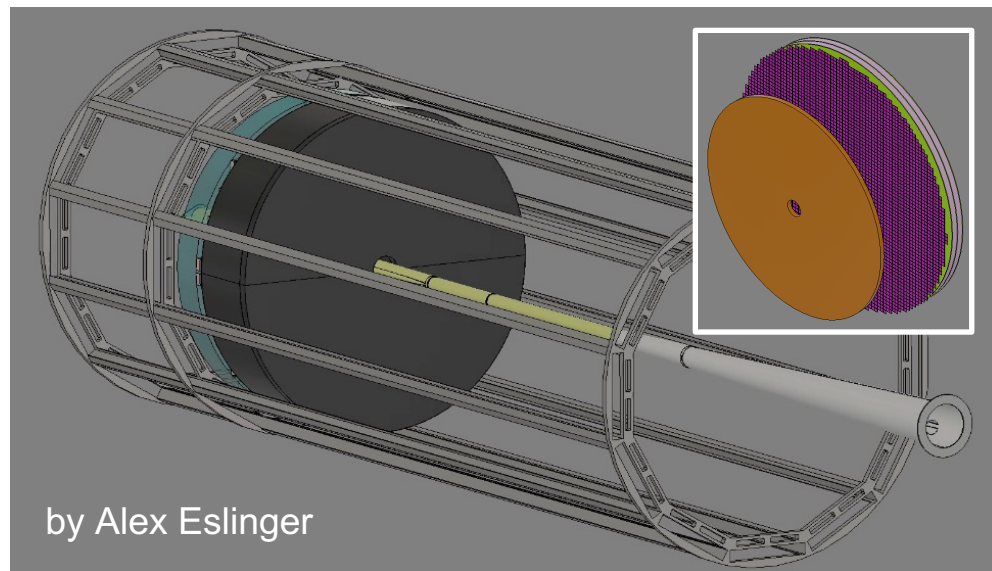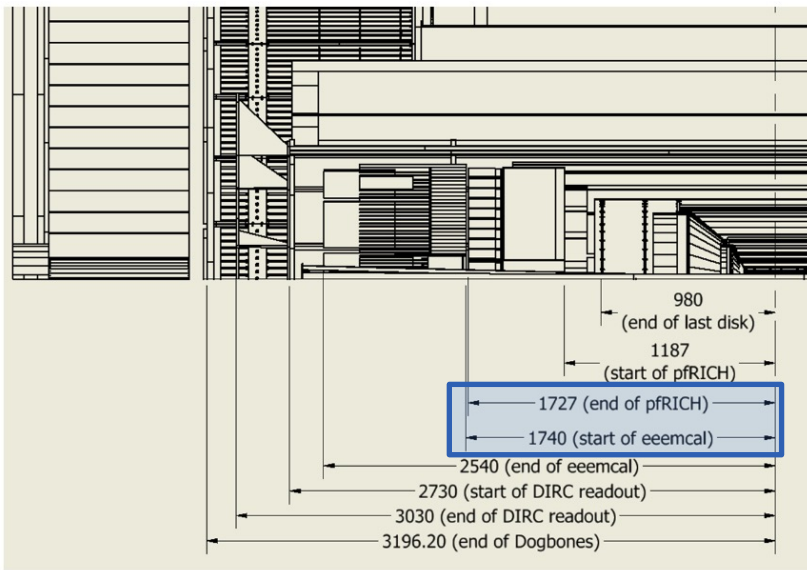# pfRICH GEANT4 implementation

A. Kiselev (BNL)

pfRICH meeting, November 2^d, 2022

Boundary conditions in the ePIC e-endcap


980
(end of last disk)

1187
(start of pfRICH)

1727 (end of pfRICH)
1740 (start of eeemcal)

2540 (end of eeemcal)
2730 (start of DIRC readout)
3030 (end of DIRC readout)
3196.20 (end of Dogbones)

by Alex Eslinger

| Inner radius	59 mm
Outer radius	~650 mm
Total length	~540 mm

- Basically, need to resize ATHENA standalone eRICH geometry, move it to a proper location, and

  - Replace SiPM panels by HRPPDs

  - Come up with a realistic aerogel tiling scheme

  - Add conical mirrors

  - Consider adding small mirror pyramids around each HRPPD

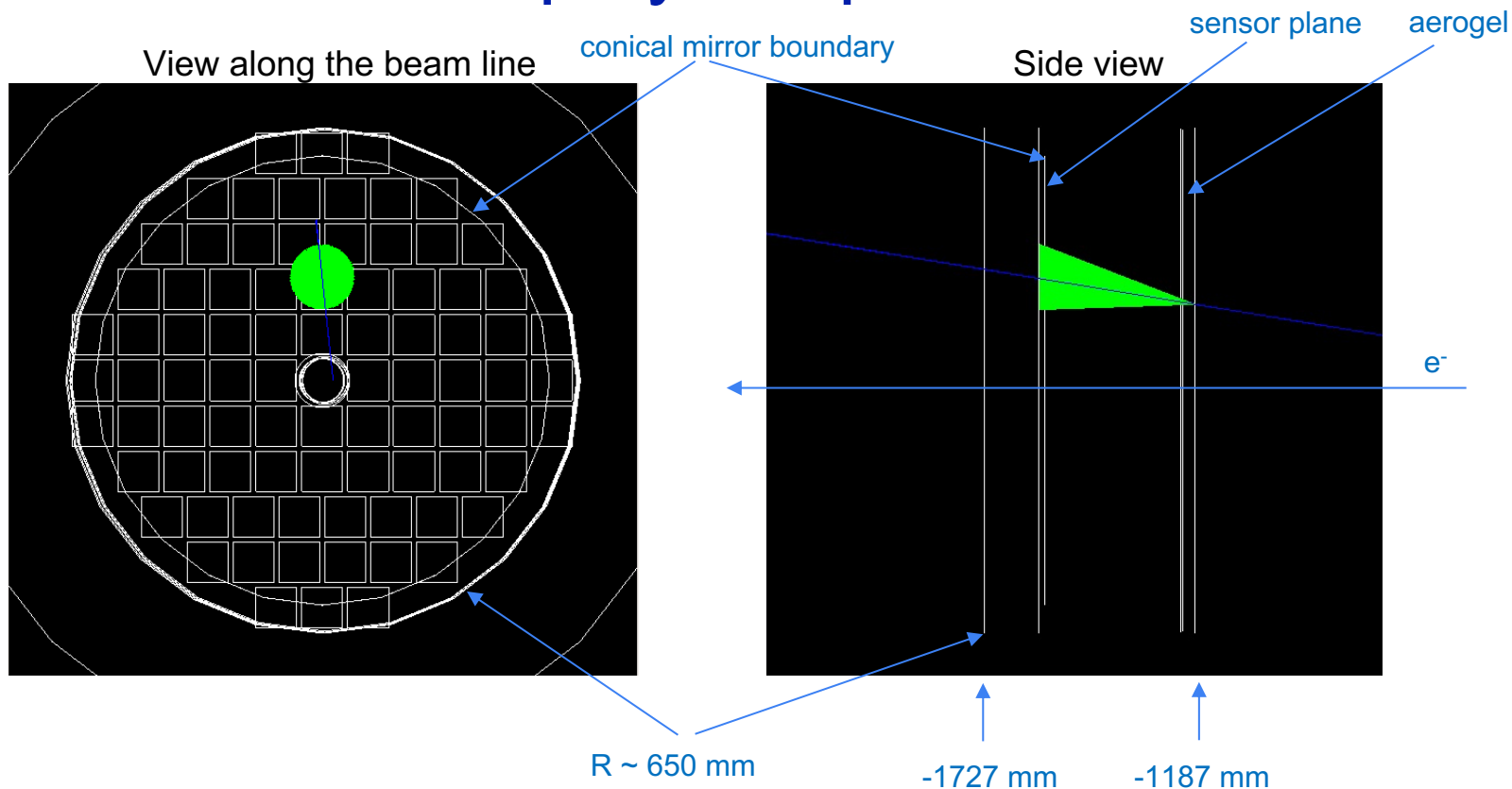# Acceptance optimization

ATHENA configuration
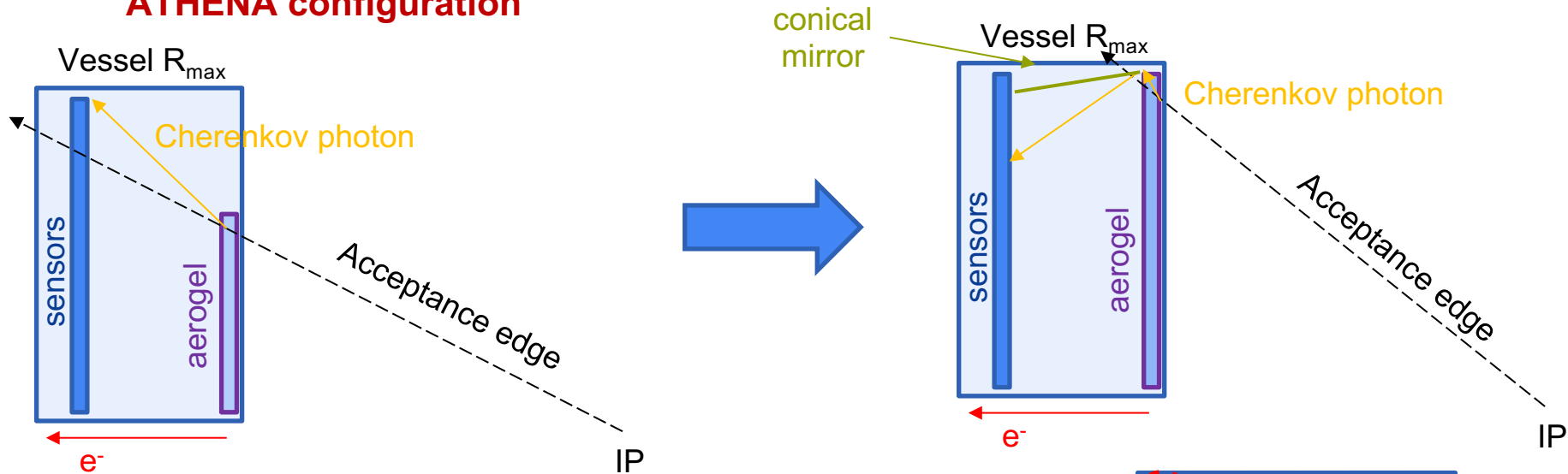
- No reason to lose this acceptance *in* η

  - (1) Increase aerogel radius all the way up to $\sim R_{max}$

  - (2) Install a cylindrical mirror at $\sim R_{max}$

- No reason to lose acceptance *on the sensor plane*

  - Use a conical (or a piece-wise flat *tilted*) mirror at $\sim R_{min}$ & $\sim R_{max}$
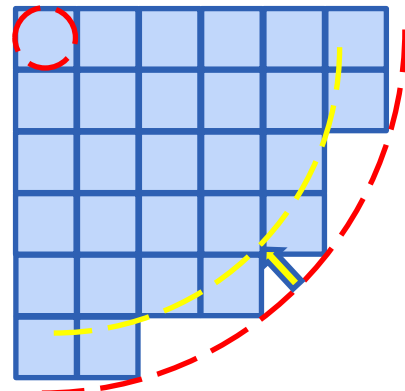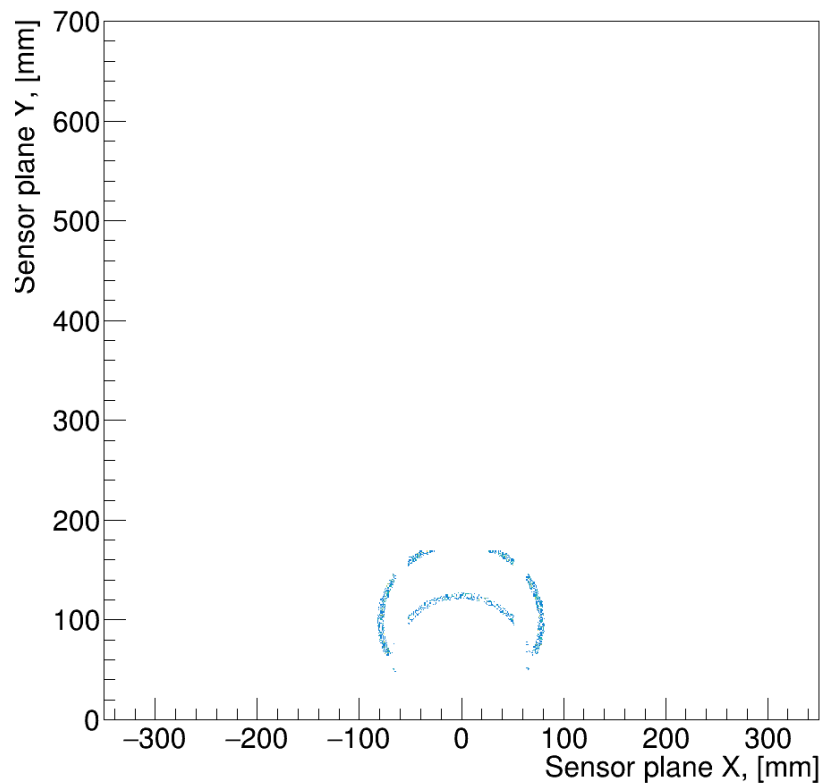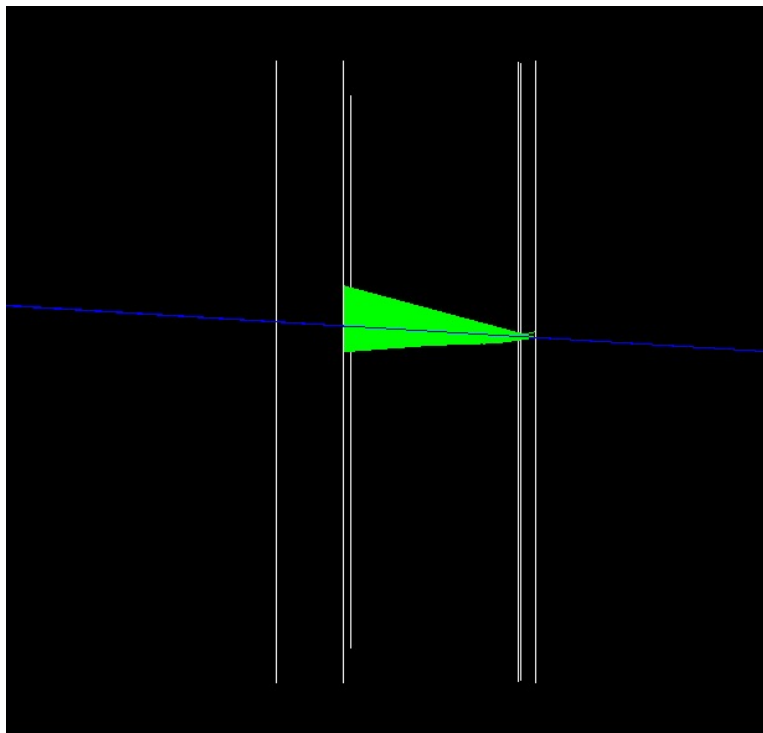
GEANT implementation

- 3cm thick n = 1.020 aerogel (no segmentation yet)

- Full available length vessel (54 cm)

- Expansion volume 37 cm

- Tile segmentation matching suggested HRPPD formfactor

- Active area 80% of the tile footprint, as suggested by Incom for future HRPPD models

- Till now was only able to see how the rings look like, and what are the acceptance boundaries

- Yet need to teach IRT algorithm how to work with conical mirrors and multiple optical paths for a given combination of emission point and hit location
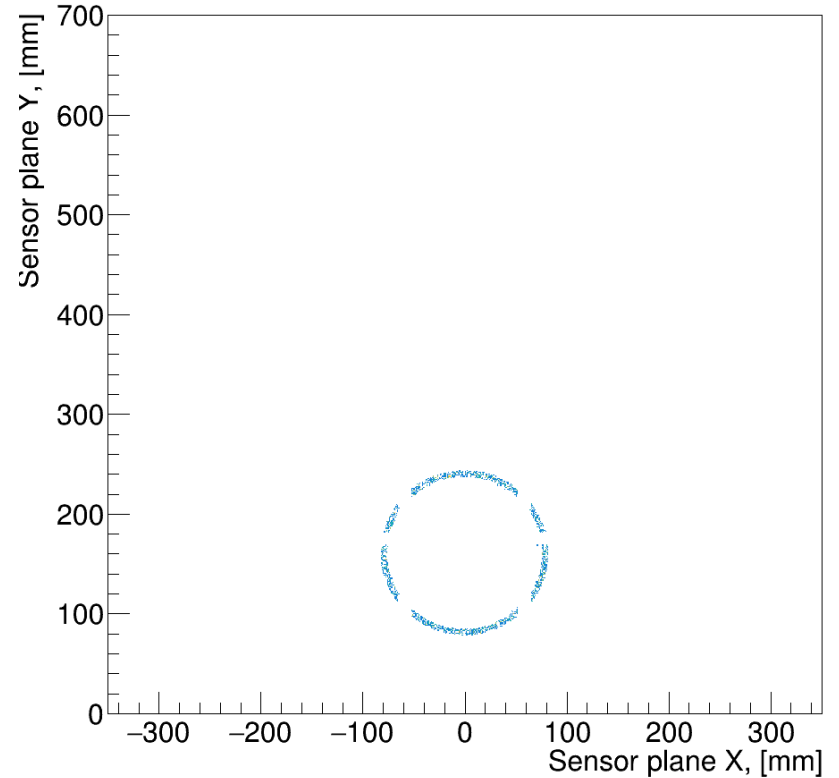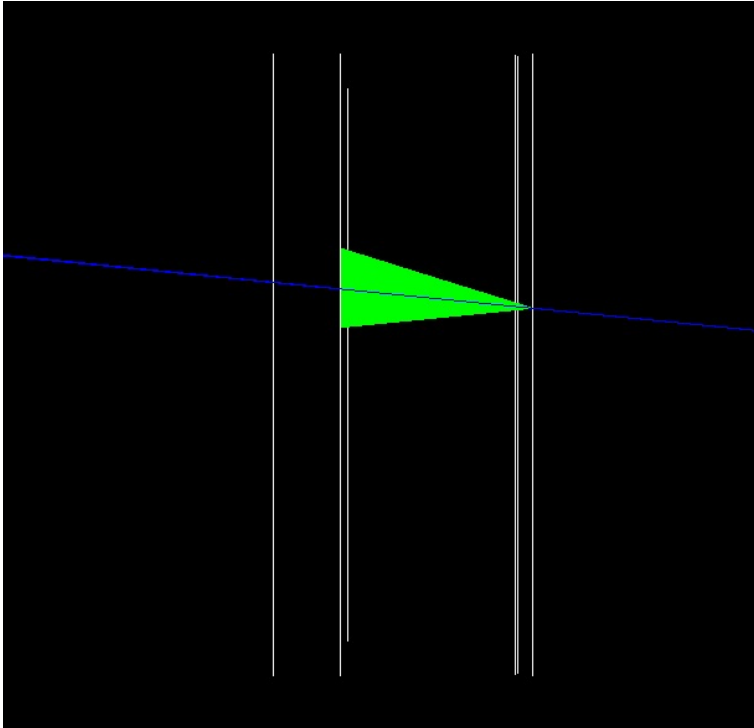
GEANT event display snapshots

View along the beam line

Side view

conical mirror boundary

sensor plane

aerogel

e⁻

R ~ 650 mm

-1727 mm

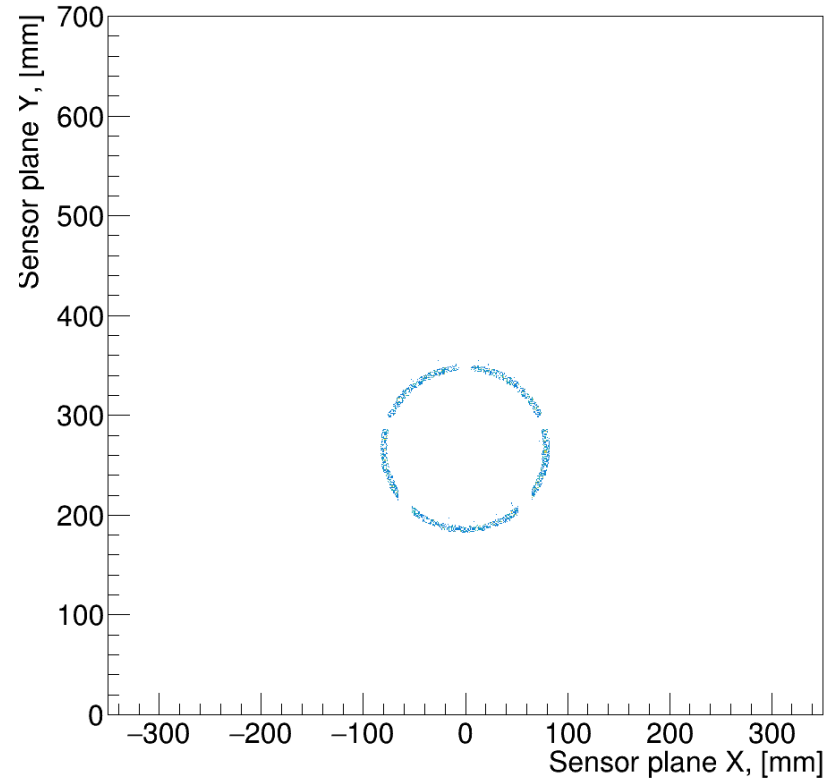-1187 mm
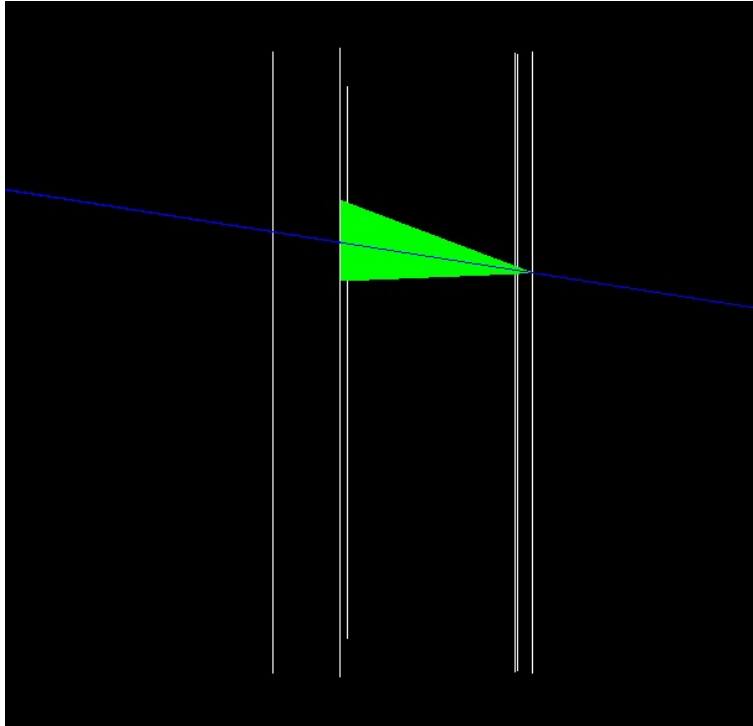
8 GeV/c pions at η = 2.5 (accumulated over several events)

Acceptance boundaries & rings: η = 3.5
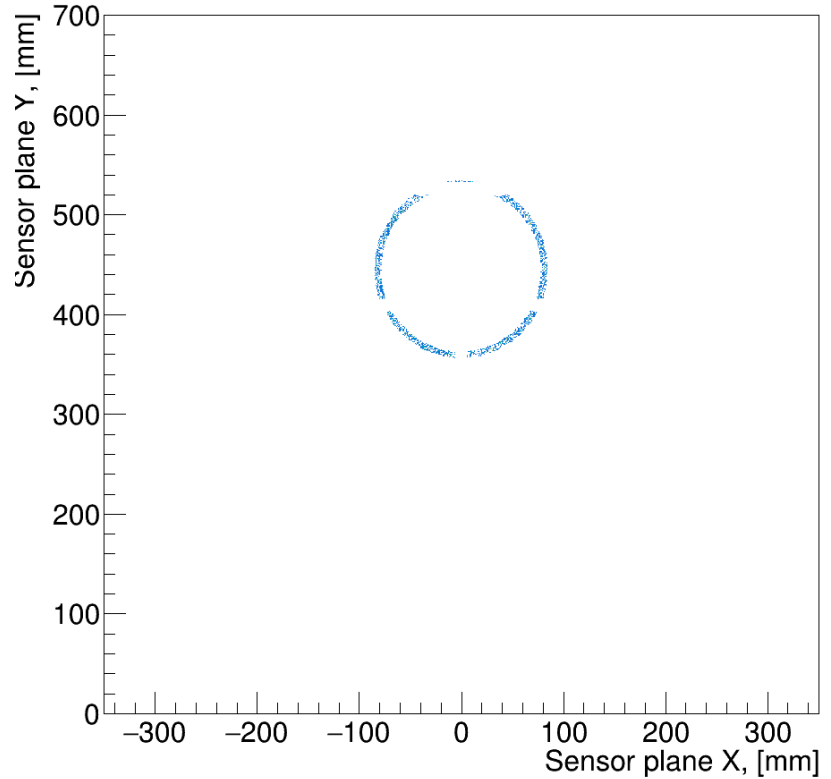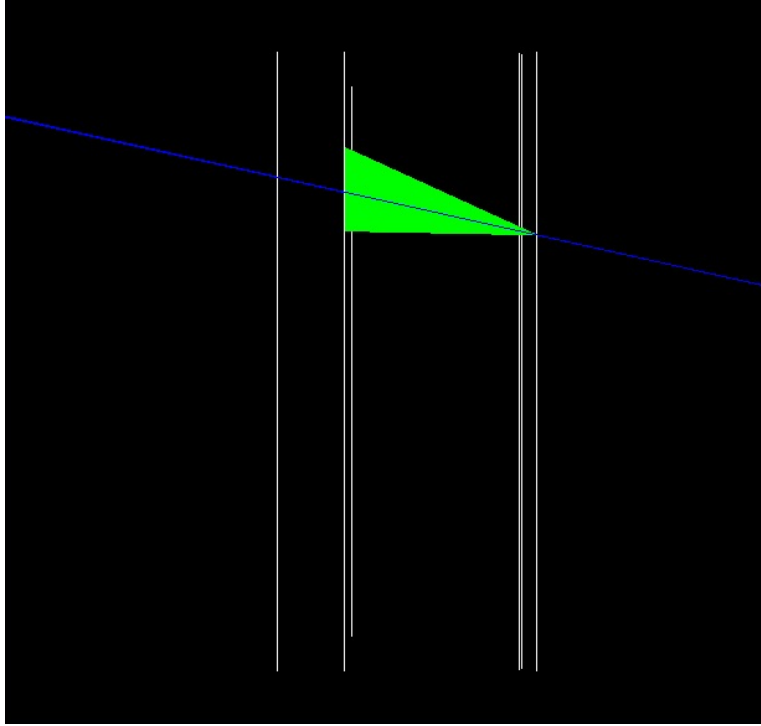
Acceptance boundaries & rings: η = 3.0
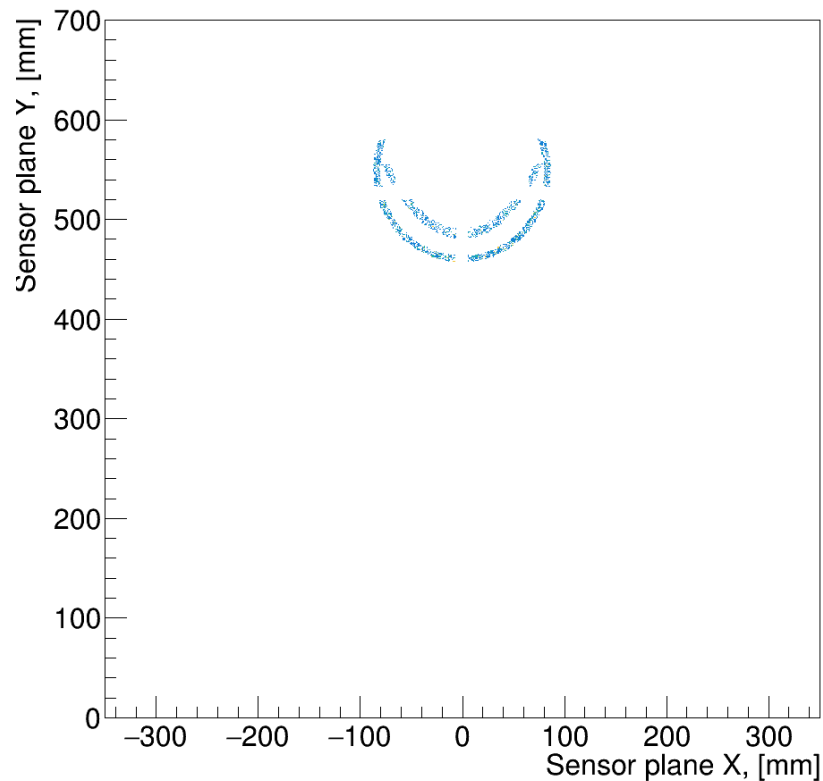
Acceptance boundaries & rings: η = 2.5

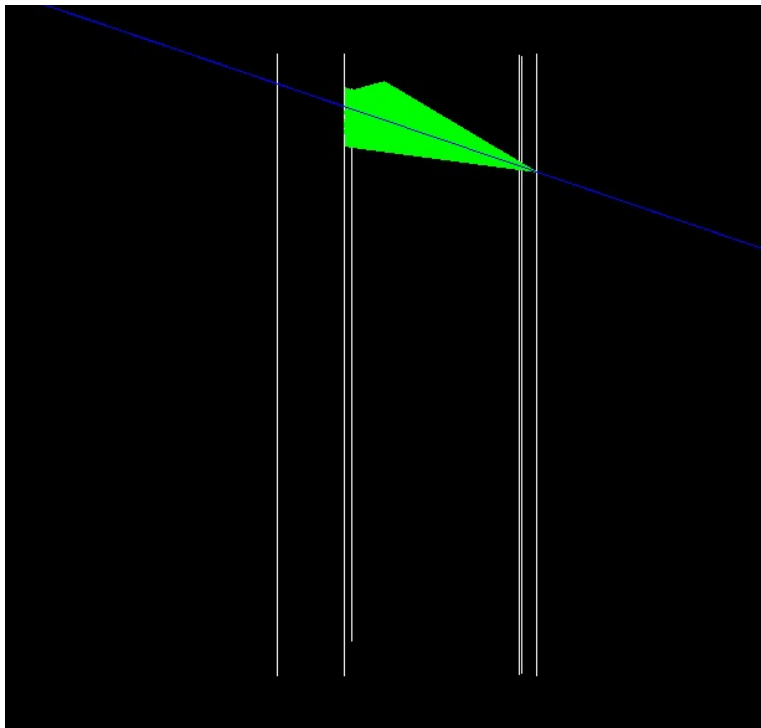# Acceptance boundaries & rings: η = 2.0

Acceptance boundaries & rings: η = 1.8

Acceptance boundaries & rings: η = 1.5