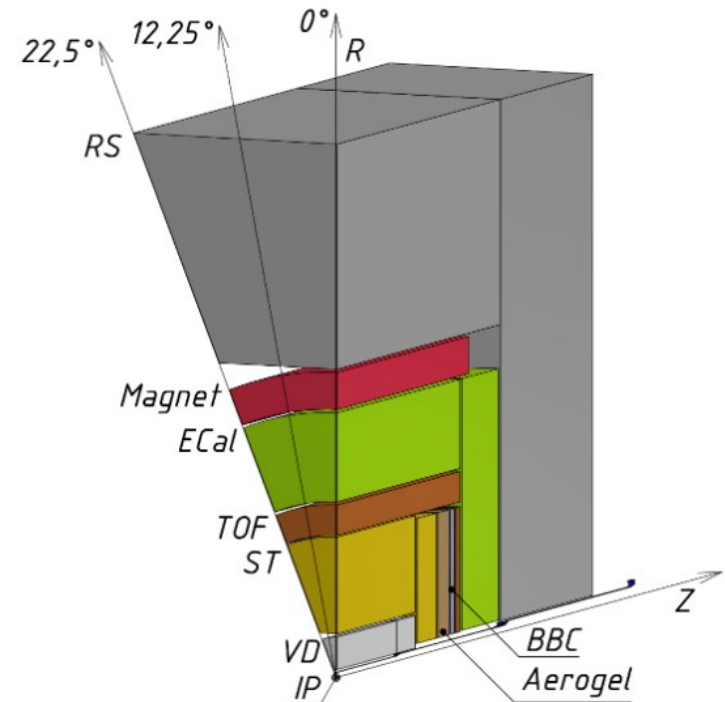


The BBC SIMULATION FOR PP INTERACTIONS

Zhanibek Kurmanaliyev

The main goals of the BBC

- the local polarimetry at SPD basing on the measurements of the azimuthal asymmetries (transversely polarized proton beams)
- the monitoring of beam collisions
- participation in the precise determination of the collision time t_0

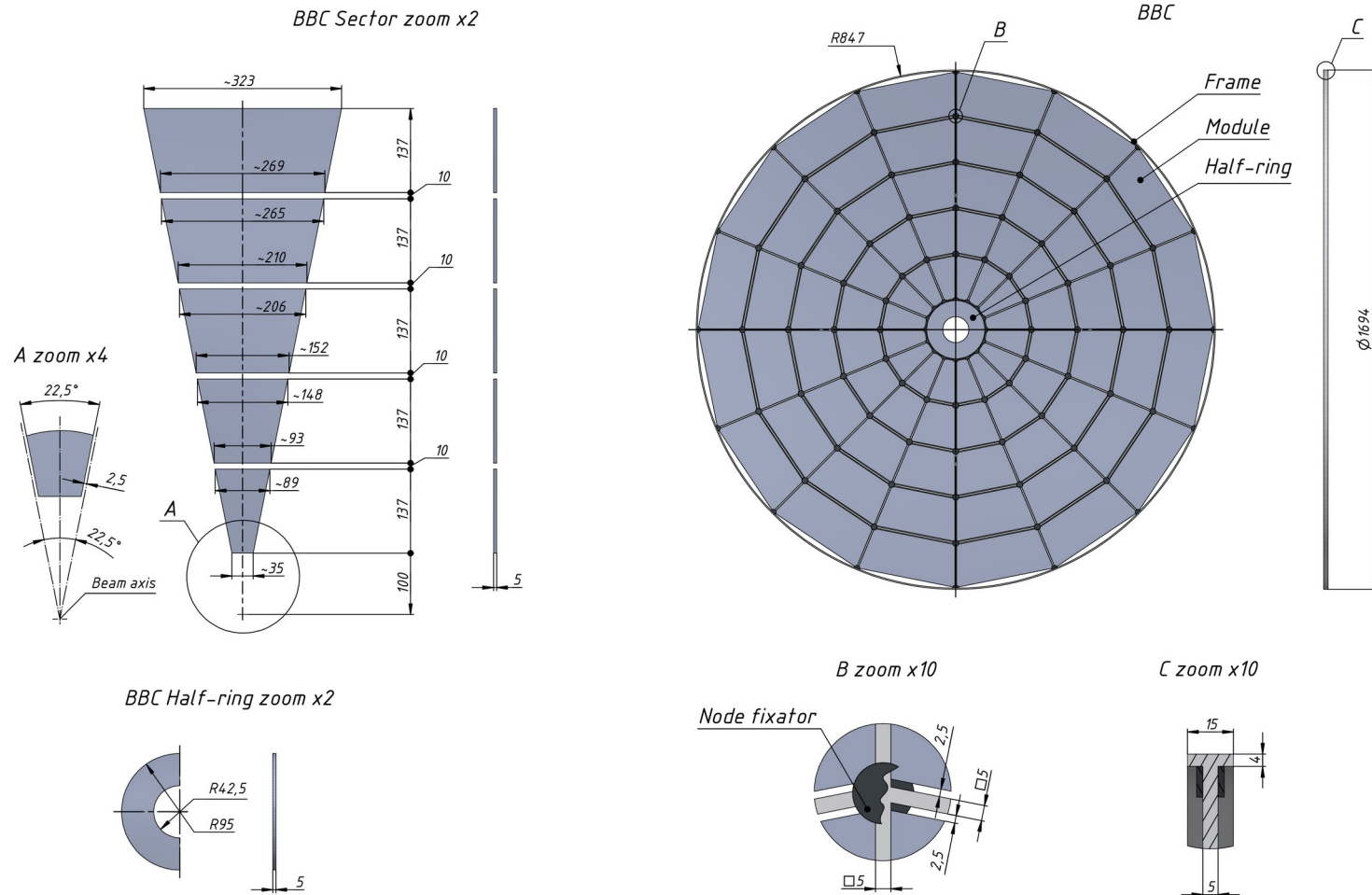


The selected configuration should work efficiently over the entire SPD energy range.

BBC Sizes:

- 2 panels ($z = \pm 171.6$ cm.)
- 16 sectors by azimuth angle
- 6 sectors by polar angle
- $1.48 < \eta < 4.39$

- 1 sector (extreme inner):
 $4.25 < r < 9.5$ (cm.)
- 2-6 sector:
 $10.0 < r < 82.5$ (cm.)



SpdRoot 4.1.4

sqrt(S) = 10 GeV:

$$L = 1e31 \text{ cm}^{-2} \text{ s}^{-1}$$

$$\sigma_{\text{tot}} = 37.9 \text{ mb}$$

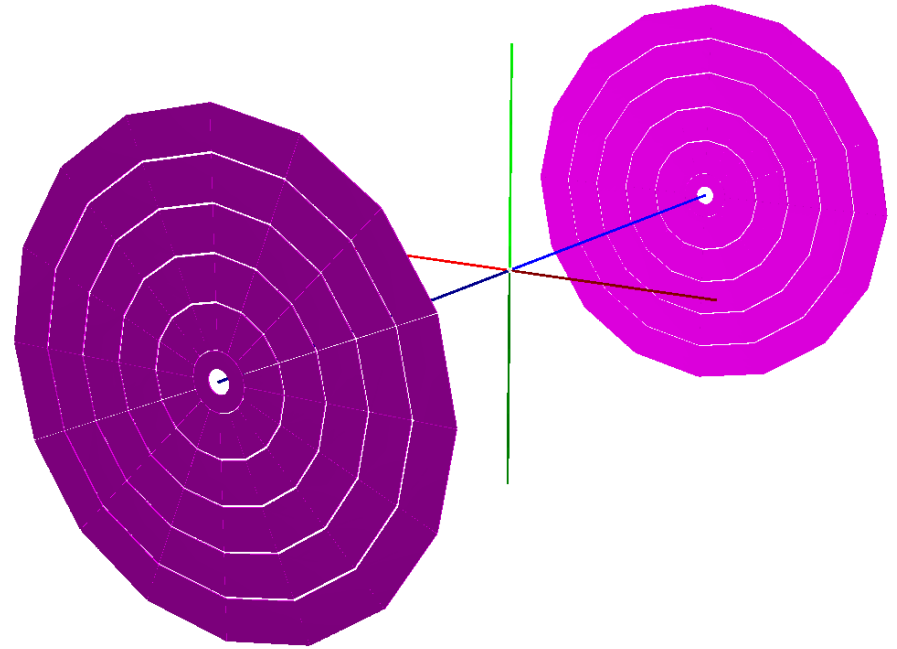
$$N = L * \sigma = 379000 \text{ s}^{-1}$$

sqrt(S) = 27 GeV:

$$L = 1e32 \text{ cm}^{-2} \text{ s}^{-1}$$

$$\sigma_{\text{tot}} = 40.0 \text{ mb}$$

$$N = L * \sigma = 400000 \text{ s}^{-1}$$

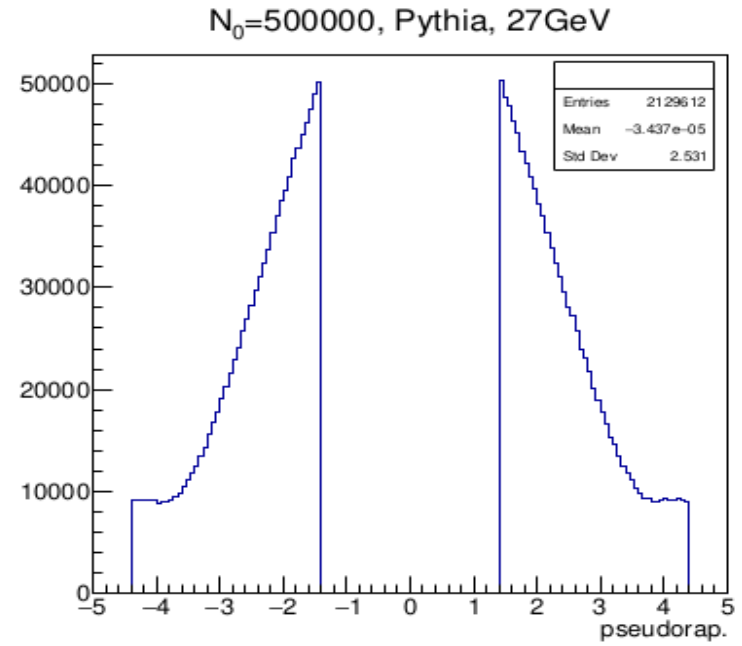
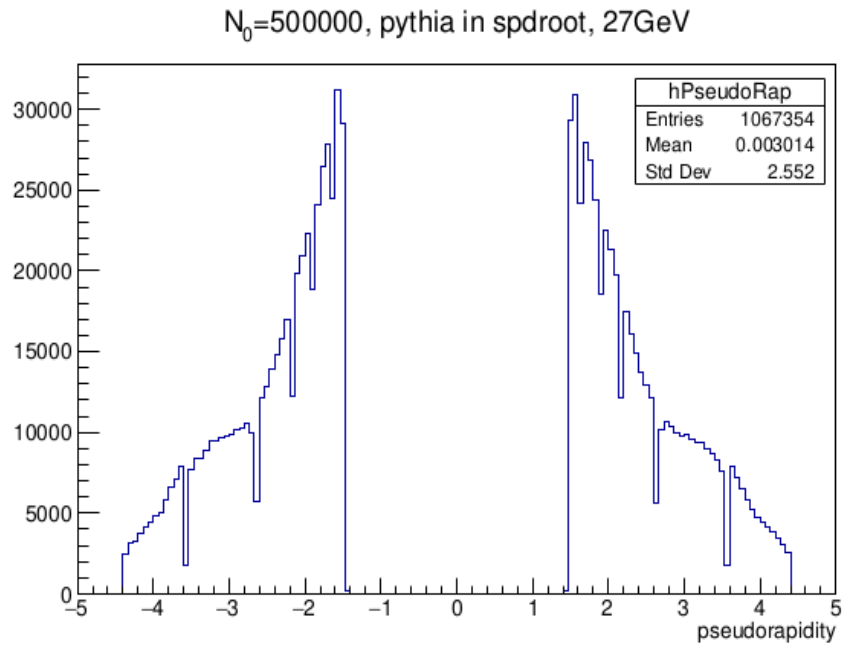
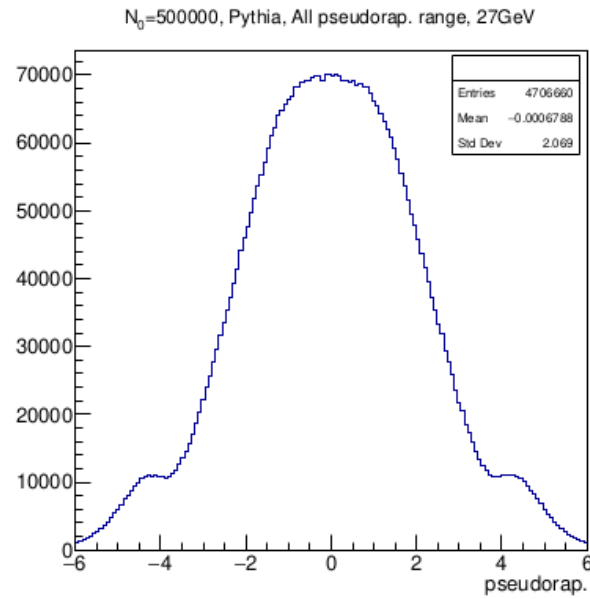


FTFgen: J.Allison et al., Nucl.Instrum.Meth.
A835, 186 (2016).

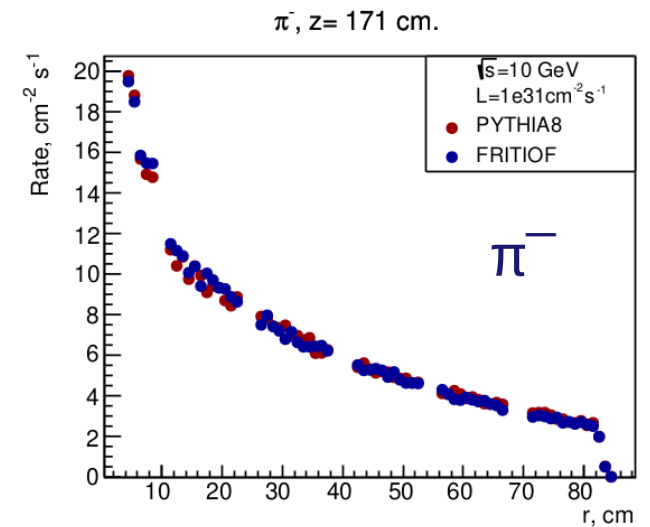
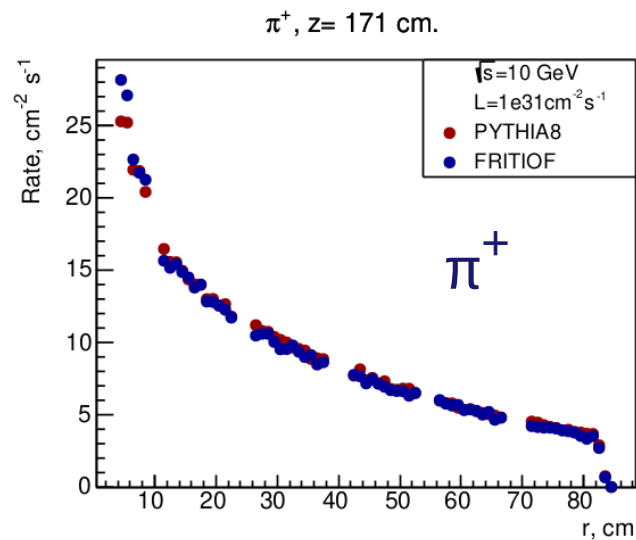
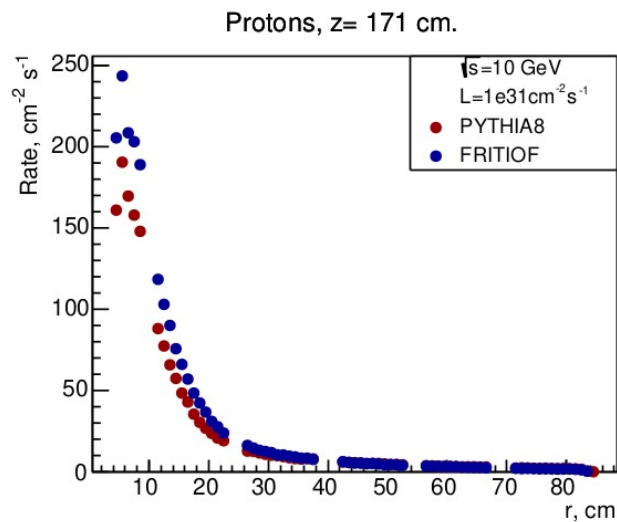
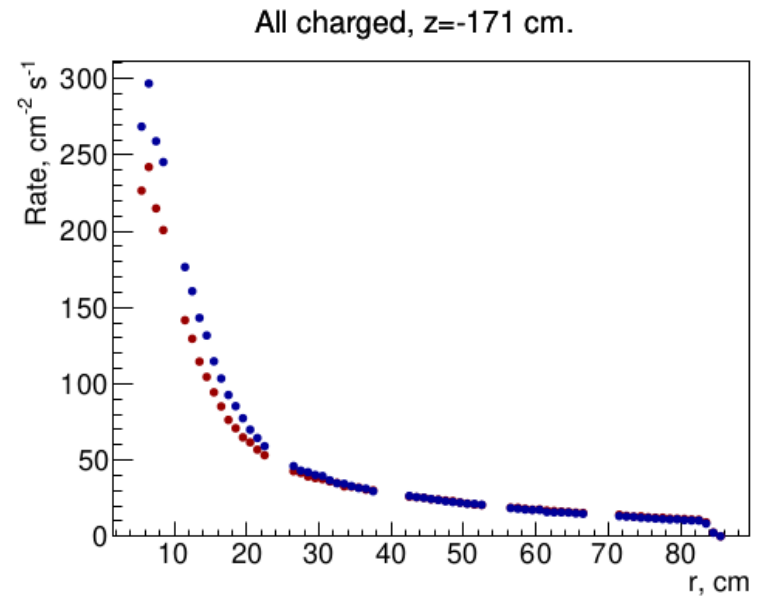
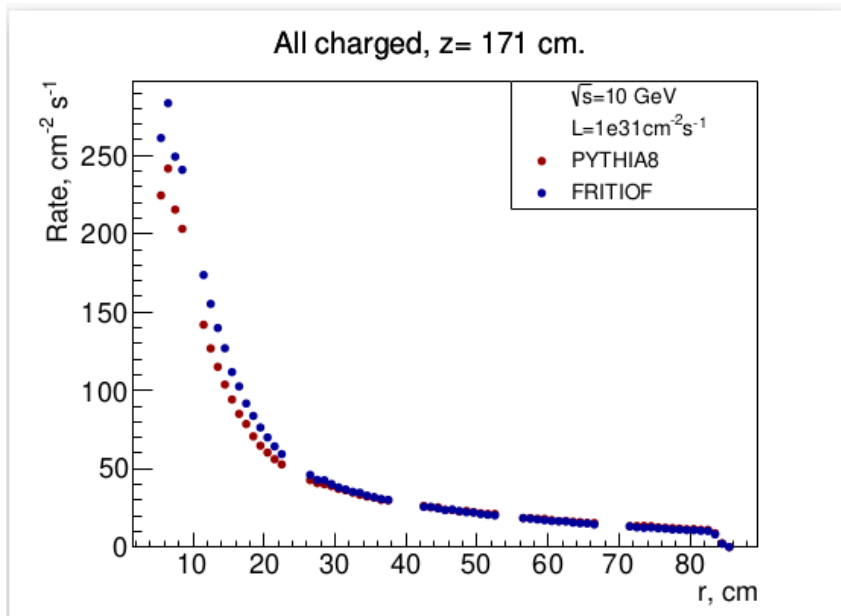
Pythia8 config.:

```
// Minimum bias
P8gen->SetParameters("SoftQCD:singleDiffractive = on");
P8gen->SetParameters("SoftQCD:doubleDiffractive = on");
P8gen->SetParameters("SoftQCD:centralDiffractive = on");
P8gen->SetParameters("SoftQCD:nonDiffractive = on");
P8gen->SetParameters("SoftQCD:inelastic = on");
P8gen->SetParameters("SoftQCD:elastic = on");
```

Pseudorapidity:

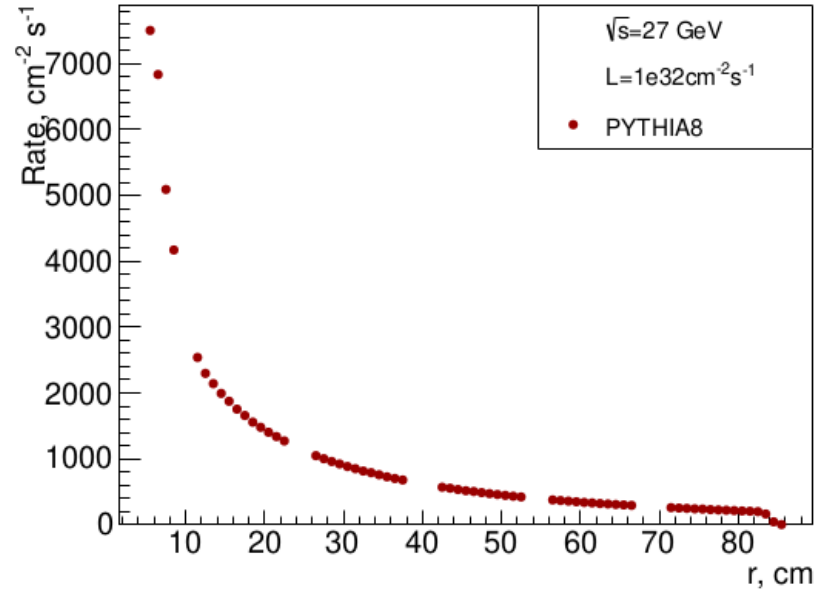


Pythia8 and FRTIOF: 10 GeV

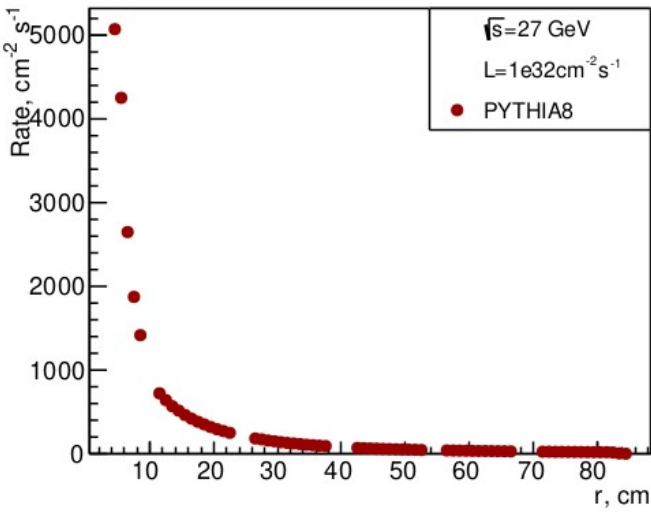


Pythia8: 27 GeV

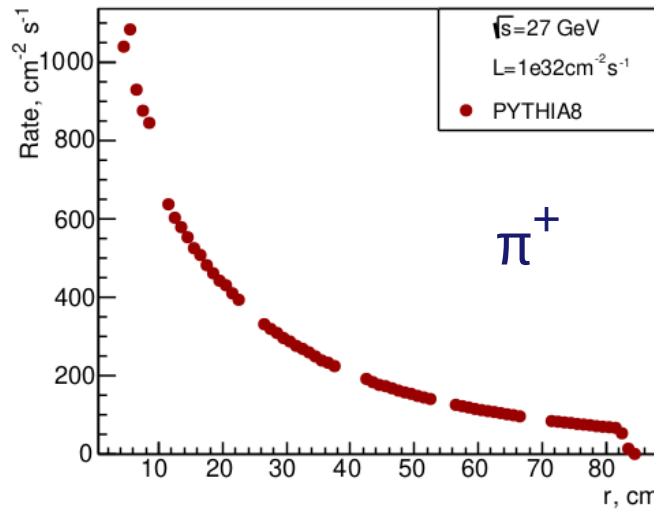
All charged, z= 171 cm.



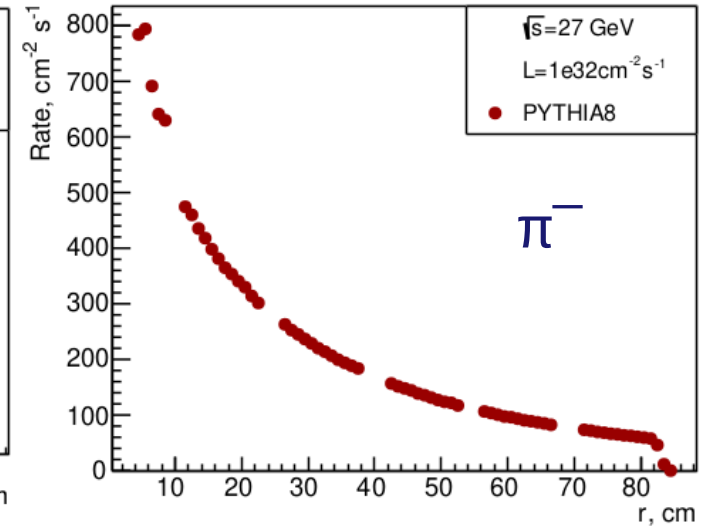
Protons, z= 171 cm.



π^+ , z= 171 cm.



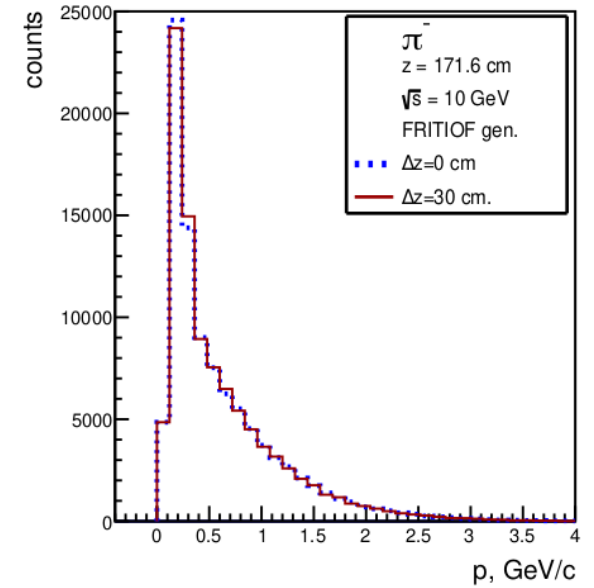
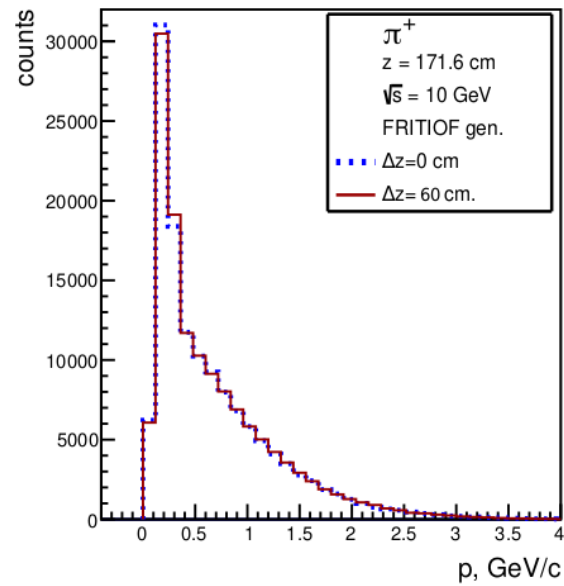
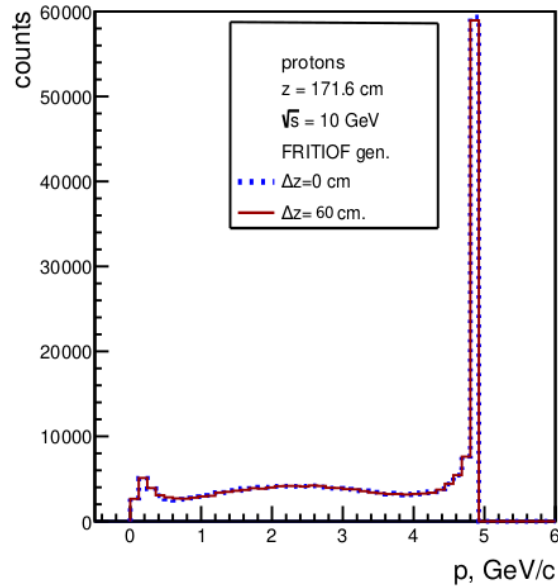
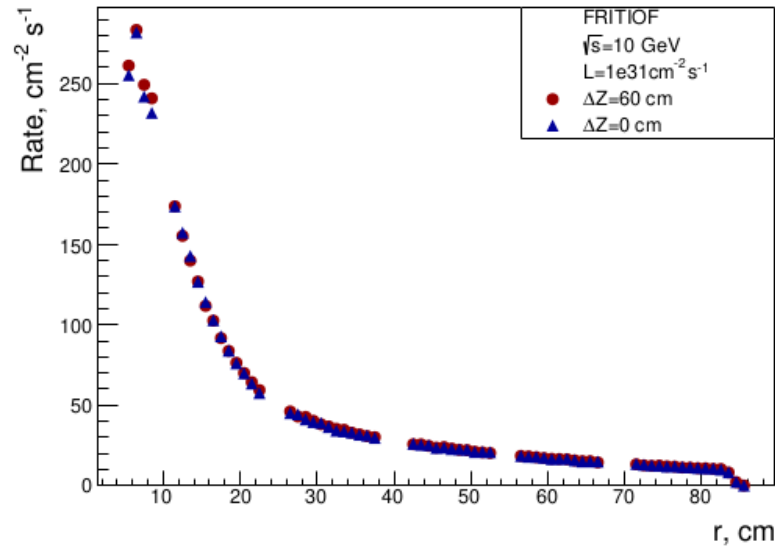
π^- , z= 171 cm.



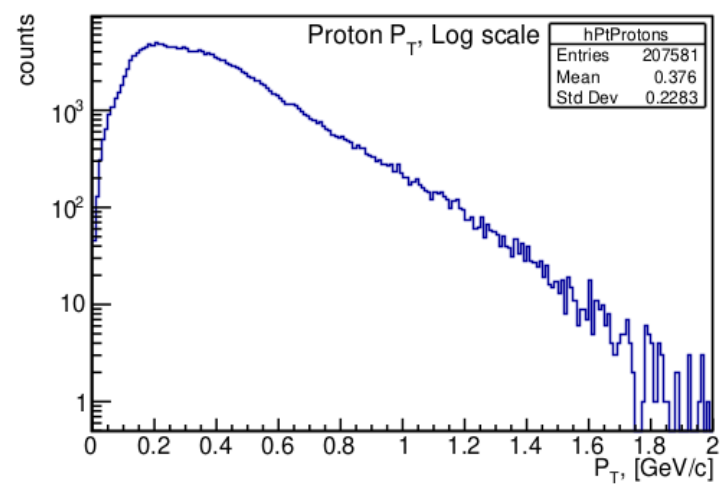
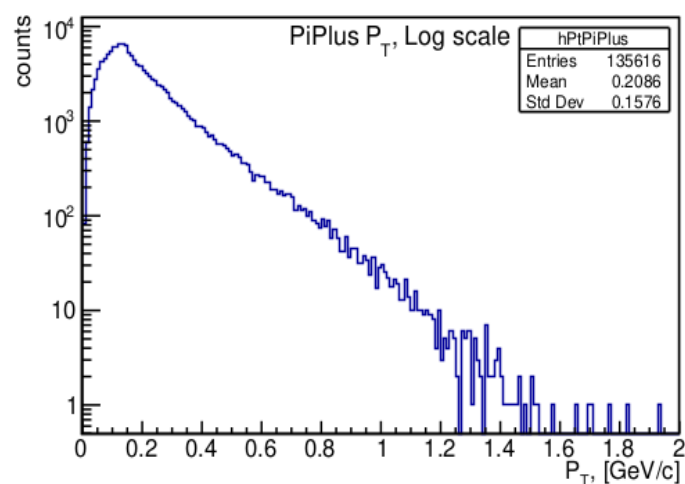
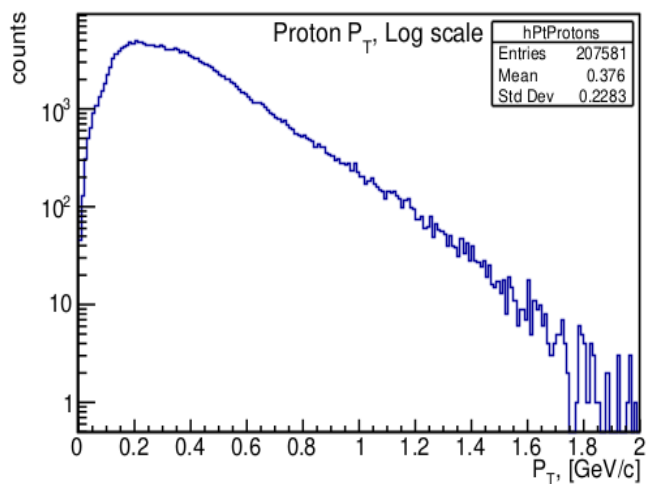
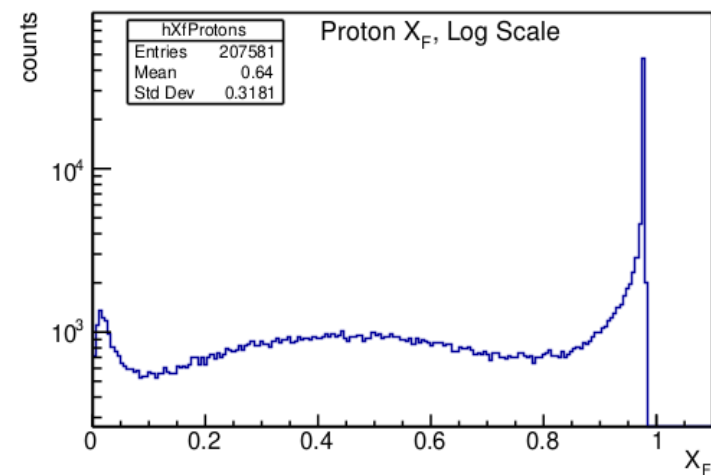
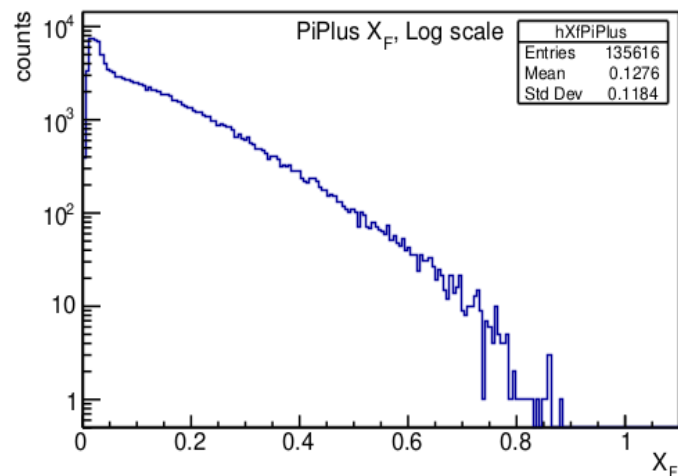
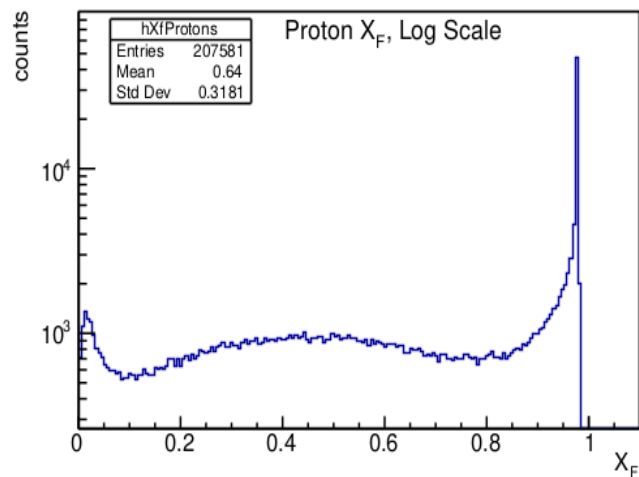
Interaction point smearing influence

All charged, $z = 171.6$ cm.

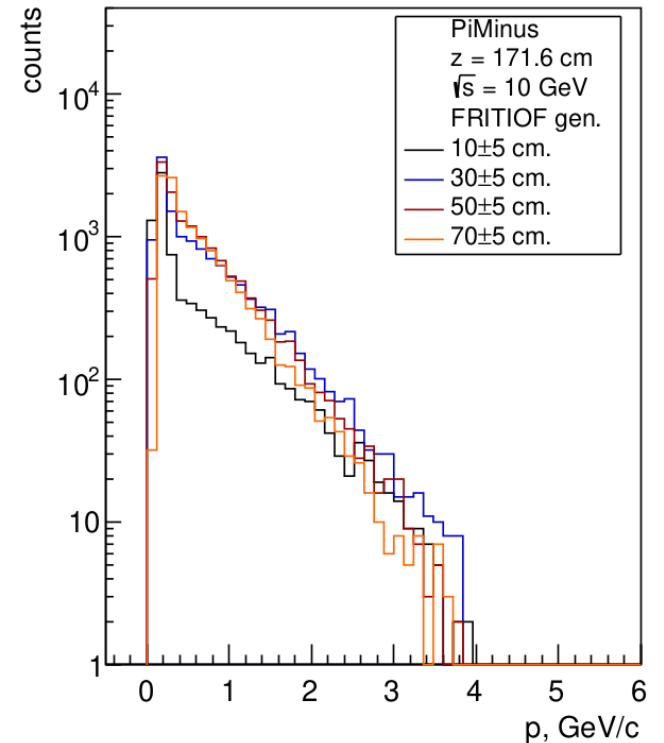
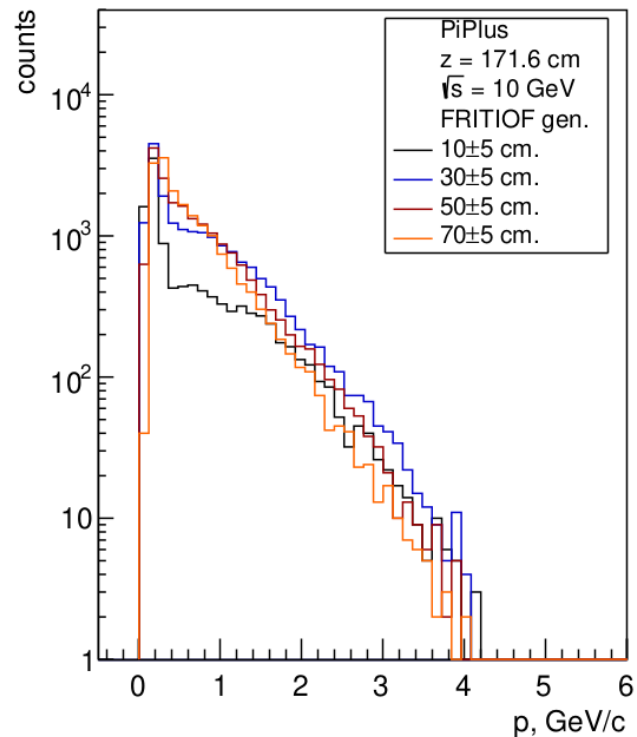
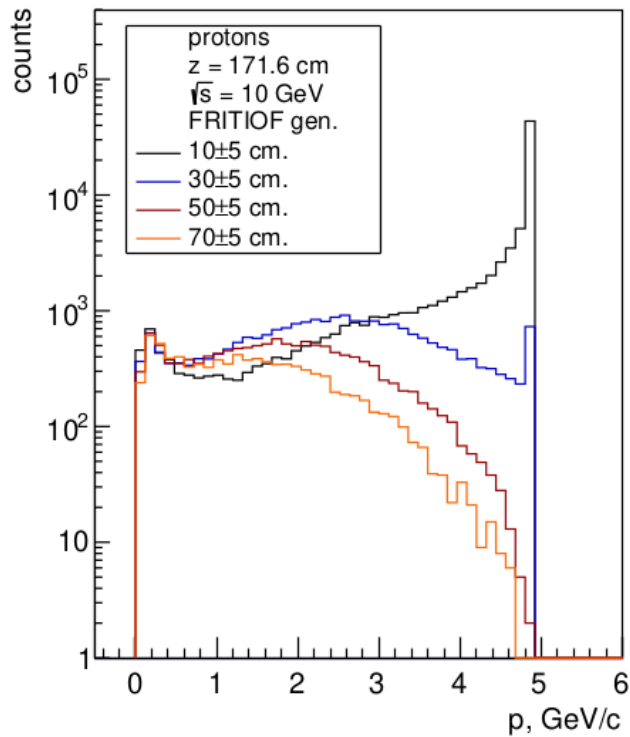
$\Delta Z = 60$ cm



10 GeV: X_F and P_T

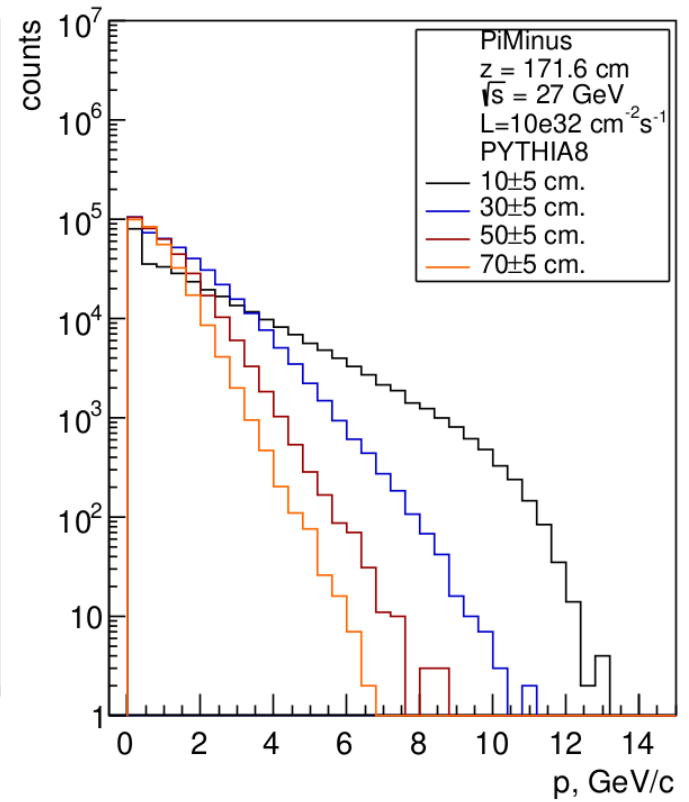
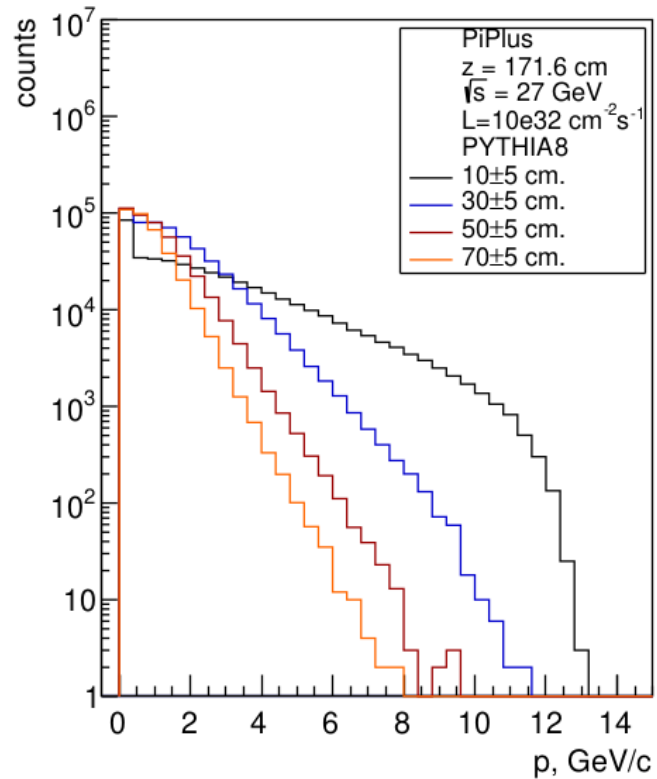
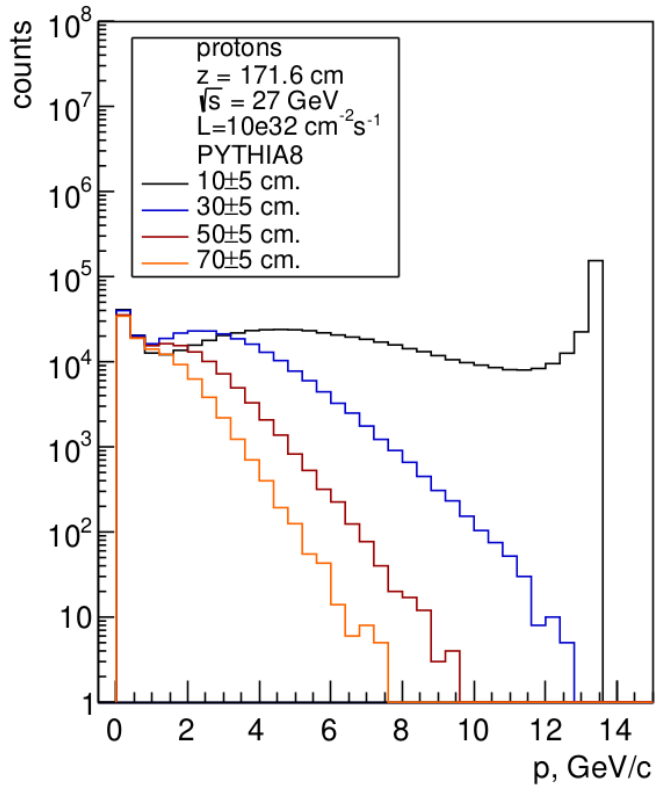


Momentum distributions. 10 GeV









The spectra of positively and negatively charged pions are almost identical in shape.

Momentum distributions. 27 GeV









Sector load

sqrt(S)=10 GeV L=10³¹ cm⁻²s⁻¹ FTFgenerator

Sector	z position	All charged particles	Protons	Pi plus	Pi minus
	171 cm	4983	750	1636	1142
	-171 cm	4940	691	1690	1154
	171 cm	5789	1034	1782	1295
	-171 cm	5427	893	1802	1225
	171 cm	6221	1288	1784	1315
	-171 cm	6118	1288	1865	1330
	171 cm	6752	1927	1694	1214
	-171 cm	6491	1891	1643	1151
	171 cm	9623	5072	1287	933
	-171 cm	9624	5198	1253	896
	171 cm	75006	47412	5567	3955
	-171 cm	77273	49464	5577	4065

sqrt(S)=27 GeV L=10³² cm⁻²s⁻¹ Pythia8

Sector	z position	All charged particles	Protons	Pi plus	Pi minus
	171 cm	96457	8908	31333	27137
	-171 cm	95552	8920	31397	27433
	171 cm	113647	11443	36850	31436
	-171 cm	110384	11387	36598	31580
	171 cm	131394	14865	42663	35234
	-171 cm	128354	14923	42693	35468
	171 cm	151871	22404	47198	37897
	-171 cm	149059	22639	47377	37504
	171 cm	169168	37176	45047	34189
	-171 cm	169220	37654	44880	34031
	171 cm	1508828	596949	216505	160618
	-171 cm	1506841	596579	215339	160049

Summary

- The Pythia8 and Fritiof generators at $\sqrt{s} = 10$ GeV give similar quantitative results for Rate-radius dependence.
- At c.m. energy 27 GeV, the relative contribution of pions to the loadings is 2-3 times greater compared to 10 GeV.
- The contribution of negative pions is smaller than that of positive pions (and protons).
- With the exception of the area near the accelerator tube, the proposed granularity makes it possible to ensure comfortable loading of scintillation tiles.

Thank you for your attention!