Baffle update

Zhiwen Zhao

2013/08/13

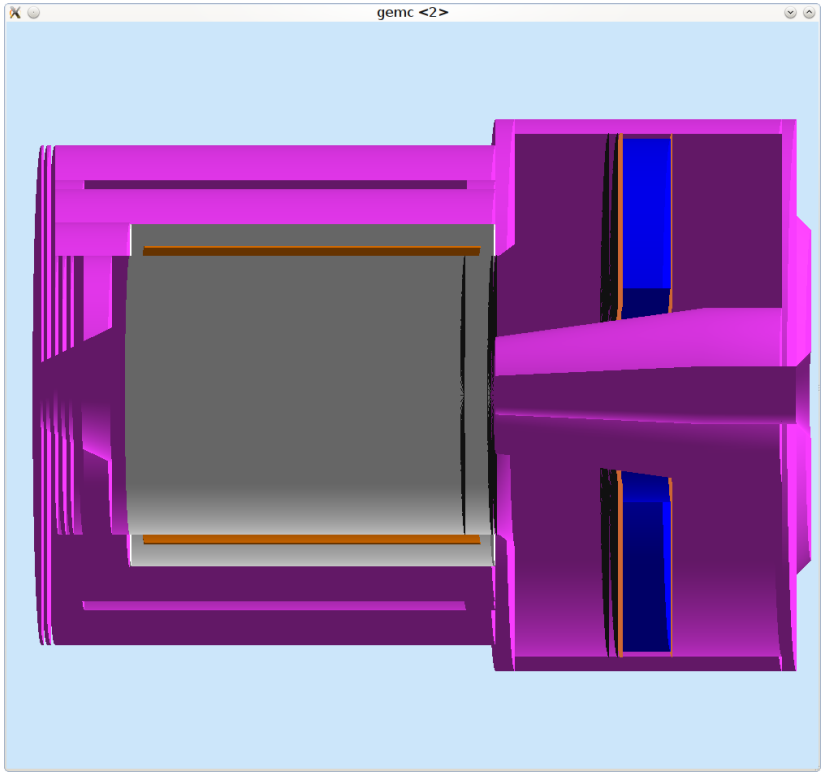
Acceptance study

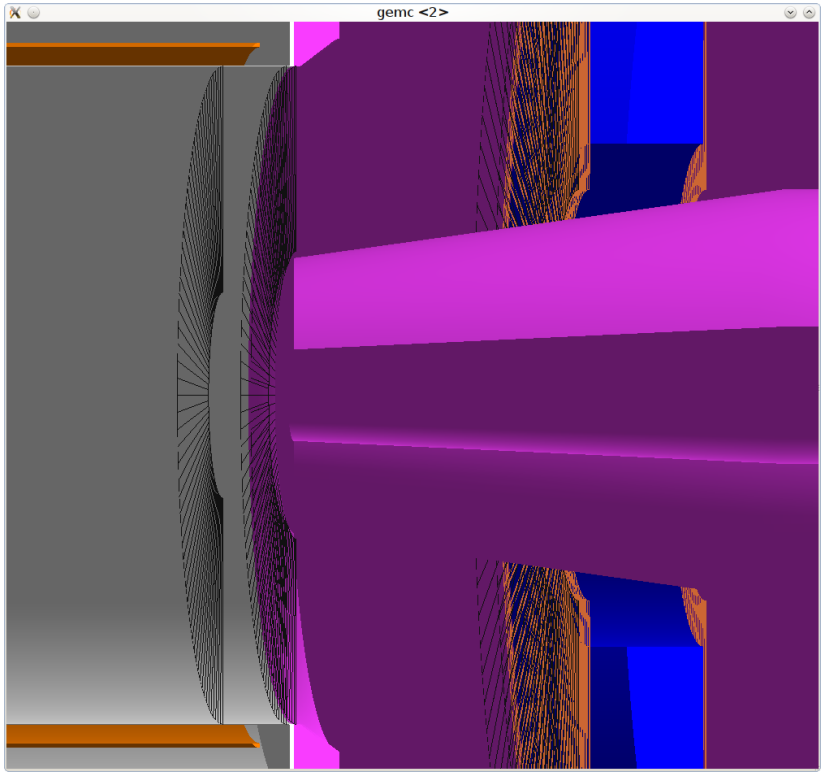
condition

PVDIS setup, no baffle

- Vacuum plane in front of EC and GEM, everything else are kryptonite or vacuum
- Virtual plane in front of EC R(90,270)cm to record hits, limited by endcap size
- EC module R(110,265)cm, 110cm due to target downstream end at 21 degree, 265cm due to endcap size
- EC effect R(110,250)cm, 250cm choose to ensure EC best performance

- Throw in geantino/chargedgeantino from various vertex and evenly in P and theta
- Look at accepted particles on virtual plane in front of EC with cut on R(110,250)cm to determine acceptance





negative

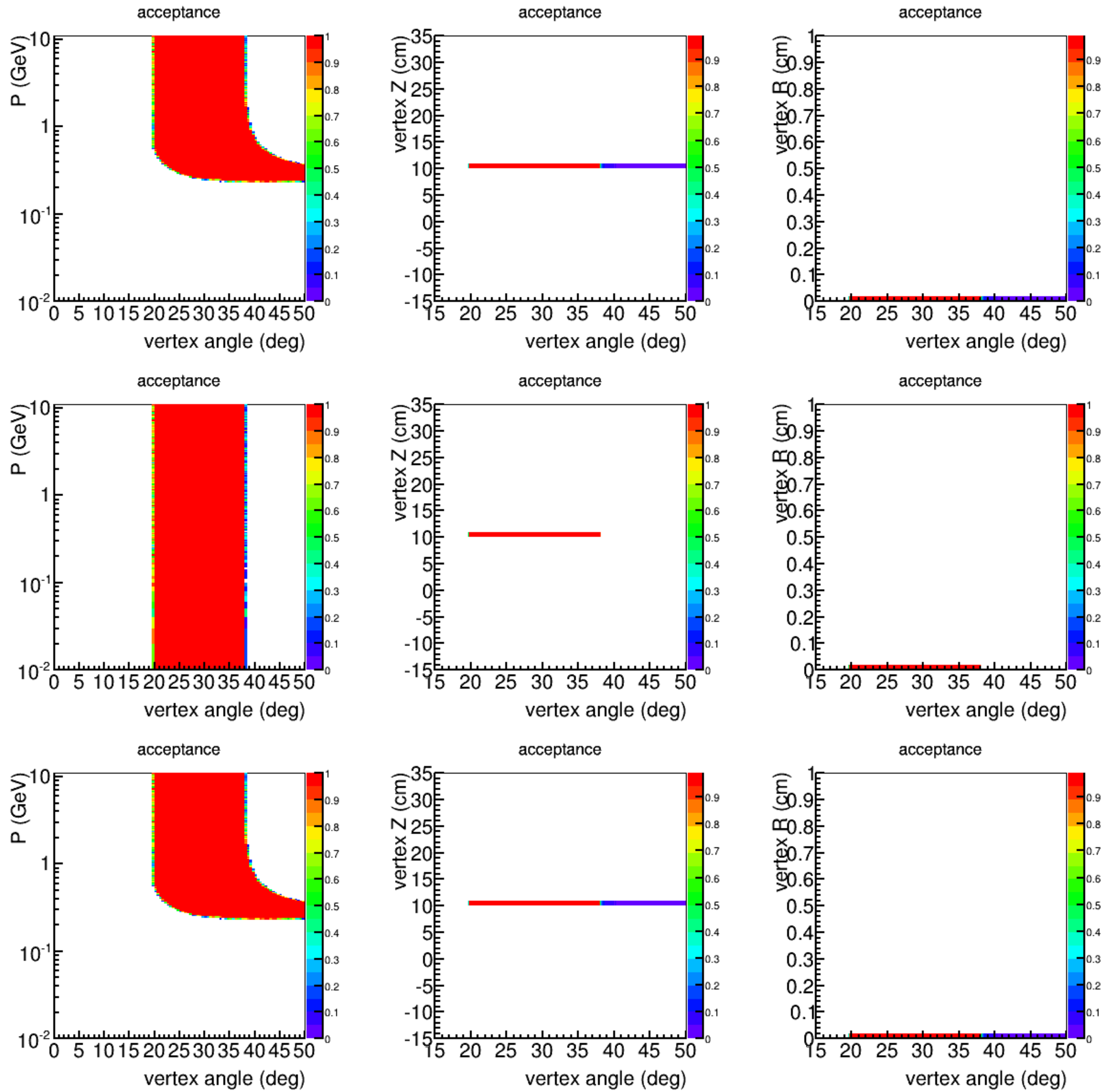
point source

Z=10cm

r=0mm

neutral

positive



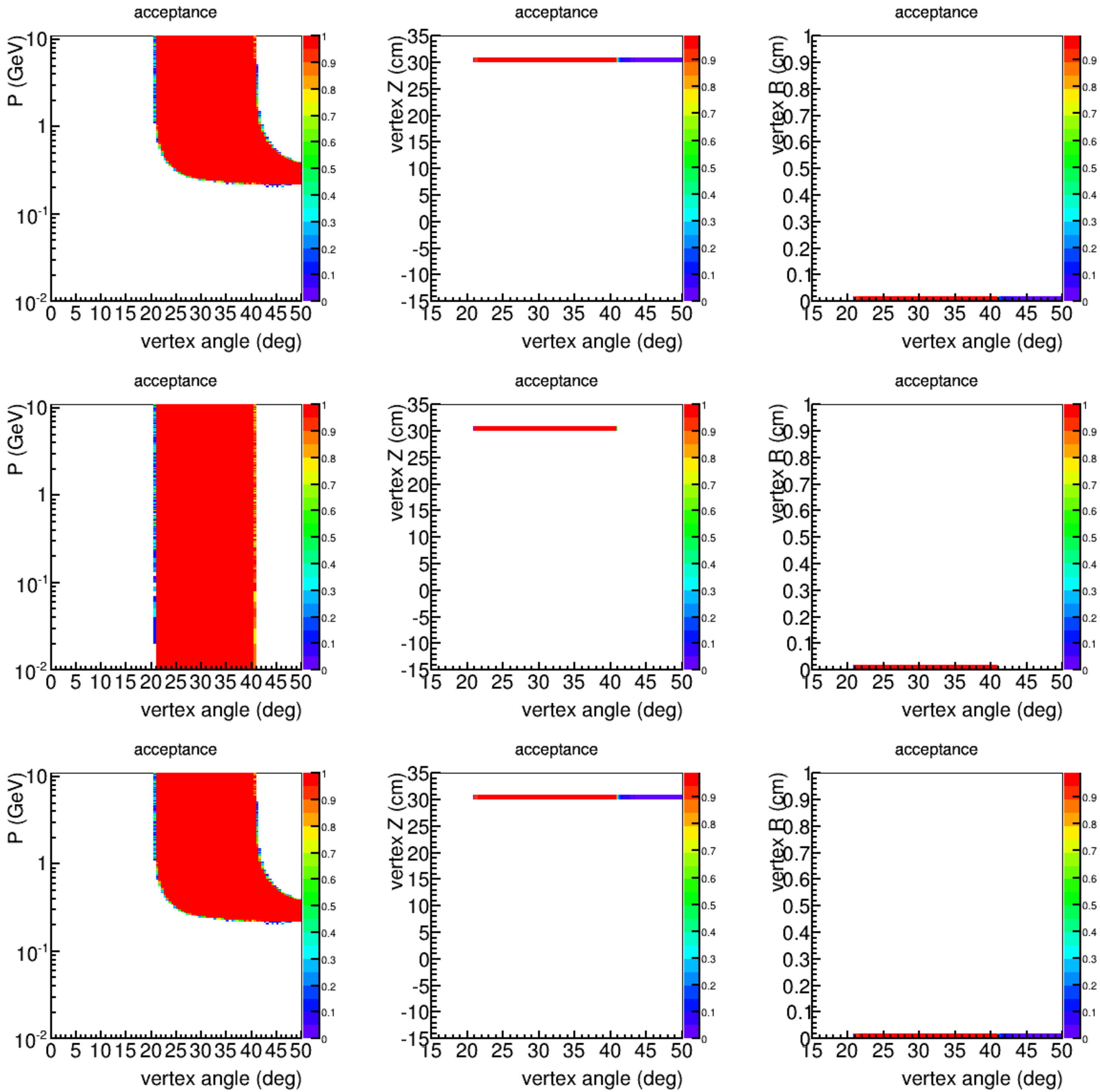
negative

point source
Z=30cm
r=0mm

neutral

Accept larger polar angle

positive



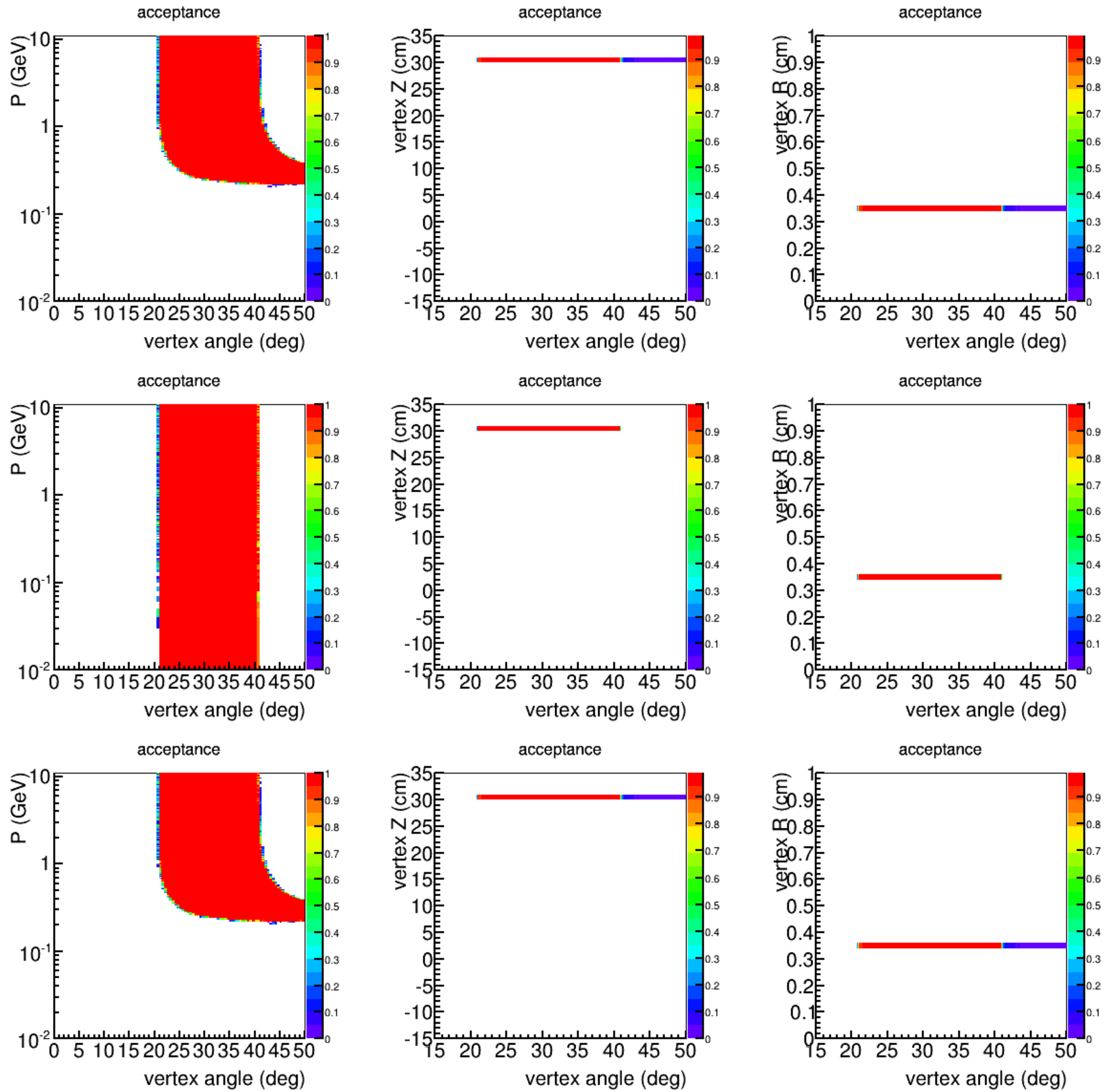
negative

point
source
Z=30cm
r=3.536mm

neutral

Accept larger polar angle

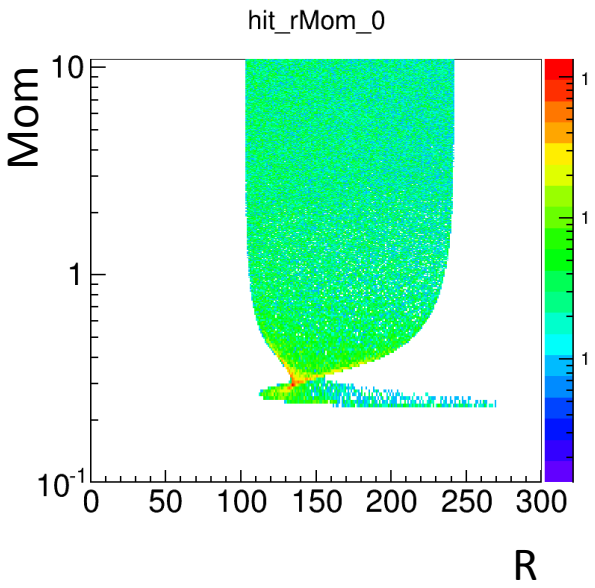
positive

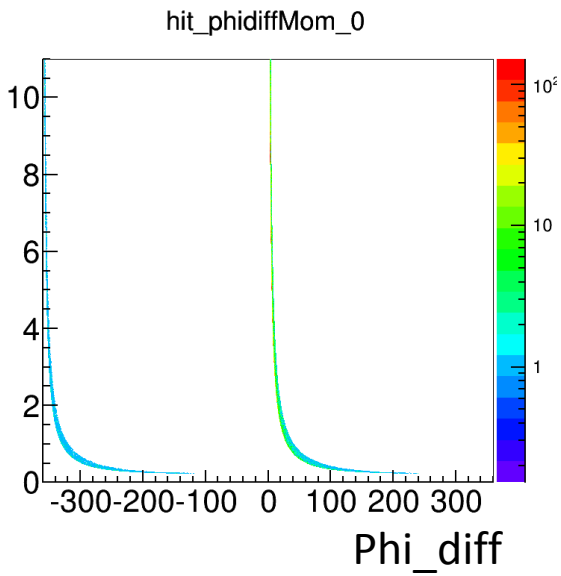


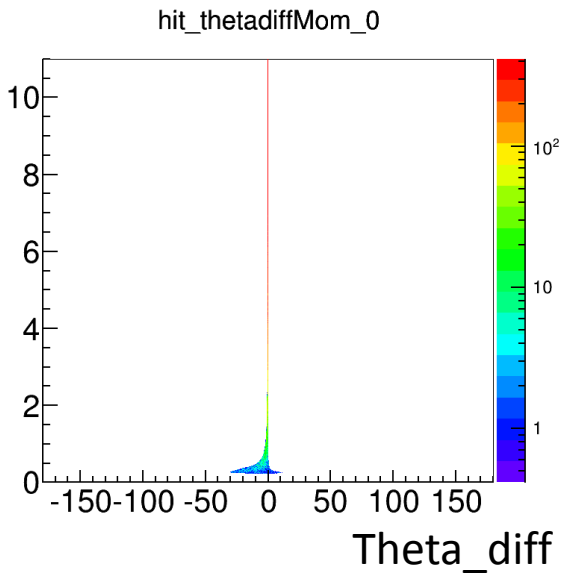
Point source
Z=10cm
r=0mm

How particle rotates in SoLID field

negative





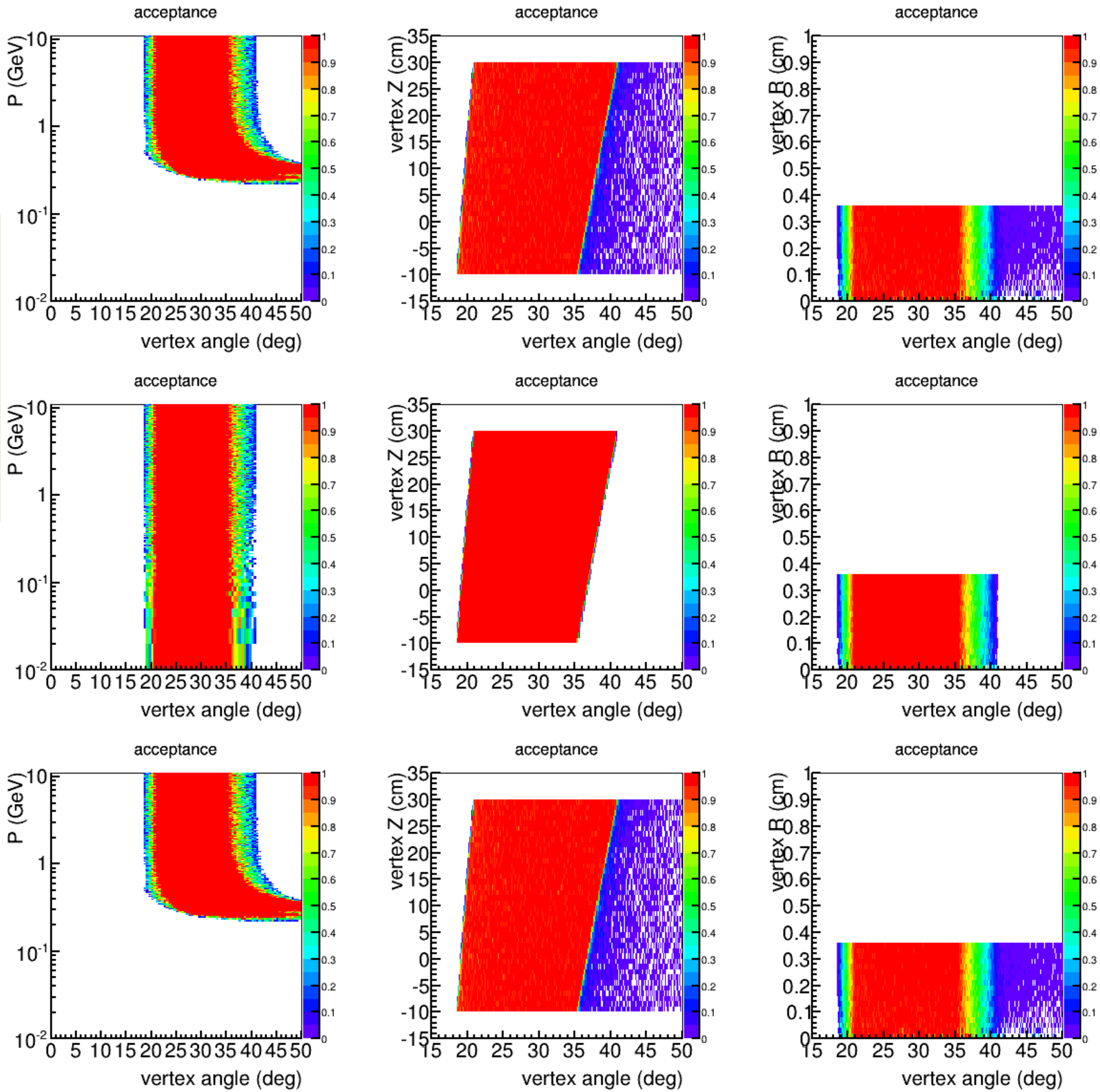


Sweep away < 0.2MeV, Squeeze ~ 0.3GeV

negative

source
Z(-10,30)cm
R(0,3.536)mm

neutral



- Strong bending < 0.5GeV
- Sweep away < 0.2GeV

positive

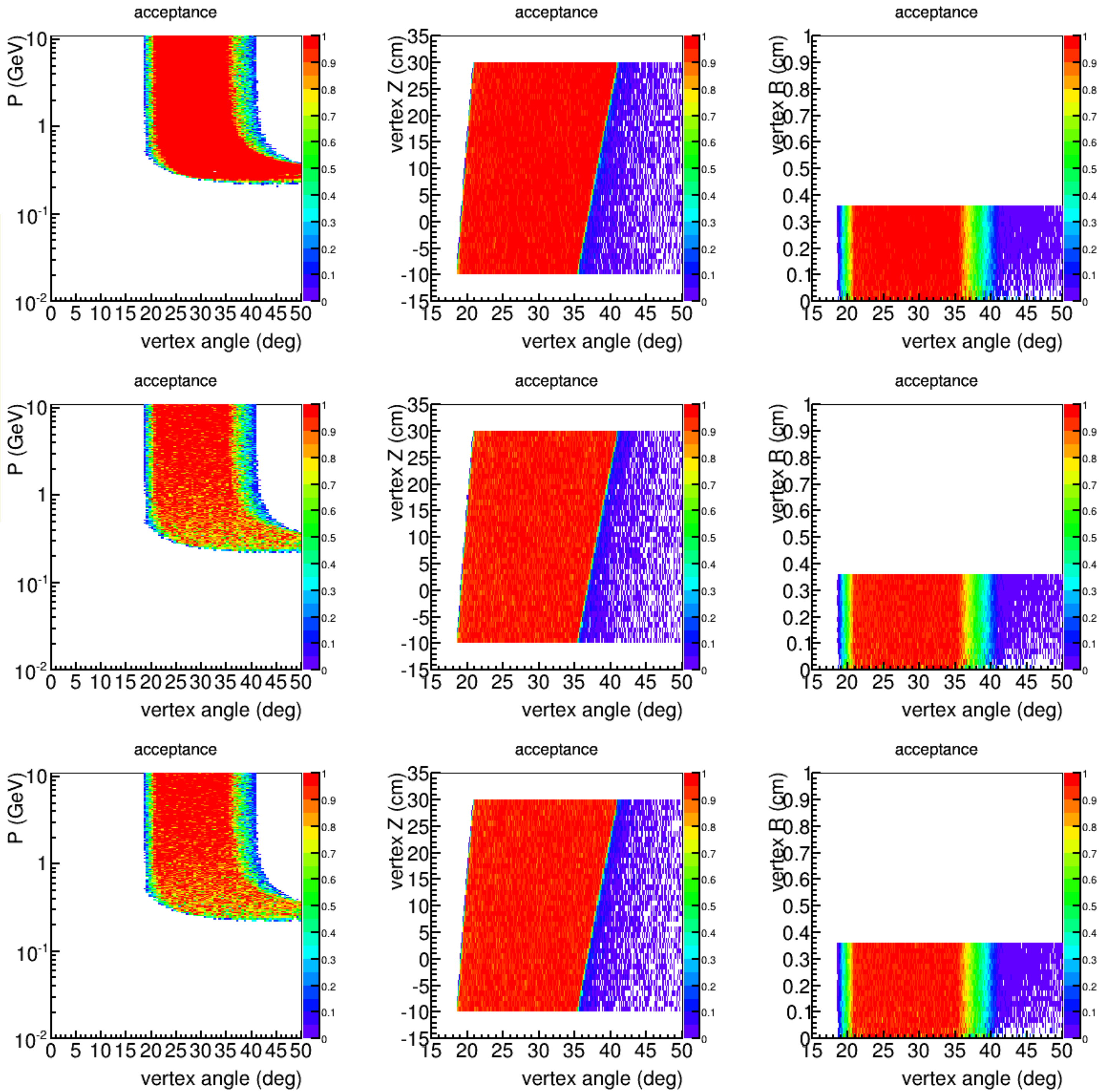
e-

source
Z(-10,30)cm
R(0,3.536)mm

pim

~3% pion decay before reach EC

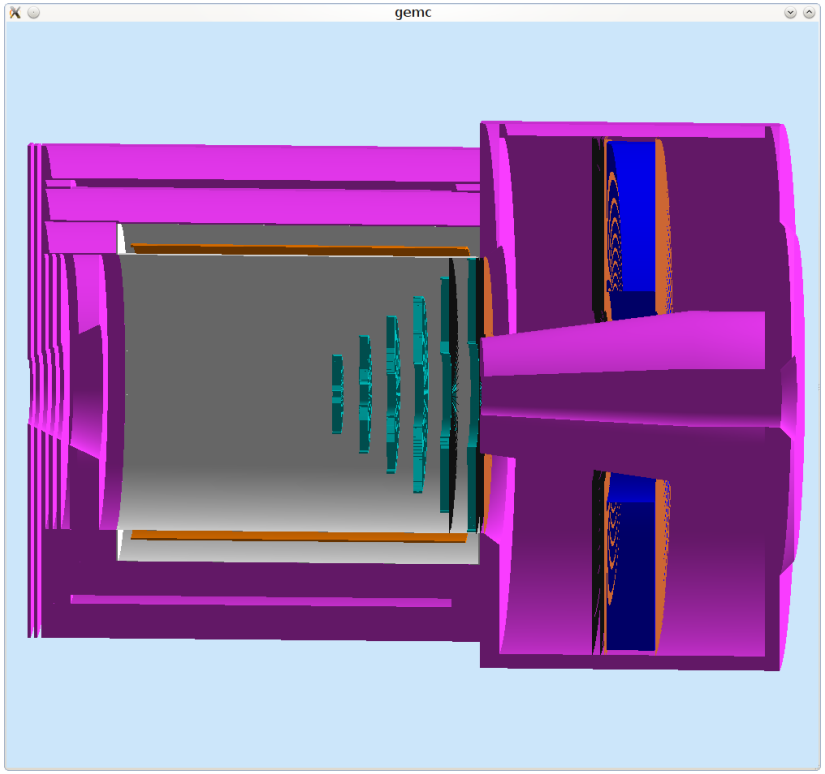
pip

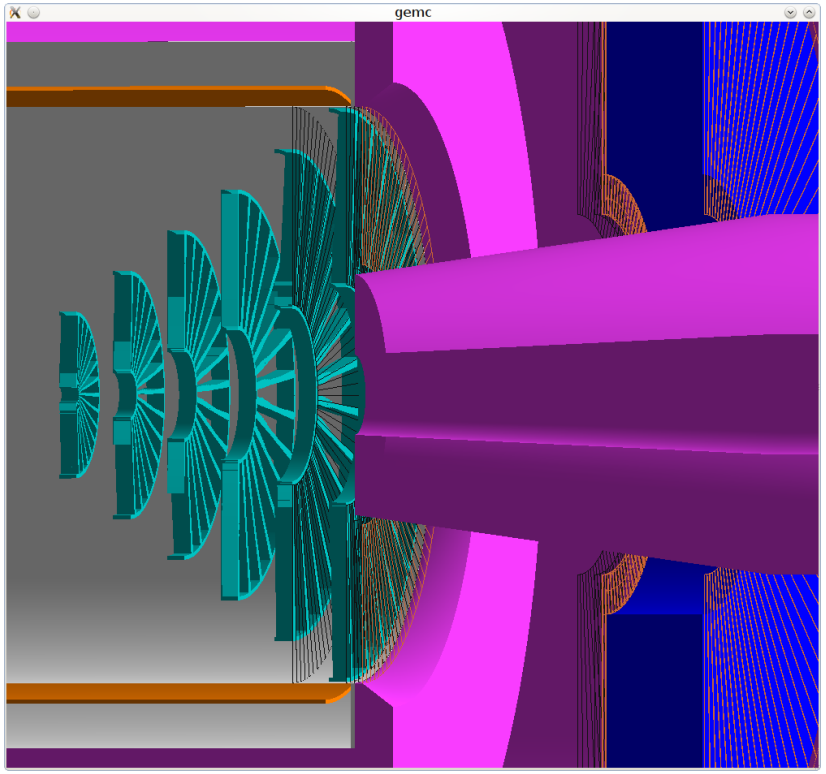


condition

PVDIS setup, with baffle

- All similar to no baffle case, just add kryptonite baffle
- Use cutinner 4cm





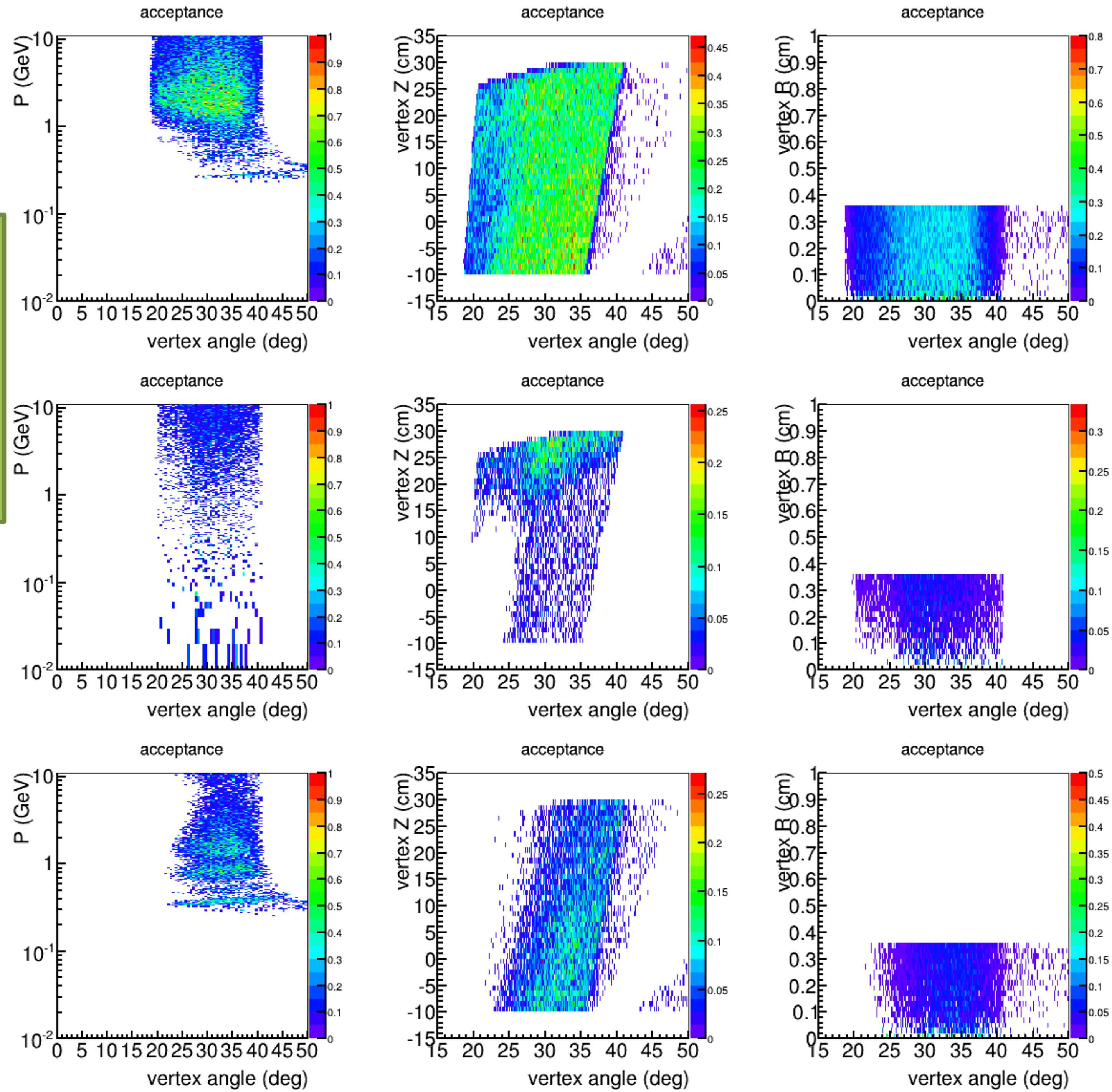
negative

source
Z(-10,30)cm
R(0,3.536)mm

neutral

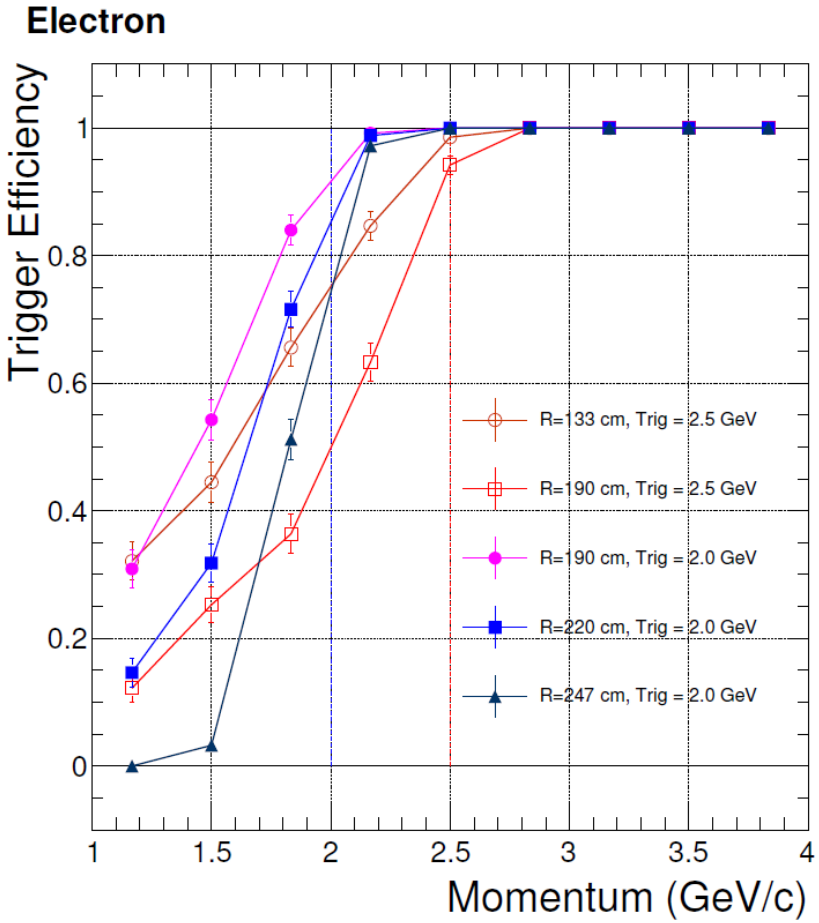
- Strong bending < 0.5GeV
- Sweep away < 0.2GeV

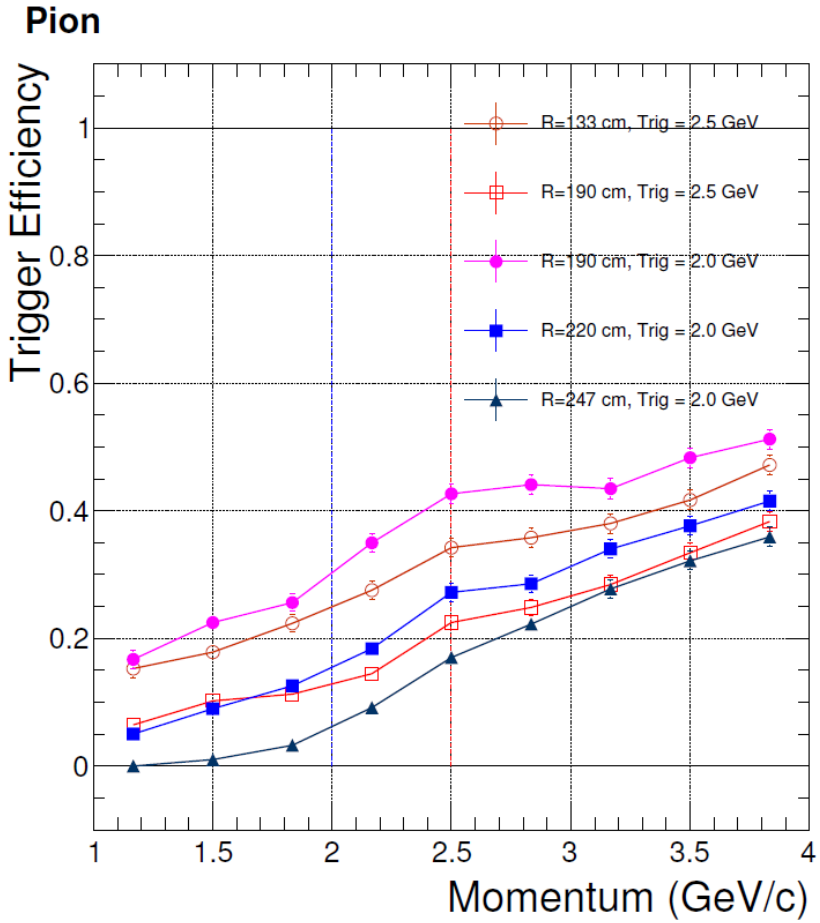
positive



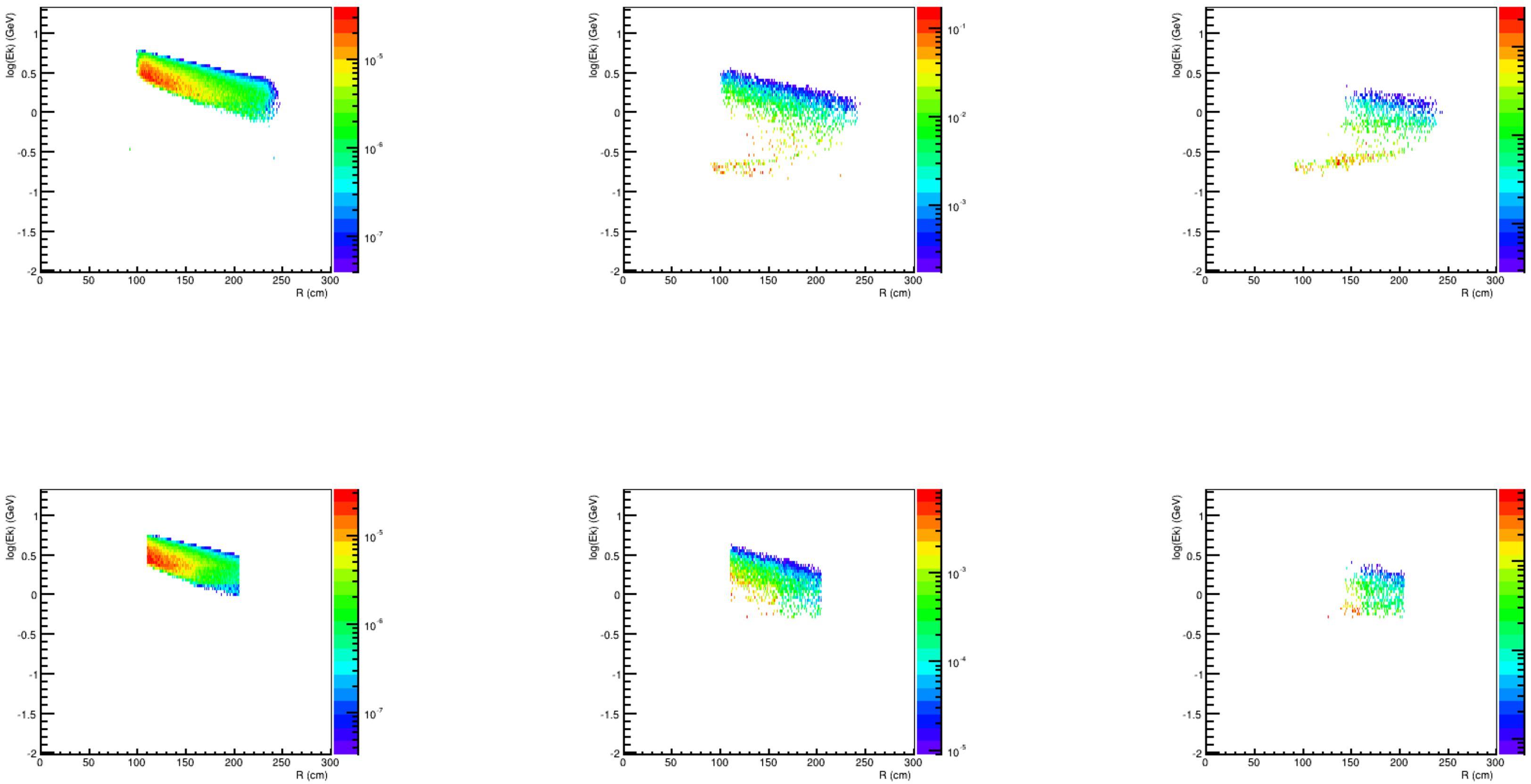
Process	Proposal PAC34		Current		
	open	baffled	Open	Baffle (smallerZ 4cm)	Baffle (largerZ)
e DIS total	2500 kHz	110 kHz	7800 kHz	1140 kHz	830 kHz
eDIS W>2GeV,x>0.20	1500 kHz	110	2000 kHz	650 kHz	618 kHz
eDIS W>2GeV,x>0.55	35 kHz	12	94 kHz	24 kHz	28 kHz
eDIS W>2GeV,x>0.65	8 kHz	3	22 kHz	5.7 kHz	6.7 kHz
pim all			26700 MHz	1000 MHz	560 MHz
pim p>0.3GeV	2300 MHz	140 MHz	14000 MHz	740 MHz	160 MHz
pim p>1.0GeV	460 MHz	70 MHz	1600 MHz	270 MHz	150 MHz
pim p>2.0GeV	26 MHz	8 MHz	53 MHz	17 MHz	18 MHz
pip all			26900 MHz	1400 MHz	1200 MHz
pip p>0.3GeV			14000 MHz	610 MHz	280 MHz
pip p>1.0GeV			1600 MHz	71 MHz	5.3 MHz
pip p>2.0GeV			51 MHz	0.25 MHz	0.039 MHz
e DIS W>2GeV,x<0.20 EC triggered	680 kHz	102 kHz	1430kHz	446 kHz 448 kHz	485kHz
Pim, EC triggered	540 kHz	120 kHz	604000	479 00 425 0	23900 kHz

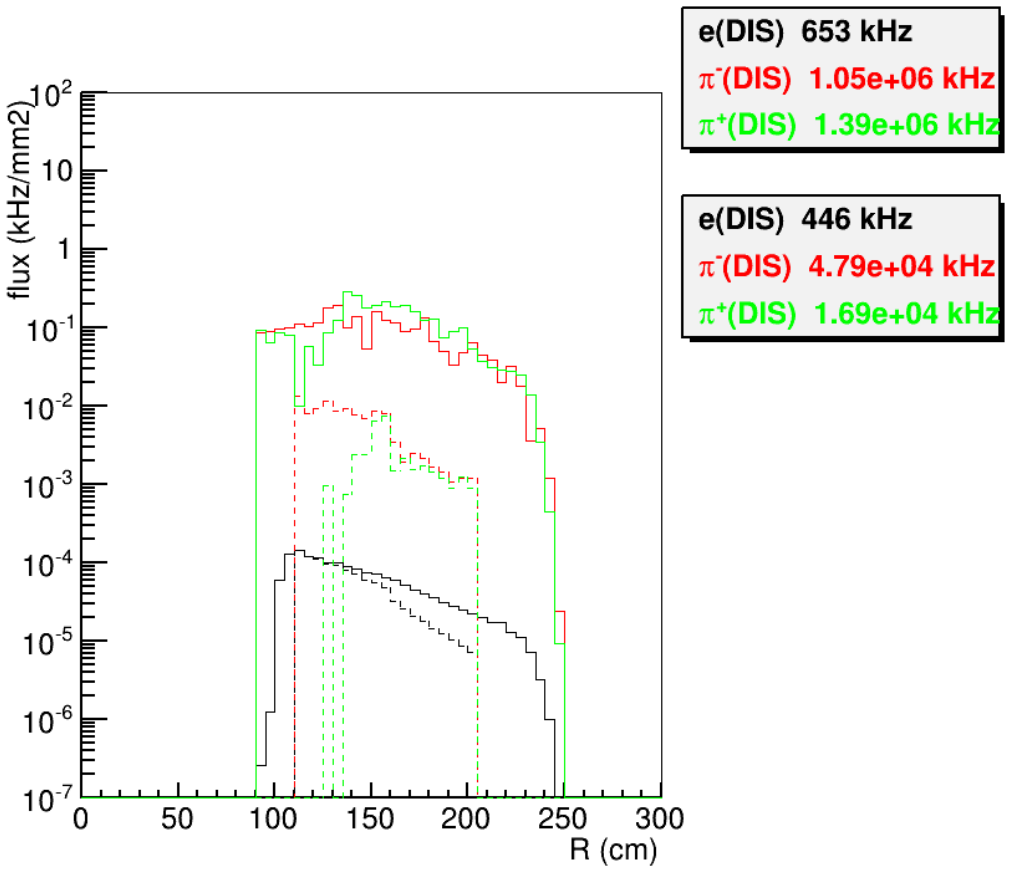
PVDIS EC Trigger Effect

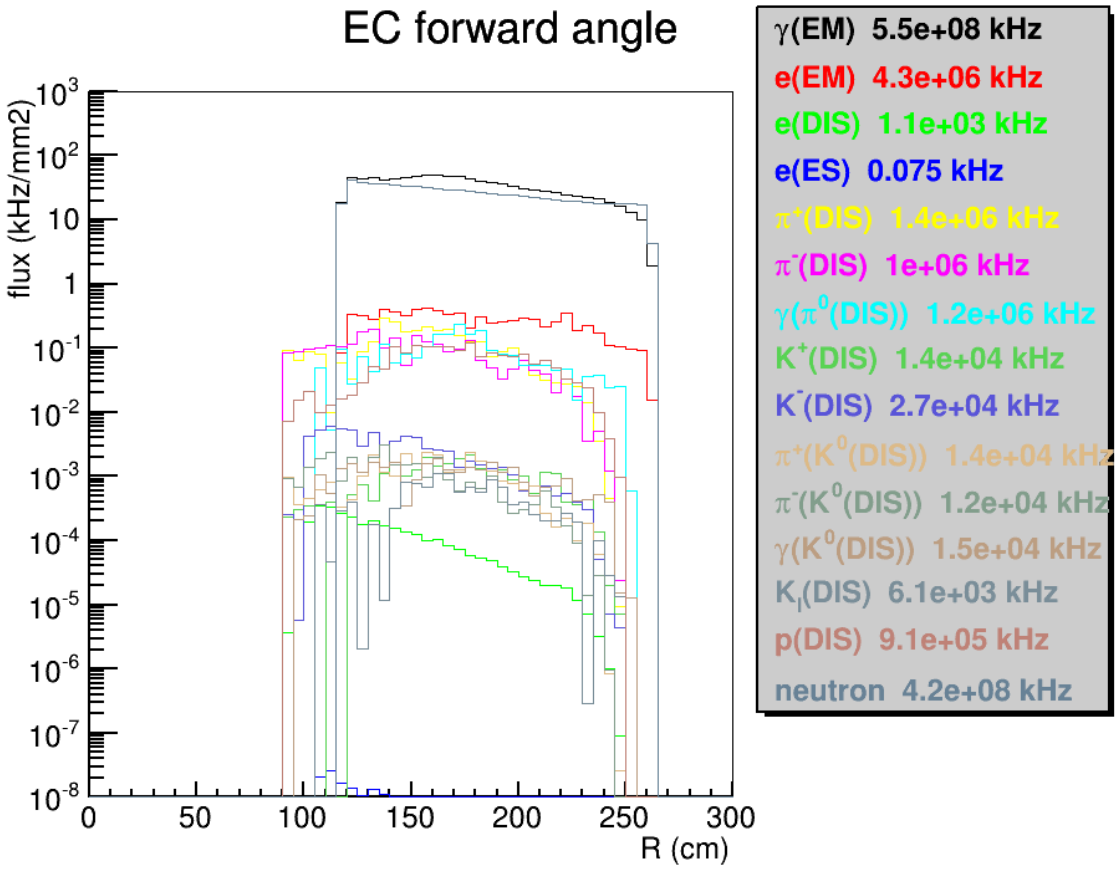




trigger




e(DIS) 653 kHz
π⁻(DIS) 1.05e+06 kHz
π⁺(DIS) 1.39e+06 kHz
e(DIS) 446 kHz
π⁻(DIS) 4.79e+04 kHz
π⁺(DIS) 1.69e+04 kHz
flux (kHz/mm2)
R (cm)

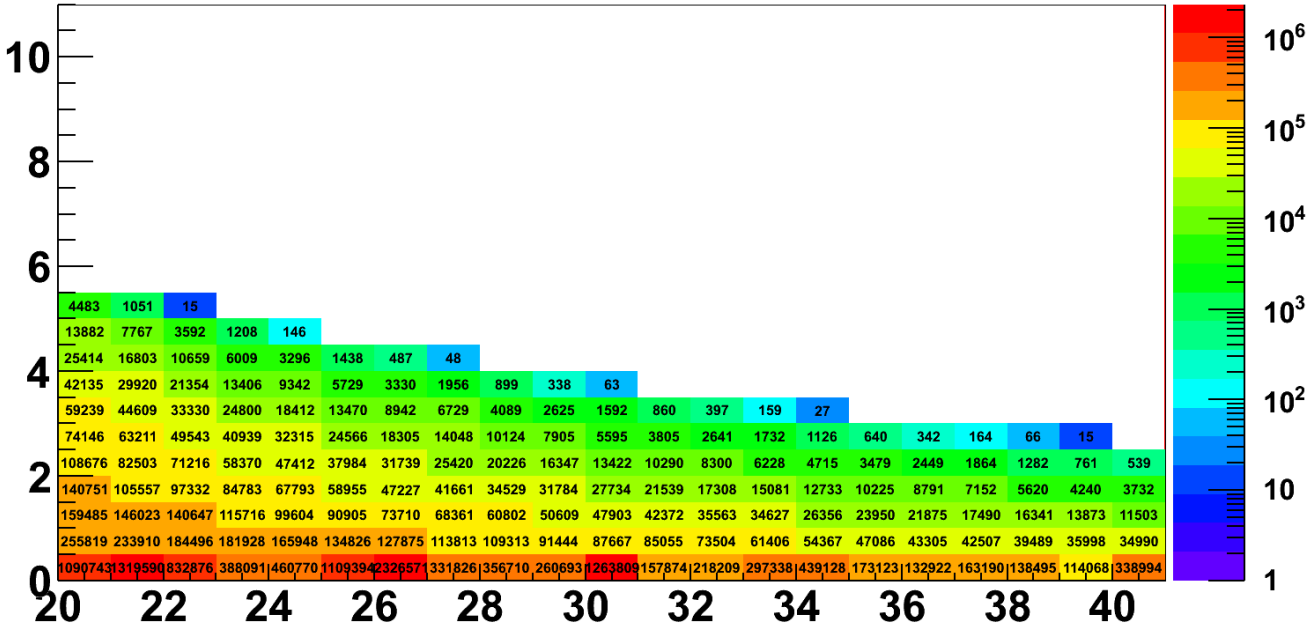

EC forward angle
flux (kHz/mm2)
R (cm)
γ(EM) 5.5e+08 kHz
e(EM) 4.3e+06 kHz
e(DIS) 1.1e+03 kHz
e(ES) 0.075 kHz
π+(DIS) 1.4e+06 kHz
π-(DIS) 1e+06 kHz
γ(π0(DIS)) 1.2e+06 kHz
K+(DIS) 1.4e+04 kHz
K-(DIS) 2.7e+04 kHz
π+(K0(DIS)) 1.4e+04 kHz
π-(K0(DIS)) 1.2e+04 kHz
γ(K0(DIS)) 1.5e+04 kHz
KL(DIS) 6.1e+03 kHz
p(DIS) 9.1e+05 kHz
neutron 4.2e+08 kHz

Generator “eicRate”

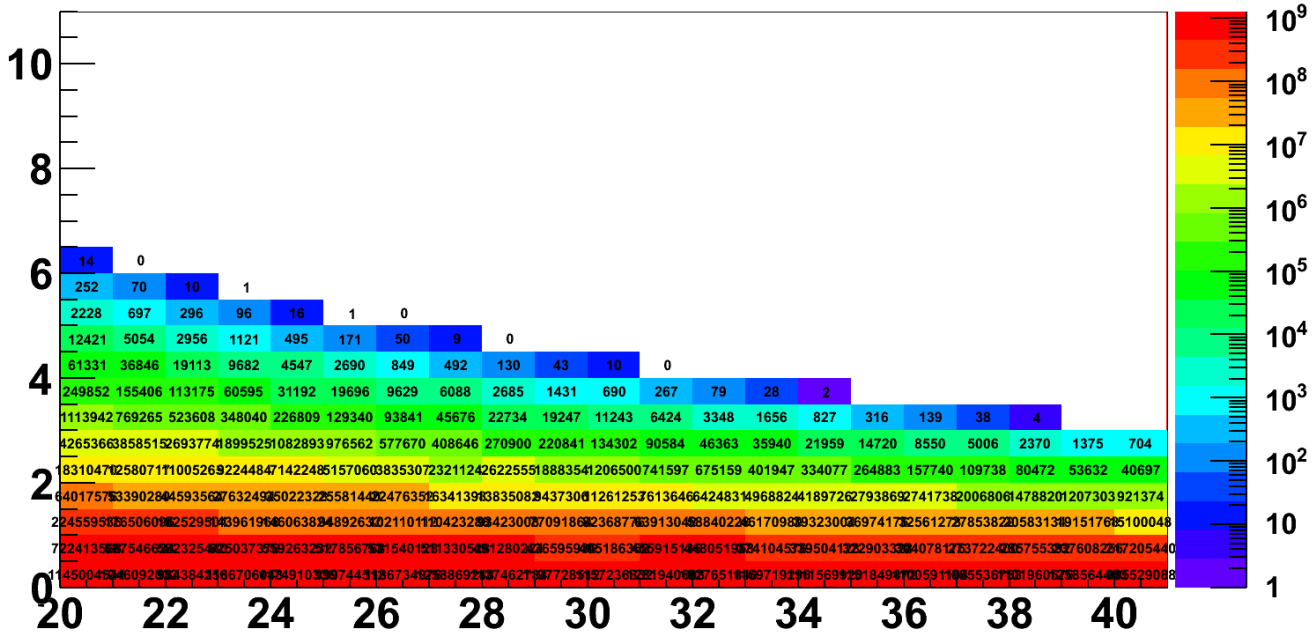
- eDIS rate based on formula from PDG on proton or neutron
- eES rate based on formula on proton or neutron
- hadron rate based on Wiser fit
  - pip,pim,Kp,Km,p and p-bar on proton from Wiser fit directly
  - pi0 rate = (pip+pim)/2 , Ks,Kl rate = (Kp+Km)/2
  - pip/pim rate on proton = pim/pip rate on neutron, Kp/Km rate on proton = Km/Kp rate on neutron
  - p rate on proton = p rate on neutron

- radlen used in Wiser fit, The crosssection output from Wiser is linearly proportional to radlen. Different code uses different estimation of radlen, here is what “eicRate” uses
  - Intrad = 2.0*log(e_lab/0.000511)/(137.0*3.14159)
    = 0.0464 (for 11 GeV beam)
  - radlen = 0.5*rad*100.*(4.0/3.0) + intrad*100.0
    = 8.22 (for 40cm LD2 target with rad=40/745.4=0.0537)

ThetaP e(DIS)



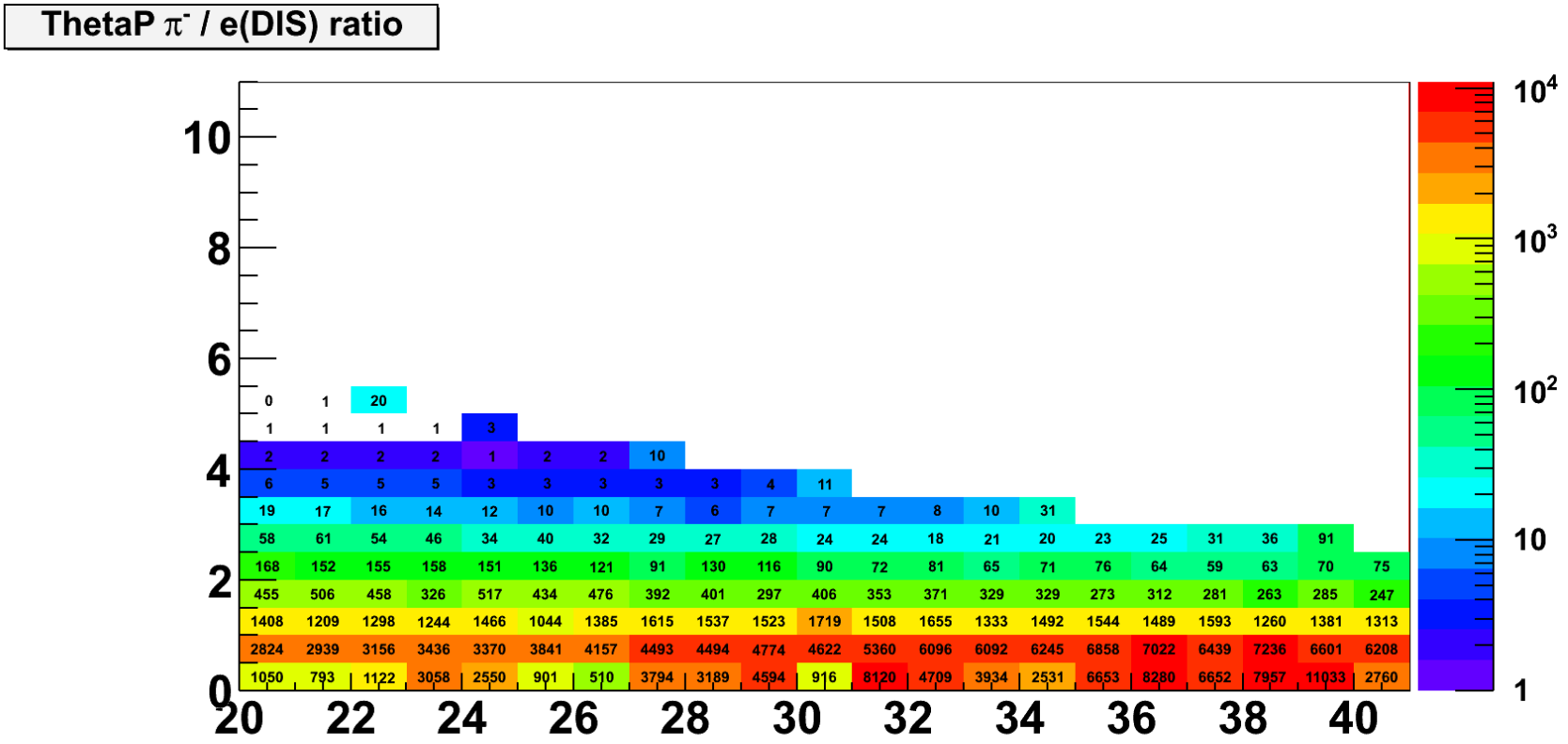
ThetaP π^-



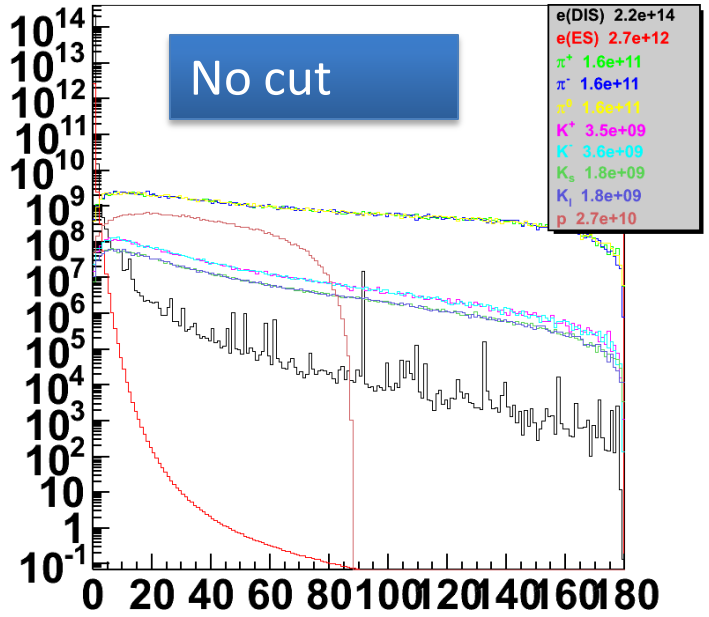
Pim/e ratio

1e2 P>2GeV, 5e2 P>1.5GeV,

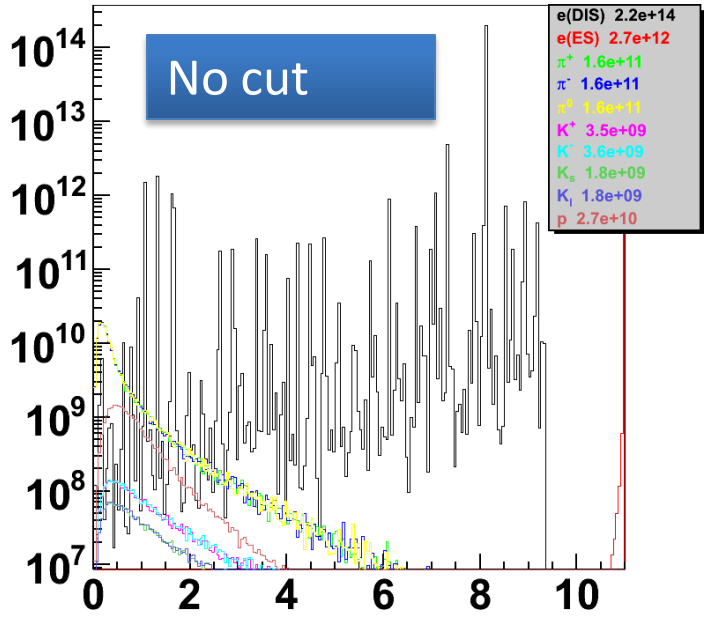
1e3 P>1GeV, 5e3 P <1GeV



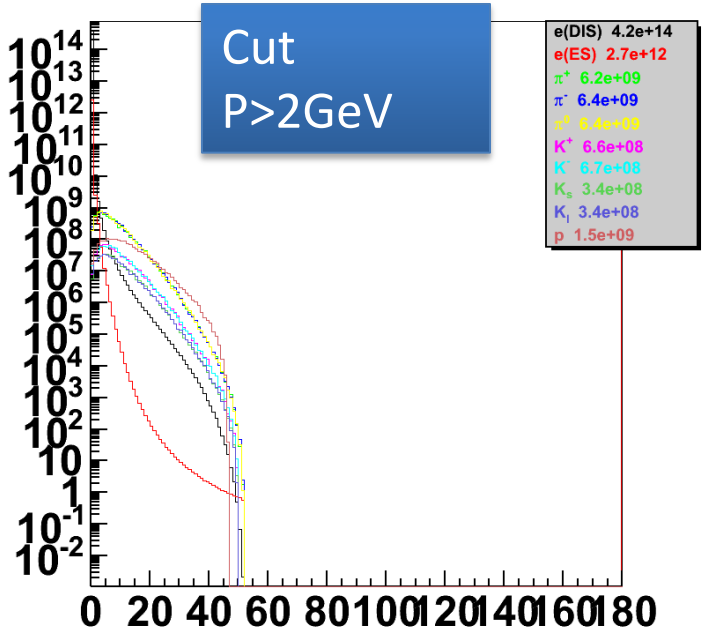
(theta*180/3.1415926) {rate*(W>2)}



pf {rate*(W>2)}



(theta*180/3.1415926) {rate*(pf>2)}



pf {rate*(21<theta*180/3.14159 && theta*180/3.14159<36)}