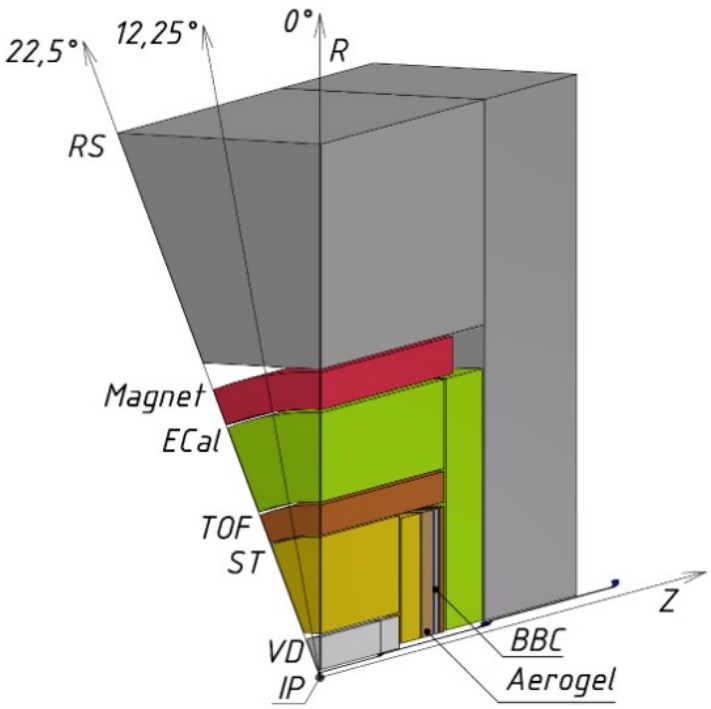
The BBC SIMULATION FOR PP COLLISIONS

Zh. 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

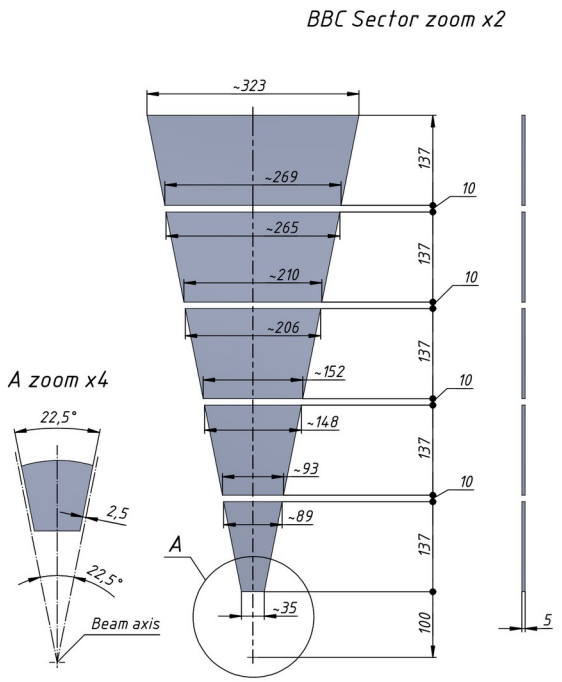


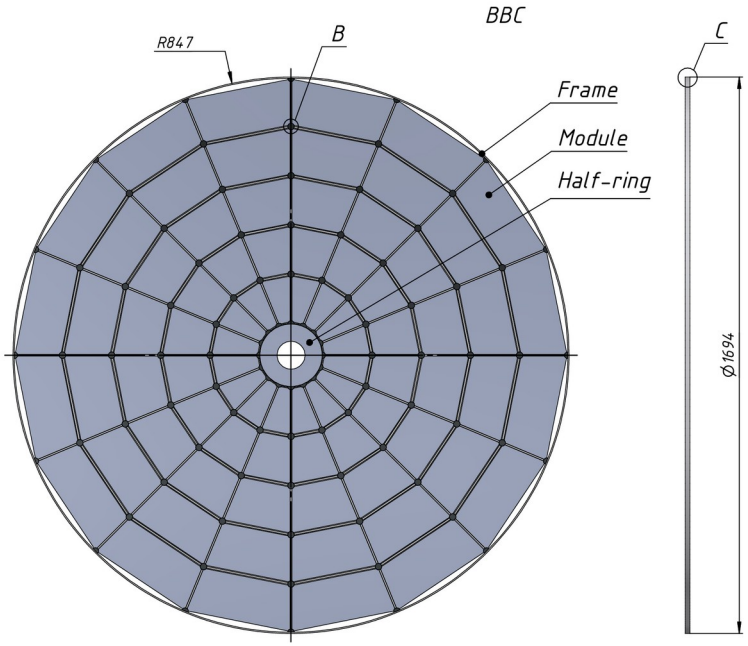
The selected configuration should work efficiently over the entire SPD energy range and luminosity.

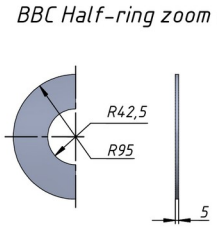
BBC Sizes:

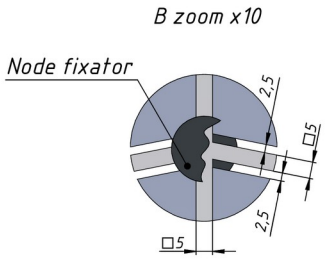
- 2 panels (z = ±171.6 cm.)
- 16 sectors by azimuth angle
- 6 sectors by polar angle
- 1.48 < η < 4.39

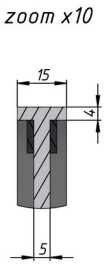
- 1 sector(extreme inner):
  4.25 <r< 9.5 (cm.)
- 2-6 sector:
  10.0 <r< 82.5 (cm.)











SpdRoot 4.1.4

sqrt(S) = 10 GeV:

L = 1e31 cm^{-2} s^{-1}

σ_{tot} = 37.9 mb

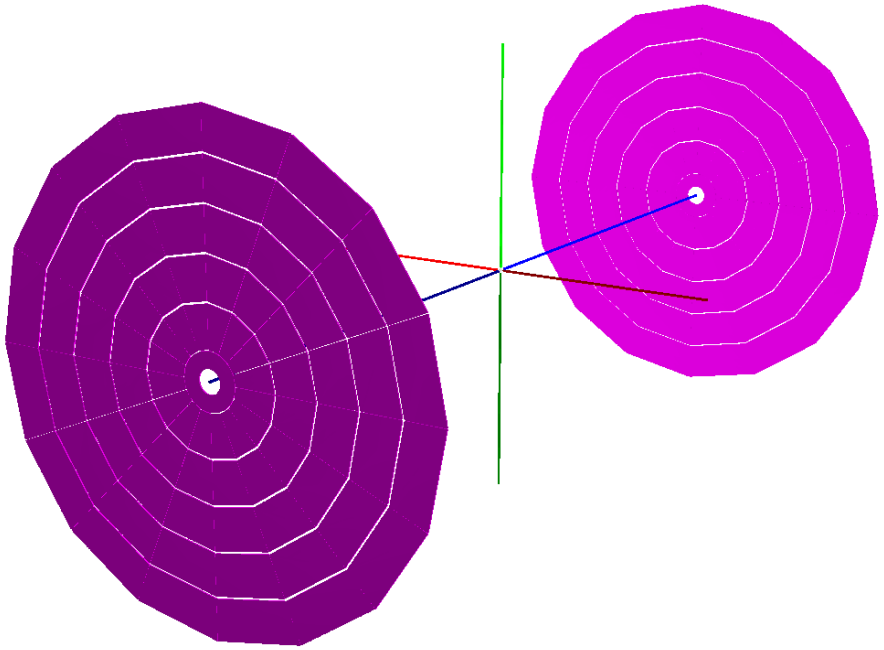
N = L*σ = 379 000 s^{-1}

sqrt(S) = 27 GeV:

L = 1e32 cm^{-2} s^{-1}

σ_{tot} = 40.0 mb

N = L*σ = 4 000 000 s^{-1}

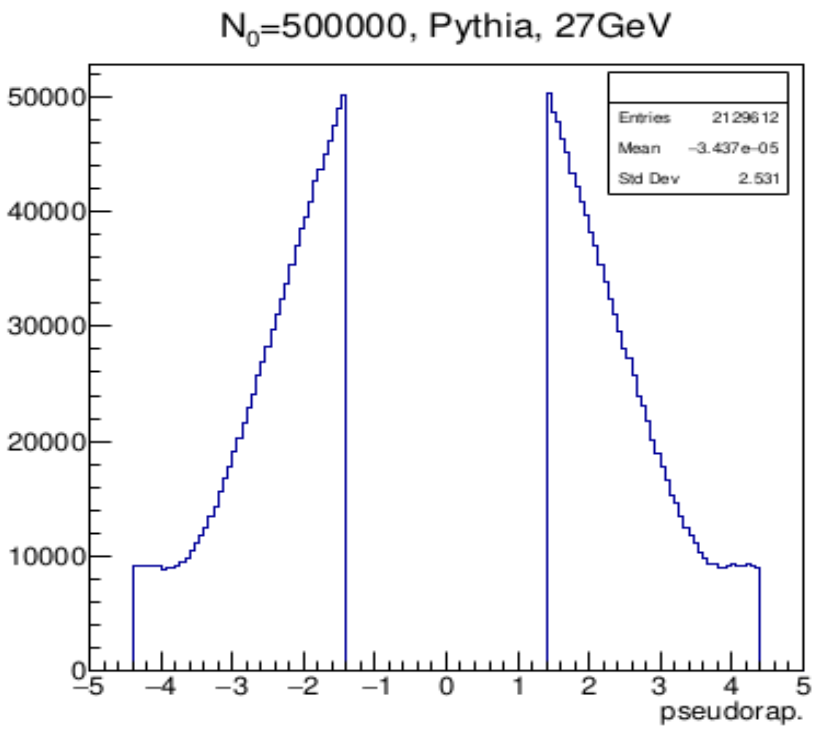


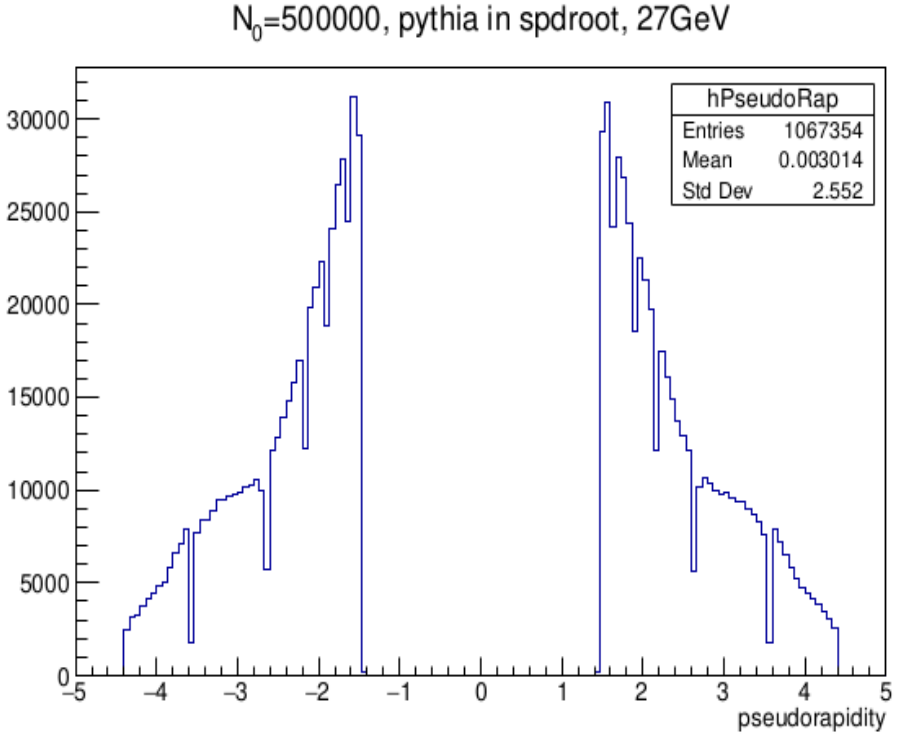
FTFgen: J.Allison et al., Nucl.Instrum.Meth. A835, 186 (2016).

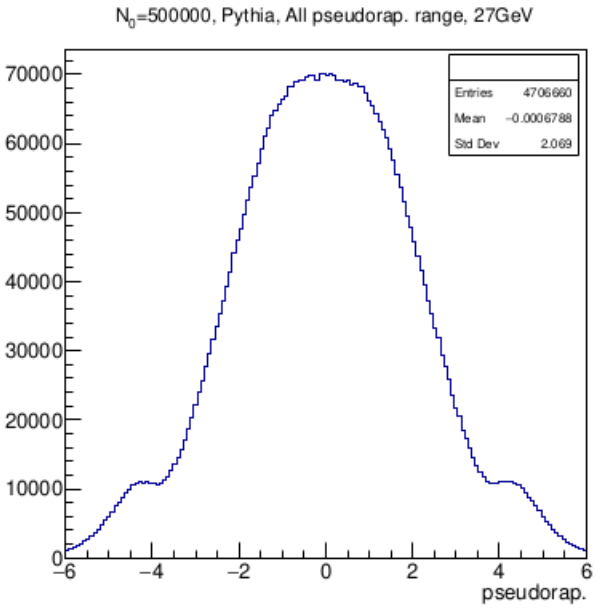
Pythia8 config.:

```
// 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:

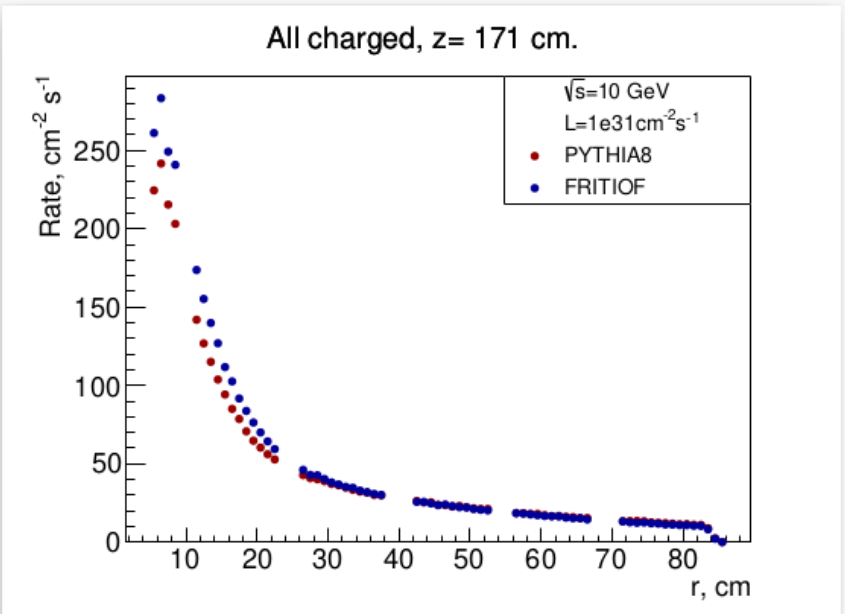


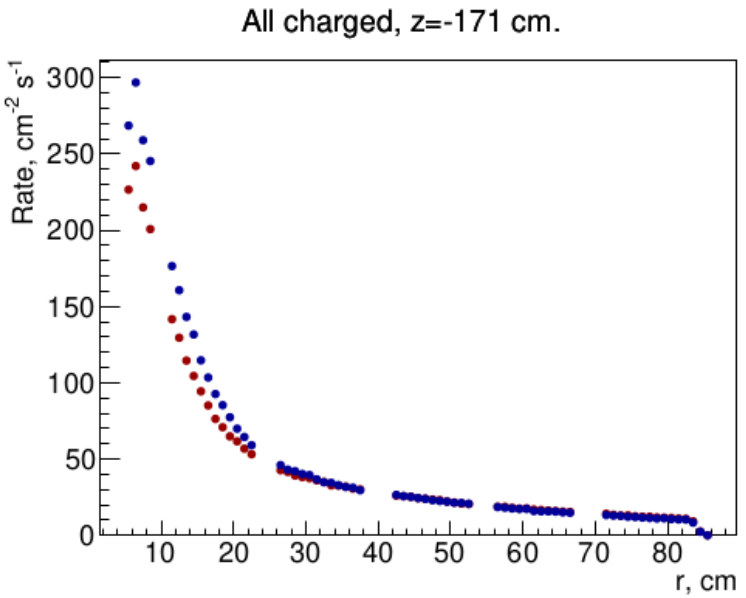


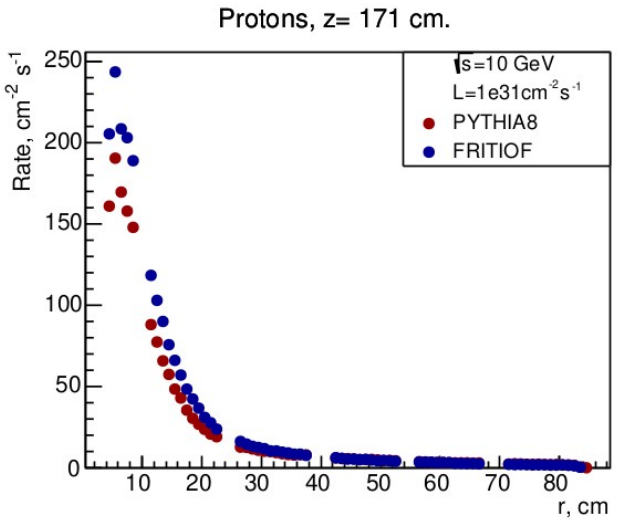


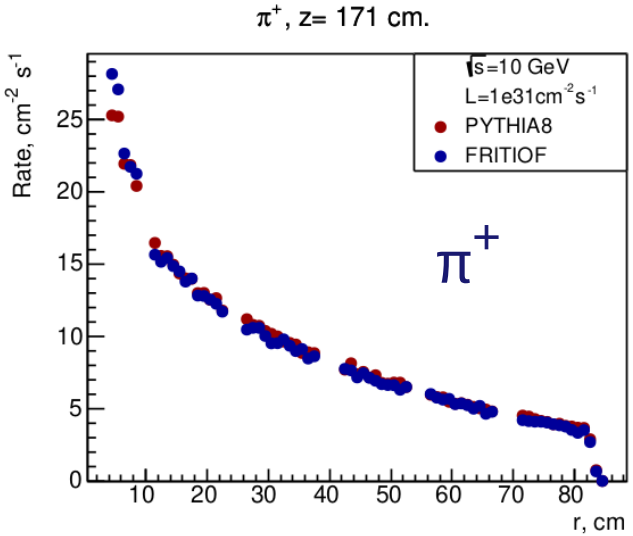
gaps in the distribution correspond to areas that are not covered by the tiles

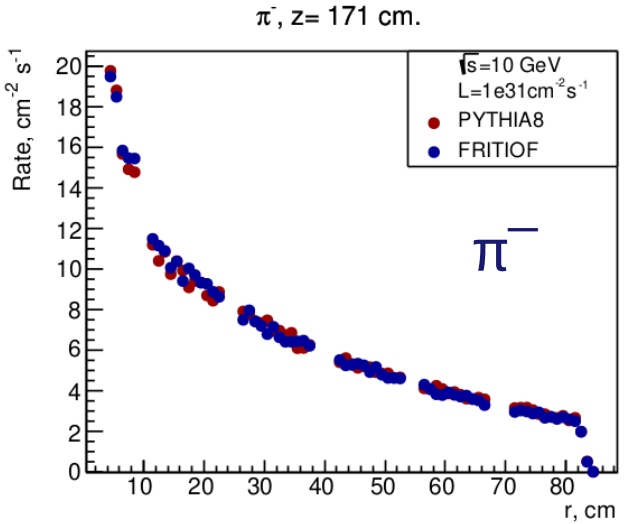
Pythia8 and FTFgen: 10 GeV



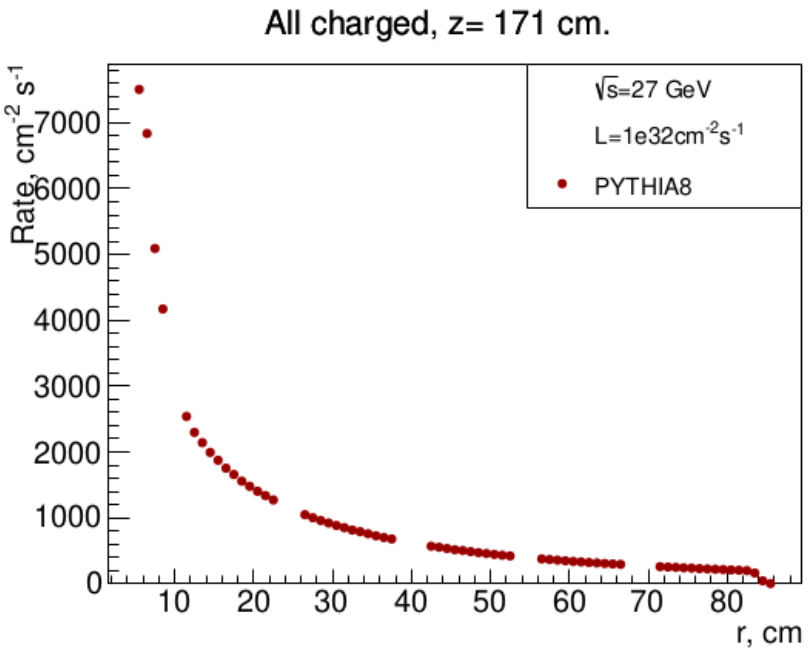


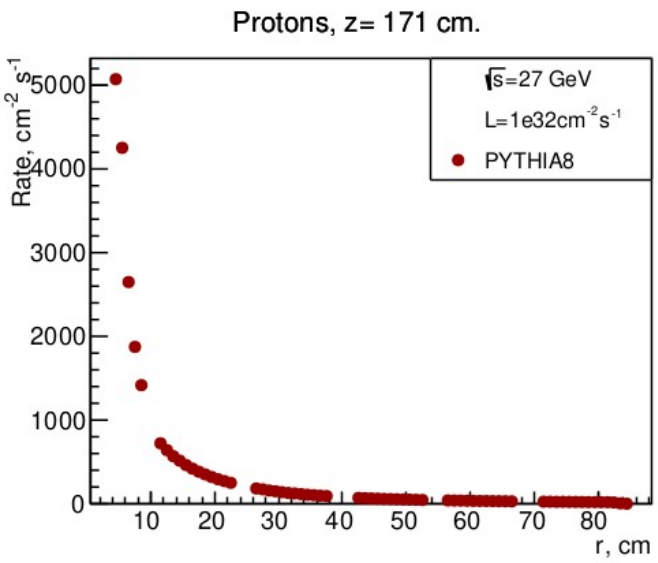


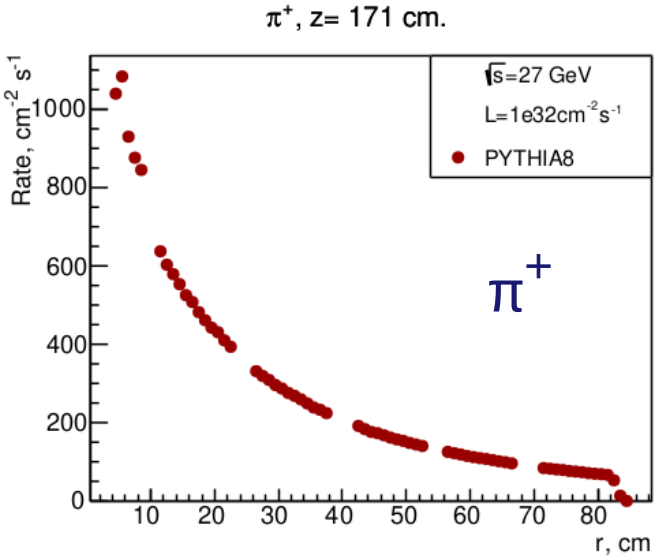


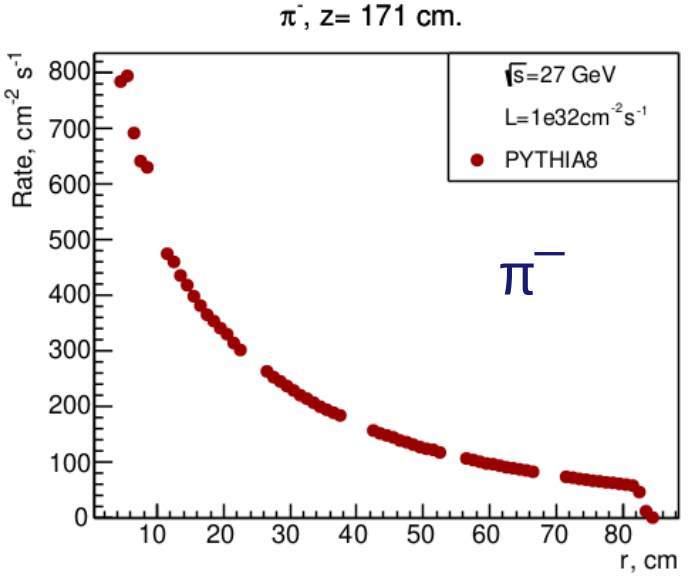


Pythia8: 27 GeV

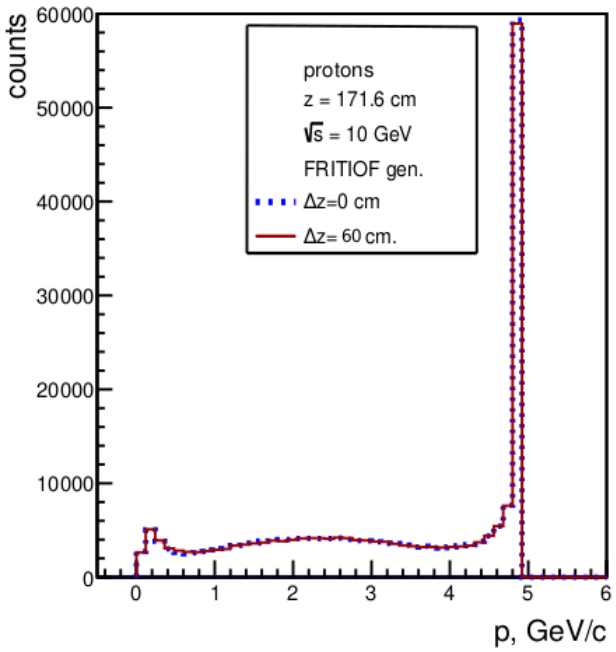


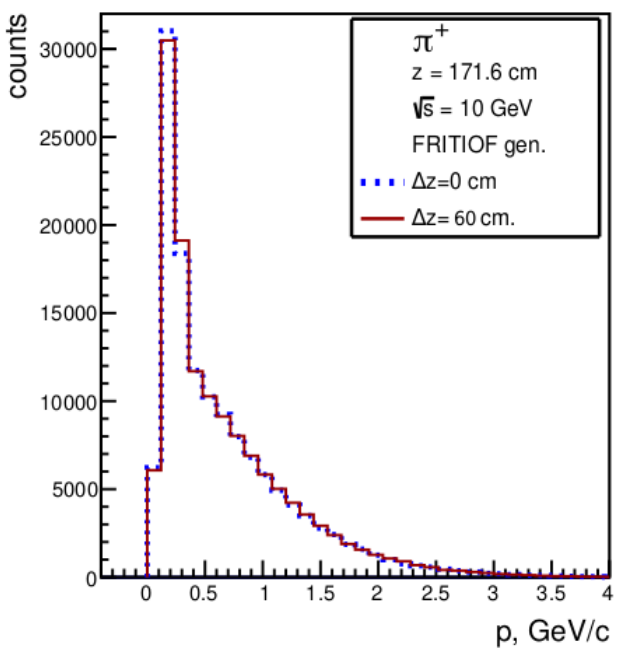


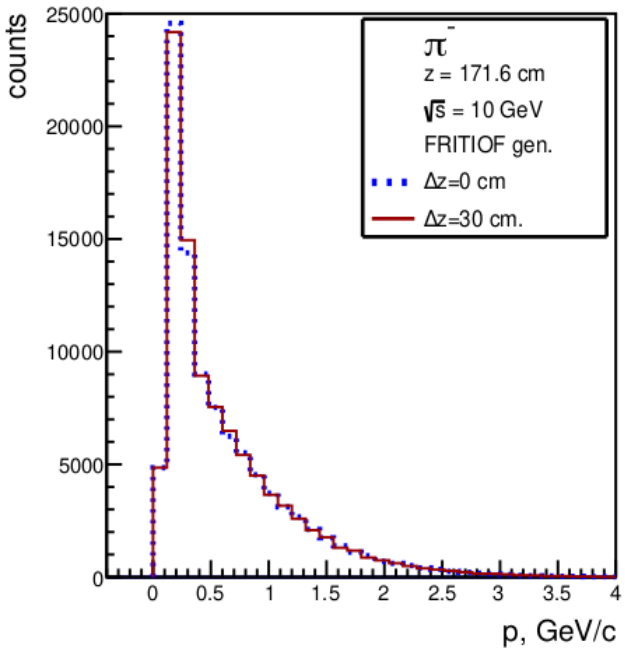


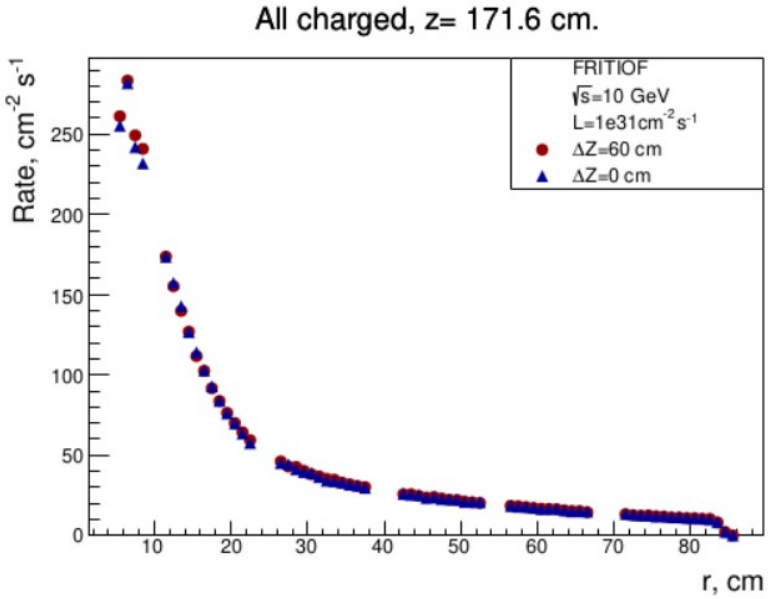


Interaction point smearing influence: ΔZ = 60 cm





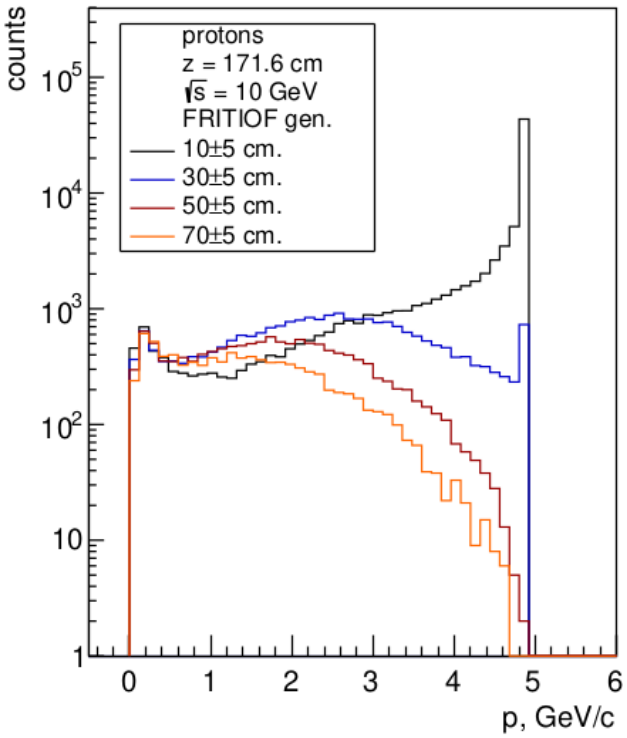


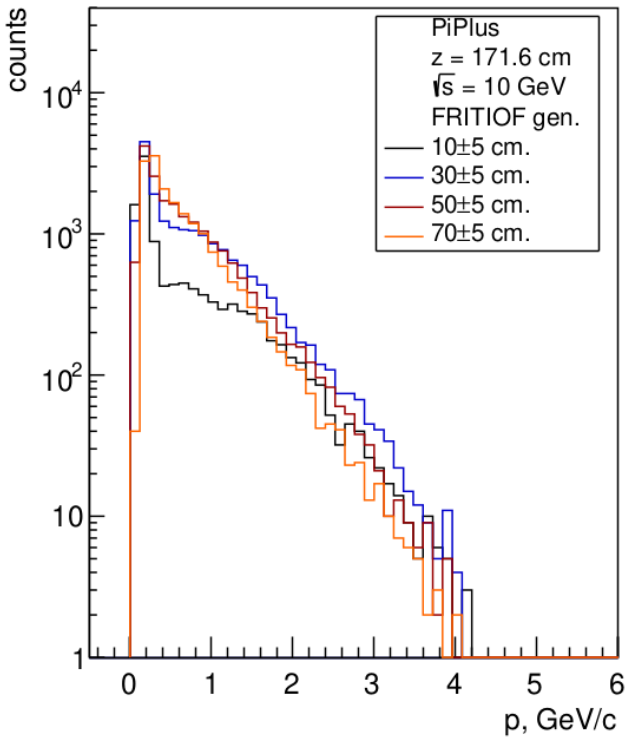


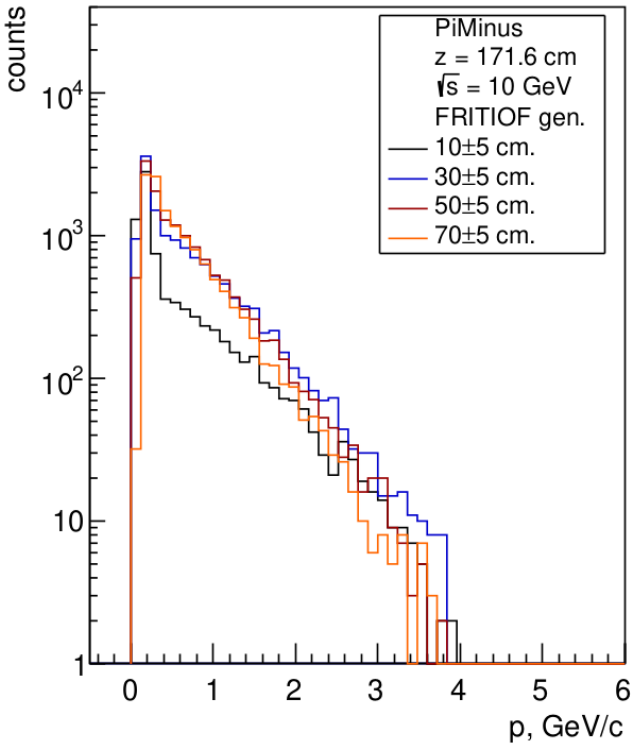
the presence of interaction point smearing does not change the distribution

Momentum distributions. 10 GeV

$L = 1e31\ cm^{-2}\ s^{-1}$
$\sigma_{tot} = 37.9\ mb$
$N = L*\sigma = 379\ 000\ s^{-1}$







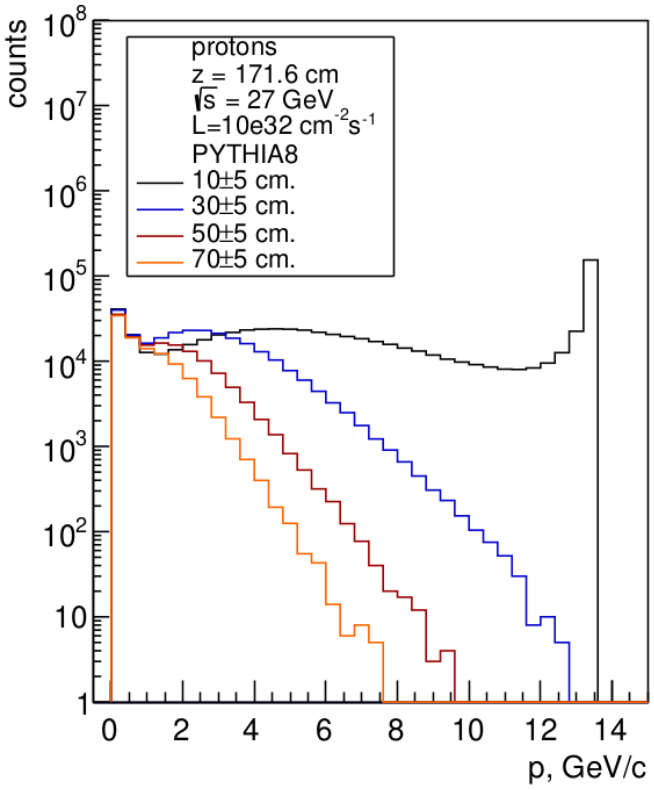
The spectra of charged pions are almost identical in shape.

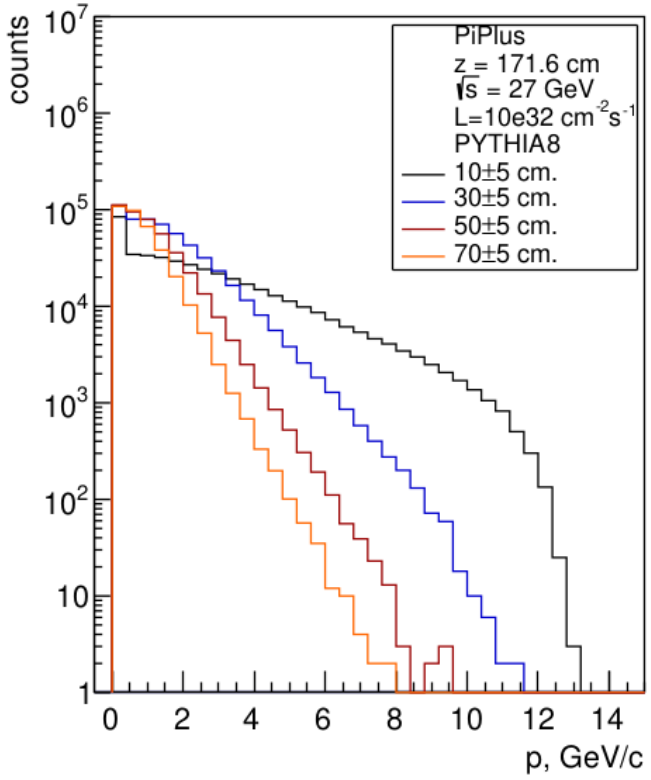
Momentum distributions. 27 GeV

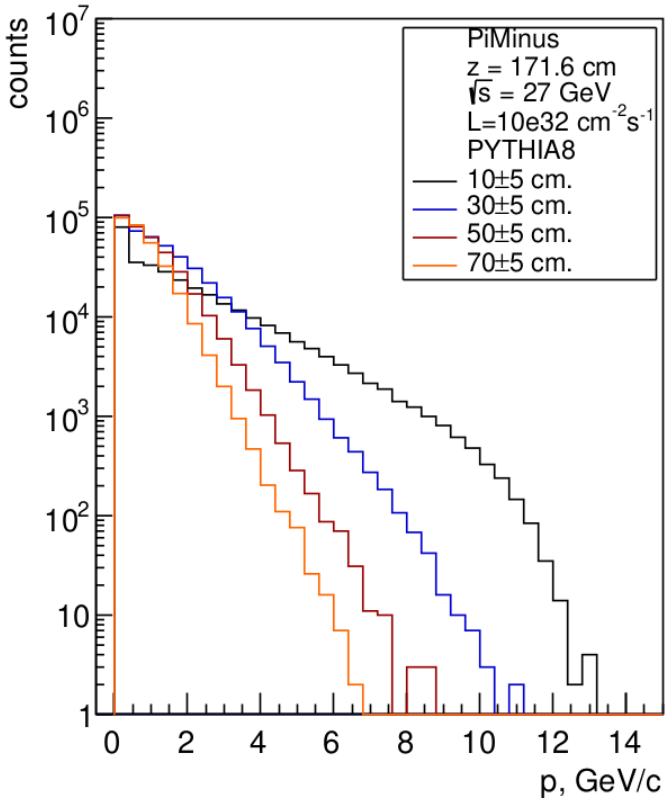
$L = 1e32\ cm^{-2}\ s^{-1}$

$\sigma_{tot} = 40.0\ mb$

$N = L*\sigma = 4\ 000\ 000\ s^{-1}$







Sector loads

sqrt(S)=10 GeV L=10^{31} $cm^{-2}s^{-1}$ FTFgenerator

Sector	z position	All charged particles	Protons	Pi plus	Pi minus
6	171 cm	4983	750	1636	1142
	-171 cm	4940	691	1690	1154
5	171 cm	5789	1034	1782	1295
	-171 cm	5427	893	1802	1225
4	171 cm	6221	1288	1784	1315
	-171 cm	6118	1288	1865	1330
3	171 cm	6752	1927	1694	1214
	-171 cm	6491	1891	1643	1151
2	171 cm	9623	5072	1287	933
	-171 cm	9624	5198	1253	896
1	171 cm	75006	47412	5567	3955
	-171 cm	77273	49464	5577	4065

sqrt(S)=27 GeV L=10^{32} $cm^{-2}s^{-1}$ Pythia8

Sector	z position	All charged particles	Protons	Pi plus	Pi minus
6	171 cm	96457	8908	31333	27137
	-171 cm	95552	8920	31397	27433
5	171 cm	113647	11443	36850	31436
	-171 cm	110384	11387	36598	31580
4	171 cm	131394	14865	42663	35234
	-171 cm	128354	14923	42693	35468
3	171 cm	151871	22404	47198	37897
	-171 cm	149059	22639	47377	37504
2	171 cm	169168	37176	45047	34189
	-171 cm	169220	37654	44880	34031
1	171 cm	1508828	596949	216505	160618
	-171 cm	1506841	596579	215339	160049

Sector loads are specified as the number of particles per second

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!