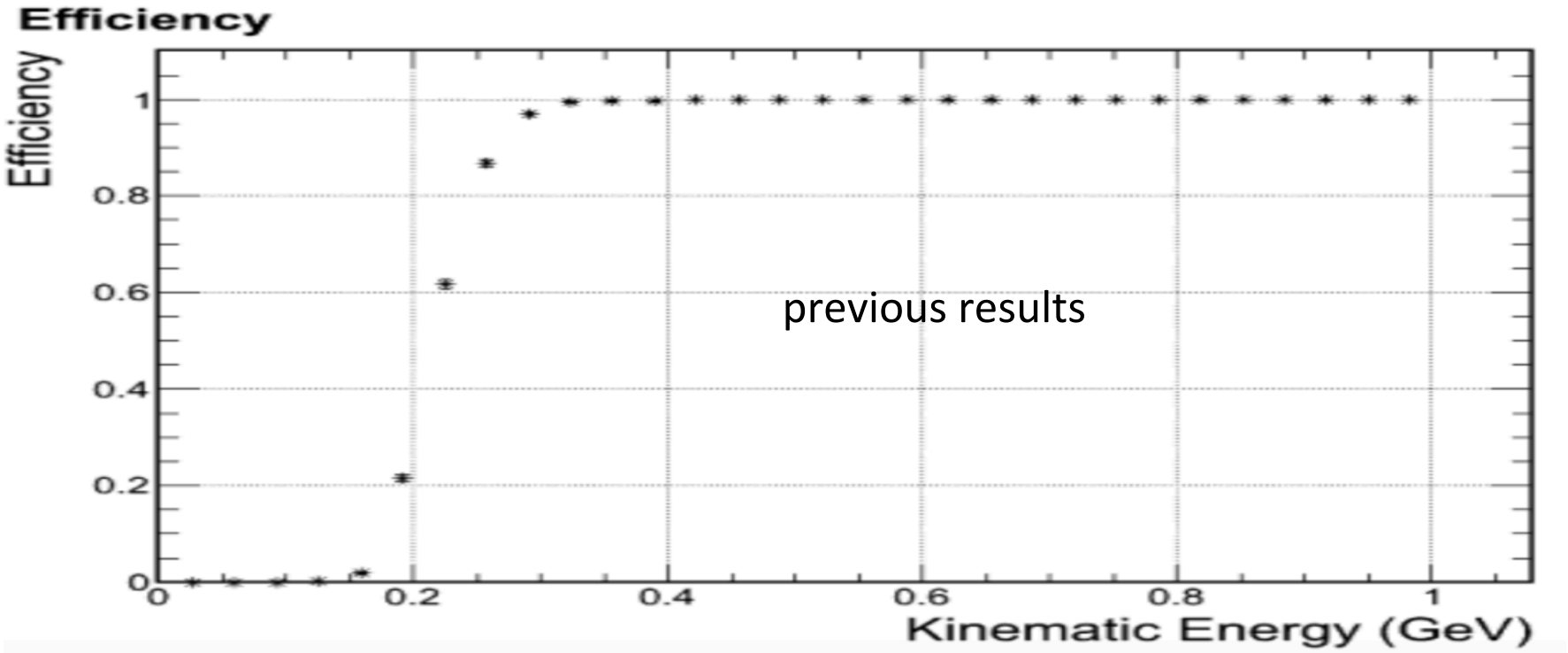
Electron Efficiency

Electron efficiency after the MIP cut






gamma Efficiency
gamma efficiency after the MIP cut
Efficiency
1
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1
Kinetic Energy (GeV)
current results


Efficiency
Efficiency
1
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1
Kinematic Energy (GeV)
previous results

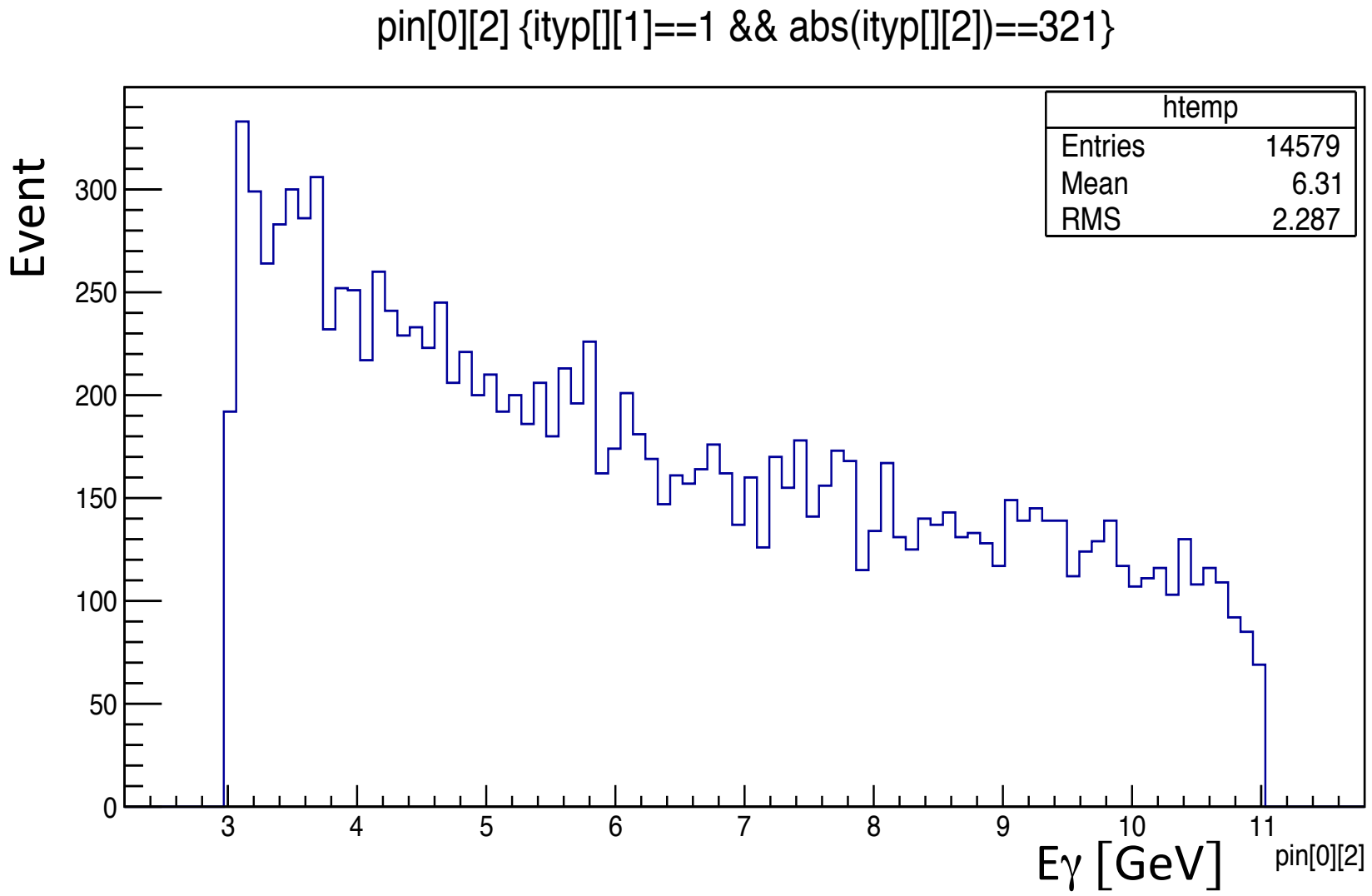
Hadron Trigger Rates for FAEC

Rate (kHz)	FAEC		FAEC+SPD	
	Zhiwen	Ye	Zhiwen	Ye
DIS e^-	140	131.754	100	95.1471
π^0	4607	4418.54	548	492.58
π^-	4925	4526.88	3971	3976.54
p	3510	3279.14	3164	2966.45
All hadrons no e-	17392	17022.8	12805	12519.5
FAEC total:				

Part of Kaons are not included

Issues

- Bggen: E_γ<3GeV SAID: no kaon channels
  E_γ>3GeV Pythia: kaon channels

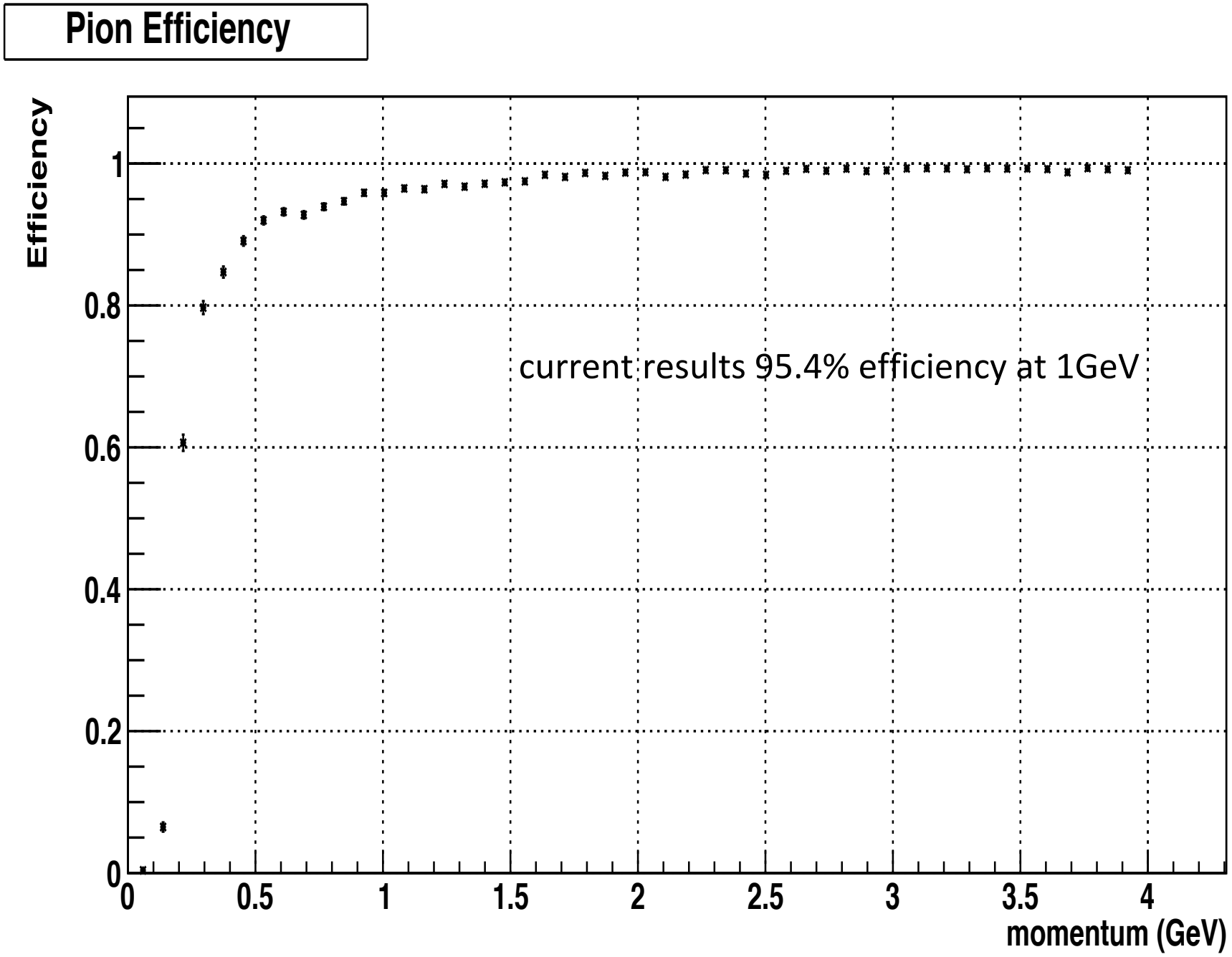


Next Steps

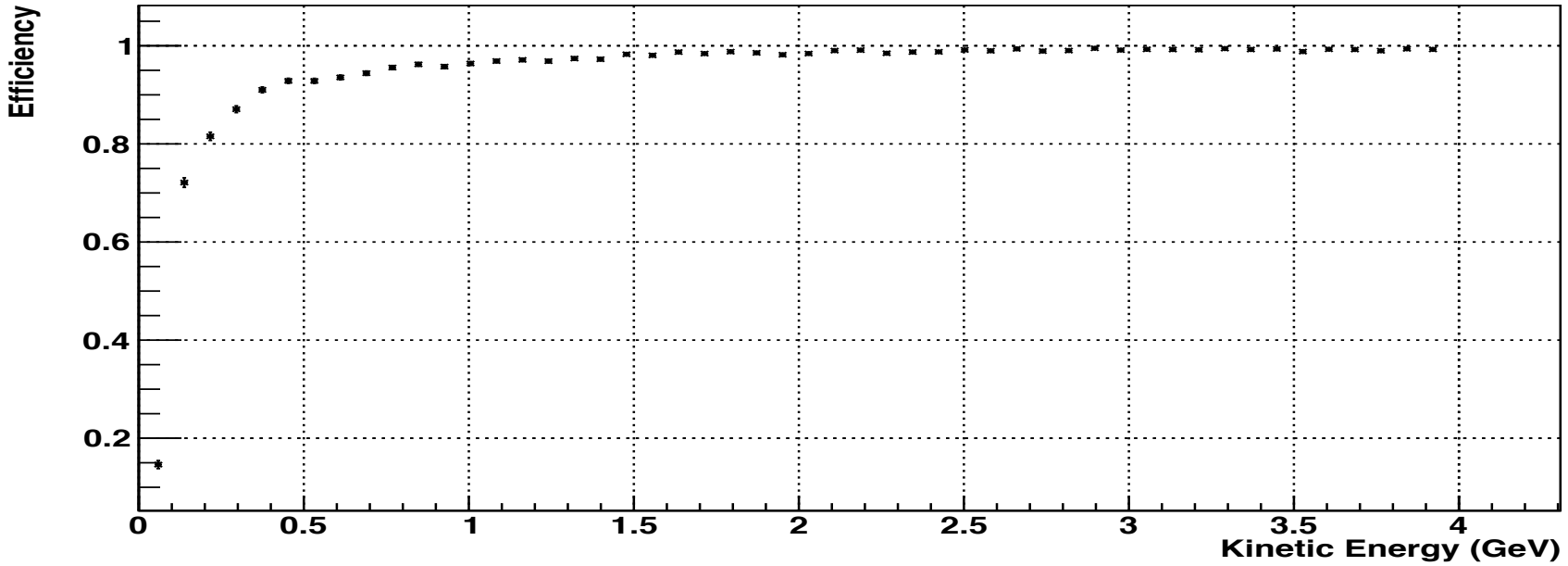
- Compare σ_{total} between bggen and Geant4?
- Add kaon channels for Er<3GeV?

Any comments and suggestions ?

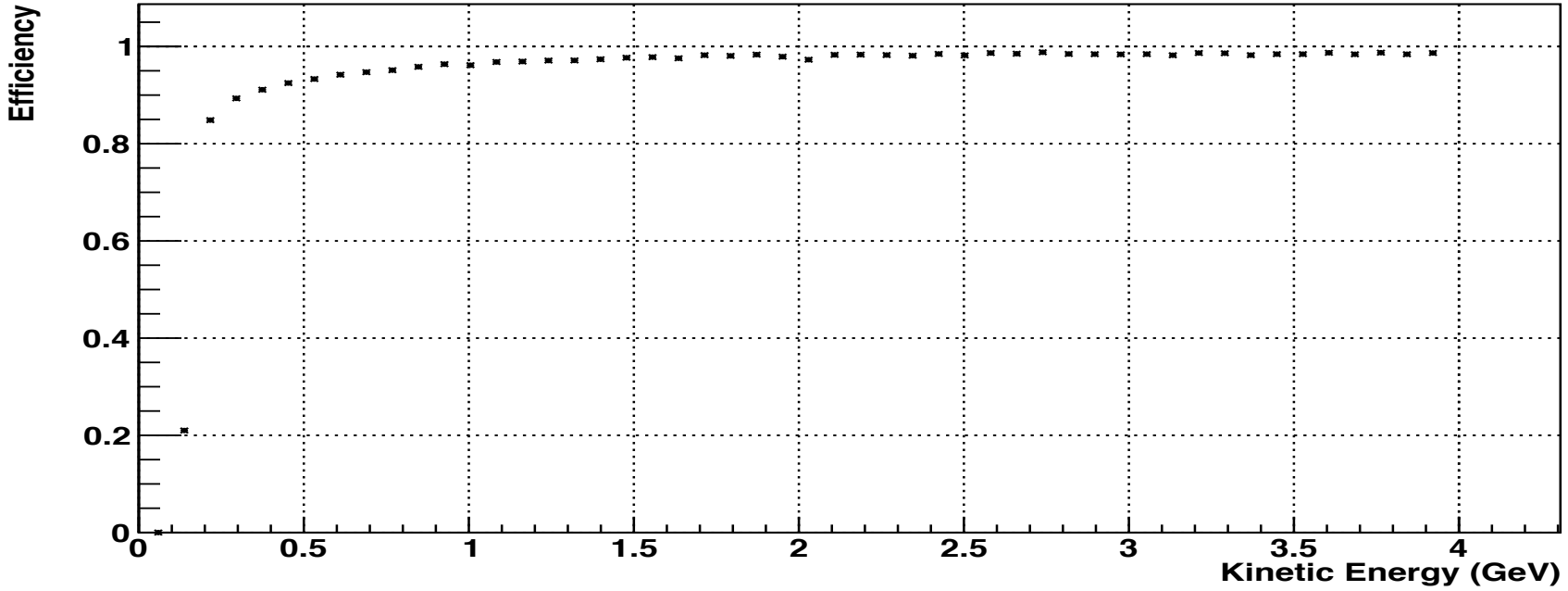
Back up


Pion Efficiency
Efficiency
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
2.5
3
3.5
4
momentum (GeV)
current results 95.4% efficiency at 1GeV

Pion Efficiency



Proton Efficiency



single (gas(hallD),win up(wiser),win down(wiser))

Jin's EC Wiser trigger **hit matching**

e_FA(kHz)	EC	EC+LGC	EC+LGC+SPD
Electron	68 (57)	63(56)	58(52)+1+2
Pip	694(643)	4.2(3.3)	3.8(3.1)+2.5/2+1.6/2
Pim	537(492)	4.0(3.2)	3.6(3.0) +2.3/2+2.1/2
Pi0	1024(120)	43(31)	32(30) +1.1/2+5.8/2
P	202(185)	0(0)	0(0) +0/2+0/2
all hadrons, no electron	2692	62	47 +?+?
Total:			105+4+7=116

electron trigger self coin prescaled by 10

61/10=6kHz

Only primary particle in parenthesis,
In case of pi0, only e+ or e-

Pi0 before LGC 26(26)
Pi0 before GEM 13(12)

e_LA(kHz)	EC	EC+SPD
electron	4.5(4.3)	4.1(4)+3.6+2.6
Pip	8.6(8.5)	7.9(8.1)+8.4/2+5.6/2
Pim	6.4(6.0)	5.9(5.7) +6.1/2+3.7/2
Pi0	15.3(0.2)	0.6(0.2) +0.4/2+0.3/2
P	2.9(3.2)	2.8(3.0) +7.6/2+4.8/2
all hadrons, no electron	38	18 +?+?
Total:		22 +14+10=46

h_FA(kHz)	EC	EC+SPD
electron	140(94)	100(87) +4+4
Pip	5855(4898)	5151(4447) +3405/2+4570/2
Pim	4925(3787)	3971(3435) +3300/2+4590/2
Pi0	4607(811)	548(468) +33/2+171/2
P	3510(3103)	3164(2831) +2243/2+2563/2
all hadrons, no electron	17392	12805 +?+?
Total:		12913 +4500+6000=23413

only primary particle in parenthesis
Wiser rate scaled down by 2

Random coin (116+46-10.3-7.06-6.96)*23413*1e3*30e-9=97KHz

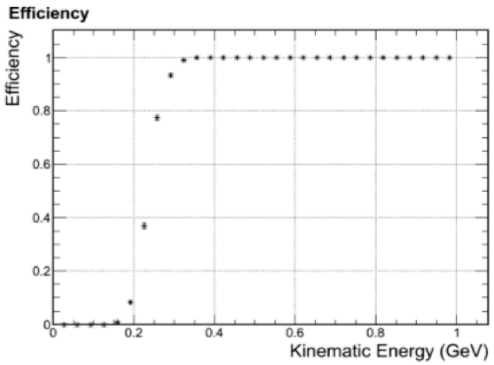
SIDIS EC MIP Trigger (100%)

- Detailed study at low energy, cut at ~200MeV to ensure pion eff is 100% at Ek=1GeV
- Independent curve for all 4 particles

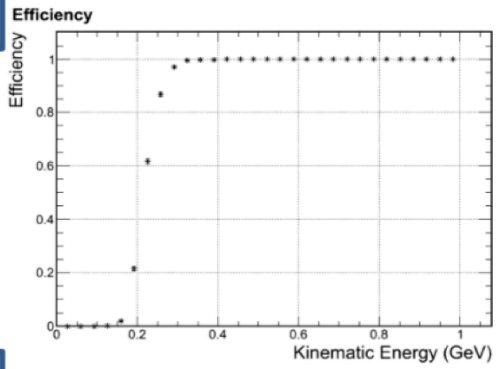
MIP trigger Assumption

- trig_eff (Ek>Max)=trig_eff(P=Max)
- trig_eff (Ek<Min)=0
- If (trig_eff<0.01) trig_eff = 0

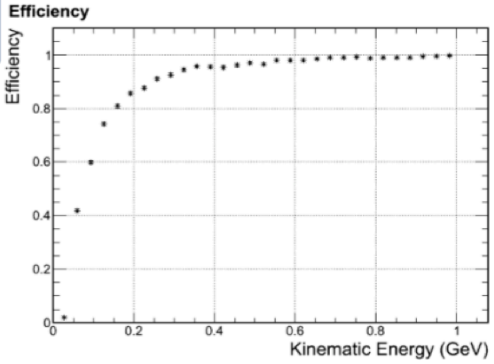
e



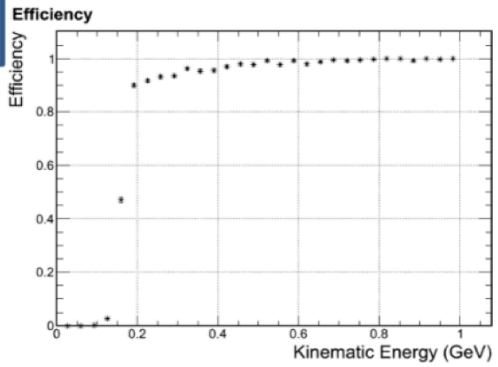
gamam



pion



p



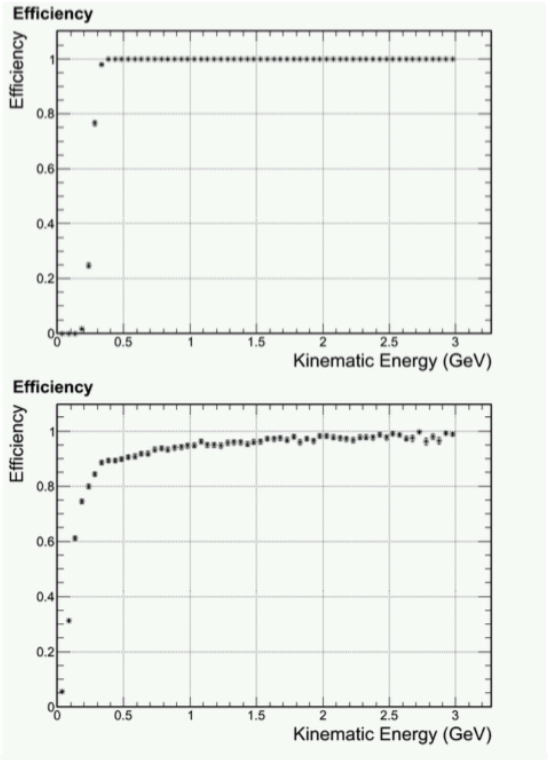
SIDIS EC MIP Trigger (95%)

- Detailed study at low energy, cut a bit higher than ~200MeV to ensure pion eff is 95% at Ek=1GeV
- Independent curve for all 4 particles

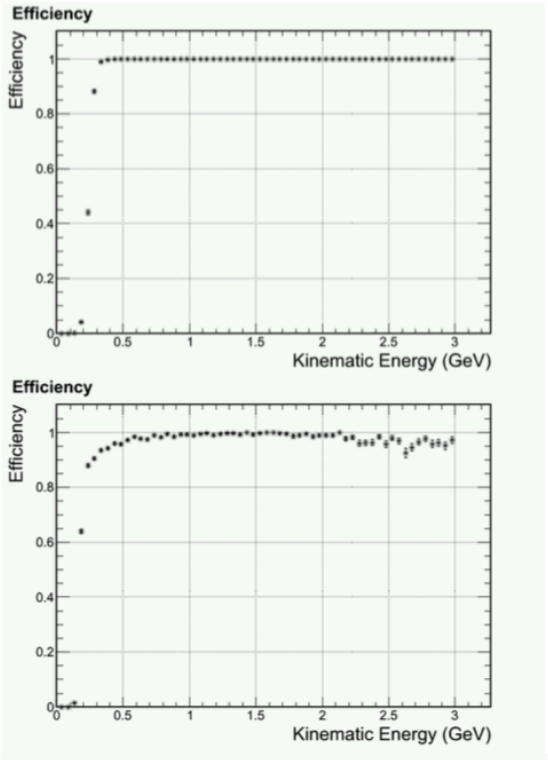
MIP trigger Assumption

- trig_eff (Ek>Max)=trig_eff(P=Max)
- trig_eff (Ek<Min)=0
- If (trig_eff<0.01) trig_eff = 0

e



gamam



pion

p

Compare Hall D vs. PDG

- Compared total cross sections from Hall D event generator and PDG photo-production cross sections on proton
- For γ momentum less than $3\ \mathrm{GeV}$ it uses combination of different models including SAID
- For γ momentum greater than $3\ \mathrm{GeV}$ it uses PYTHIA

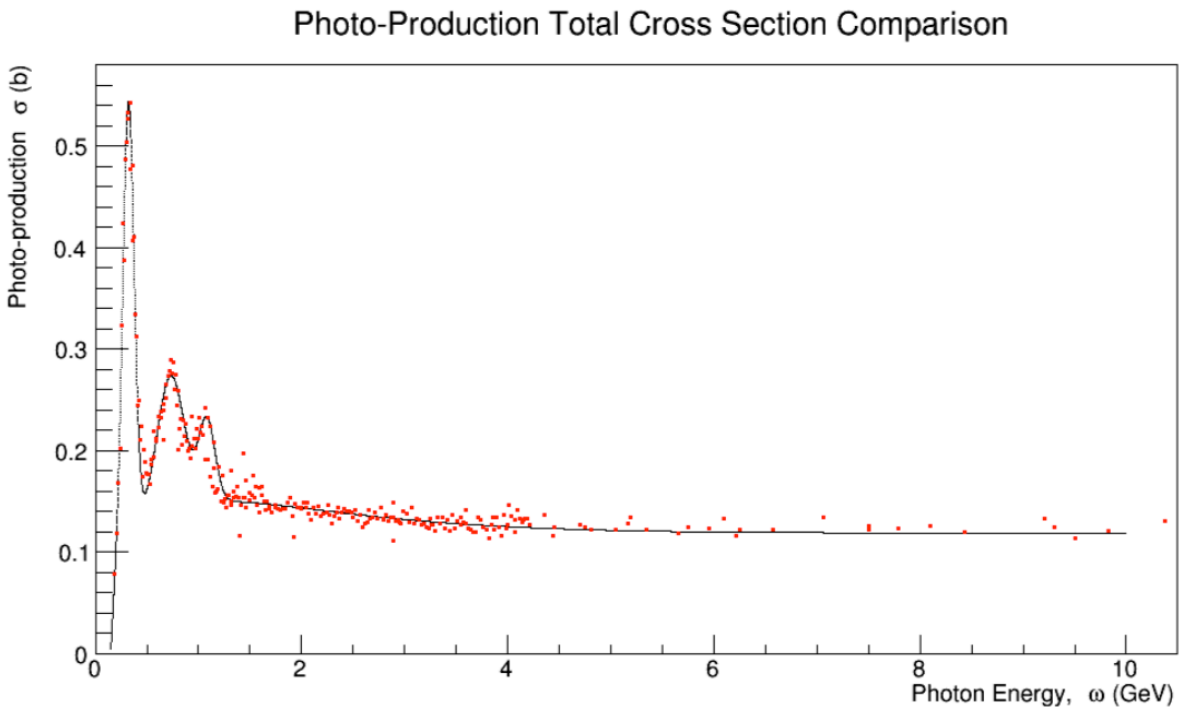


Figure: Black line : Hall D genertor, Red points : PDG