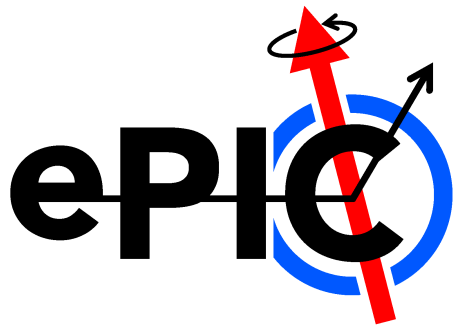
dRICH Simulations Updates

simulation, reconstruction status and plannings

C Chatterjee

20^{th} June 2023

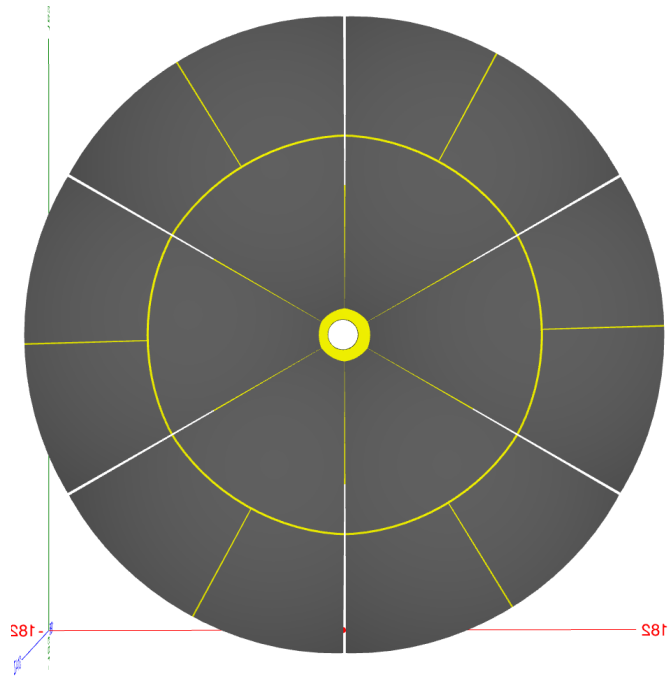


Outline

Segmenting Mirrors and geometrical tunings

Mirror segmentation:

- All segments have same parameters. Easy for reconstruction.
- Implementing Carbon Fiber ribs
- The segments are based on polar angles. For more meaningful segmentation we should decide on some parametrization.



To be done:

- Realistic Segmentation.
- Segmentation of Aerogel.
- Study the dead area and effect on PID for particles at specific $\eta - \phi$.

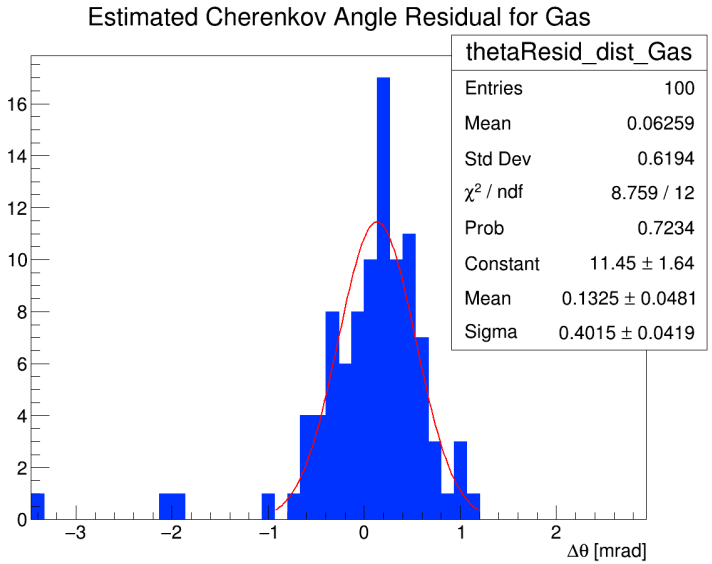
Segmenting Mirrors contd ...

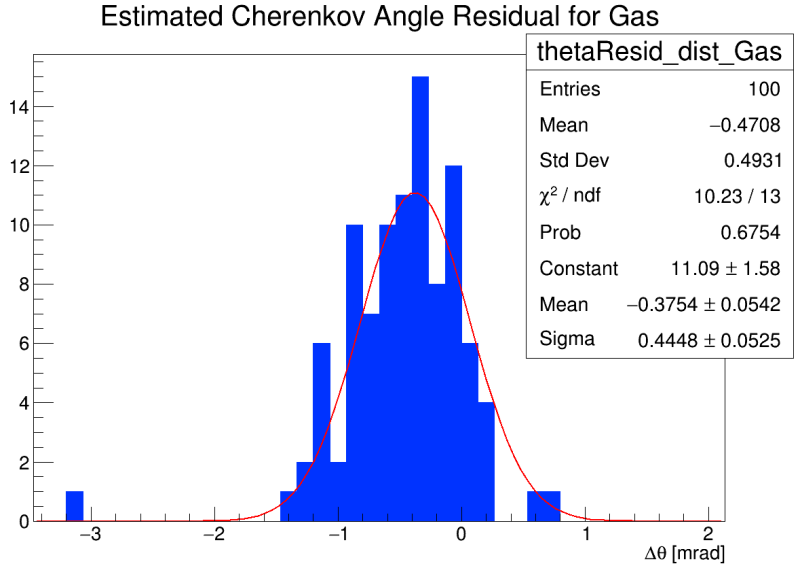
- **Why not different radii**?
  1. Not super easy to deal with one parameter and study the effect of dead areas.
  2. Complication related to the reconstruction of the Cherenkov photon angles. The geometry pass has to be modified.
  3. I am using a relatively simple method to implement these segments. Constructing a section of sphere of same parameters from θ_1 to θ_2, then a gap of $\delta\theta$ and then $\theta_2+\delta\theta$.
  4. **No two spheres are intersected in this method**. How to make it useful for minimum user defined different mirror parameters, I am trying to understand.
- **What about slicing aerogels**?
  1. Relatively simple. But to be done from scratch in DD4Hep.
  2. Stand-alone pfRICH has tiled aerogel (20 cm size). But not imported properly in ePIC.

By en of August we should be able to ready to implement and test the *dead-area-effect* of aerogel and also some meaningful segmentation of mirror segments (even though same parameterization).

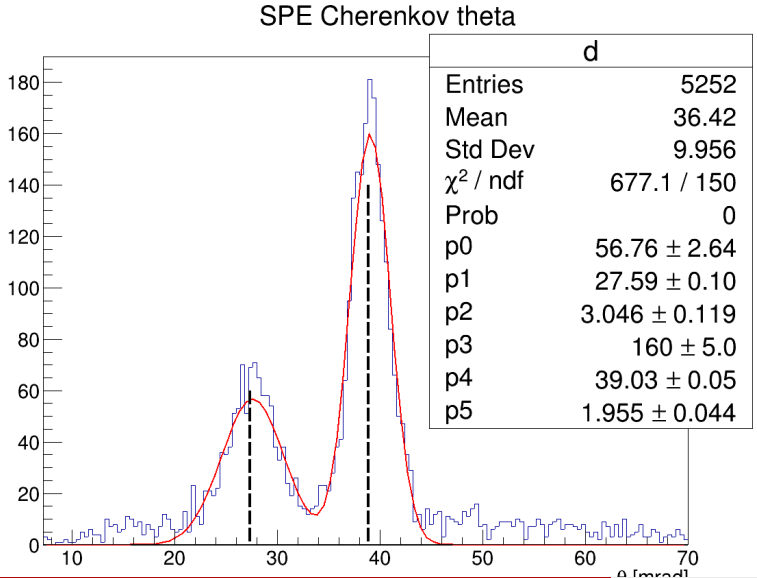
Reconstruction

- We can run hepmc events. The results are 'almost' compatible.





- We can run hepmc events. And maybe multi-particles (with meaningful results).



May not need any big changes. In tension with Annalisa's observation. We are trying to look into the 'hepmc' generator. Before we never studied SPE Cherenkov angles in detail. We studied the ring angles and ring angles are currently computed as an average of the SPE angles.

Reconstruction Contd...

Work To be done:

- A better definition of ring angle is needed. (End of August)
- Consistency studies with noise. (End of August)
- Systematic studies with multiple particles in a single event. (W/ and W/O noise). (Early October)
- A robust PID estimator (χ^2 based) and a global likelihood following 'Cutting-Edge' WG recommendation. (Early next year?)

Simulation Campaigns

- I will be closely following the Comp SW WG to understand the schedules for the next simulation campaigns. Any information I should be already aware of? Once Chris is a little free, I will try to understand all the unfinished merges and branches to keep an eye on.
- Should we stick to the private reconstruction?
- How can we include our Rome colleagues in the reconstruction chain?

Suggestions? Comments?