Barrel DIRC Simulation in PANDAROOT

Dipanwita Dutta
GSI, Darmstadt

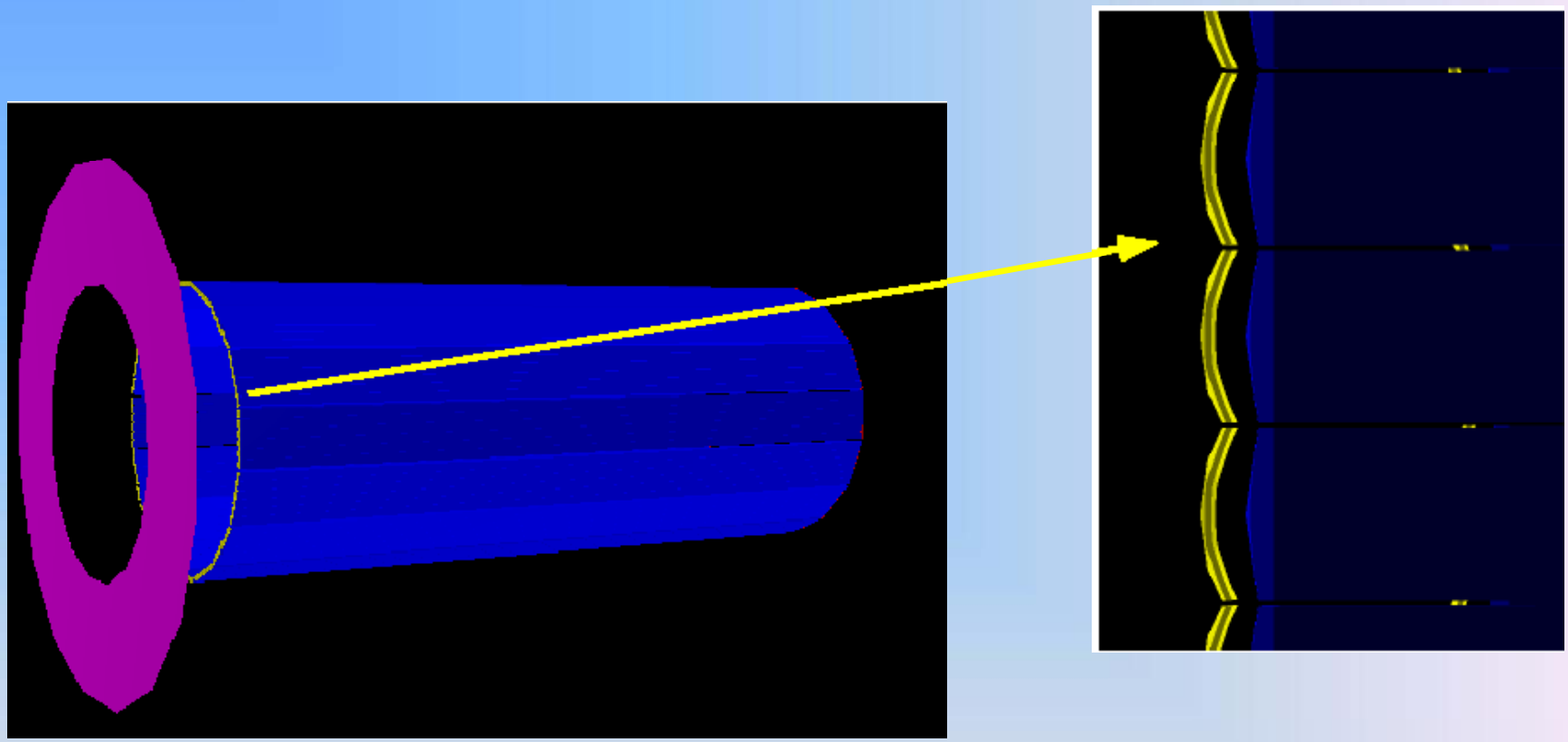
PANDA Collaboration Meeting, GSI
Dec. 2009

Outline

- Present Geometry of DIRC
- Class Structure in PANDAROOT
  - News on Hit Producer
  - Results from Hit Producer
- Patterns in Photon Detector Plane
- Summary and Outlook

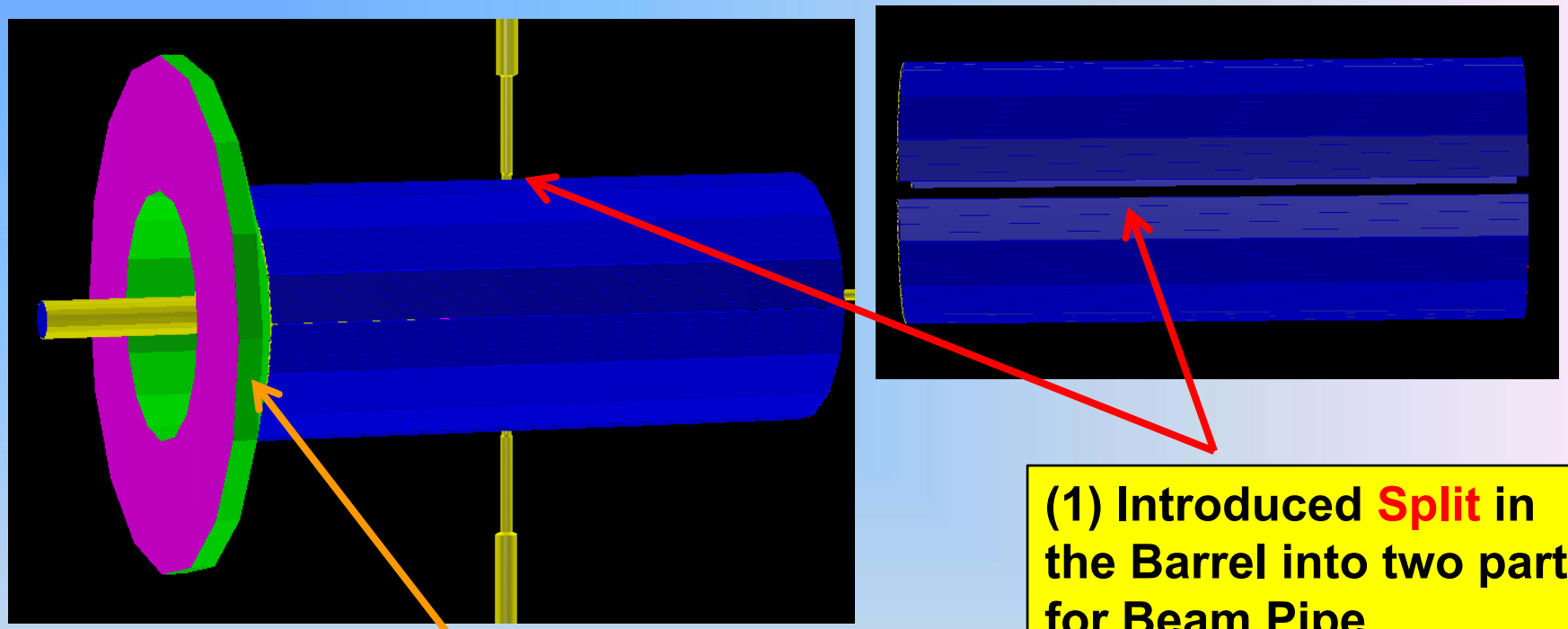
Present Geometry of DIRC

Old Geometry



- **No Split for the Beam Pipe**
- **No Visible Medium for Photon Propagation**

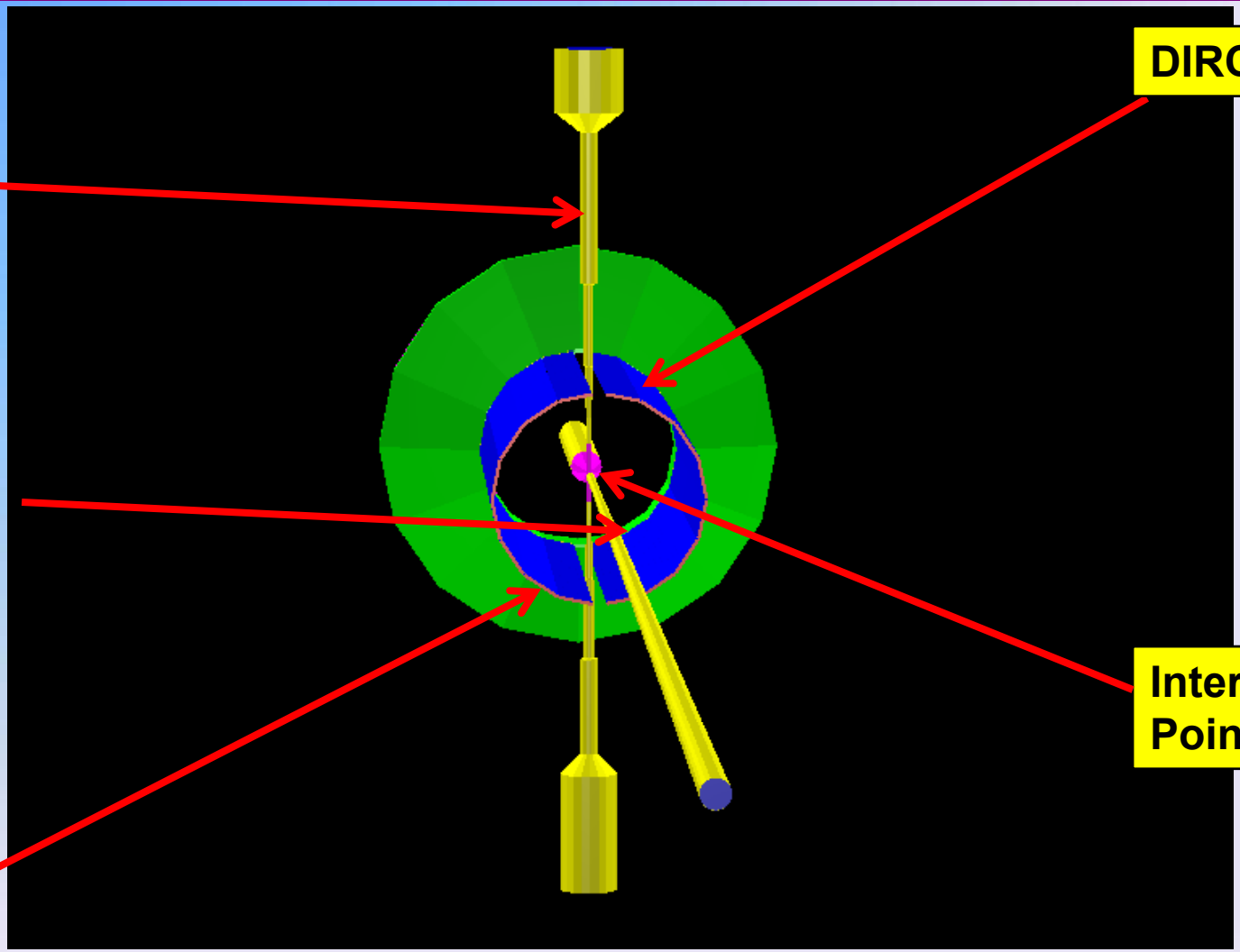
New Geometry



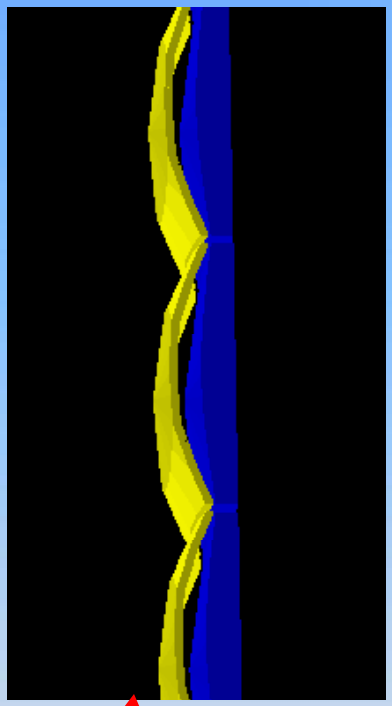
(1) Introduced Split in the Barrel into two parts for Beam Pipe

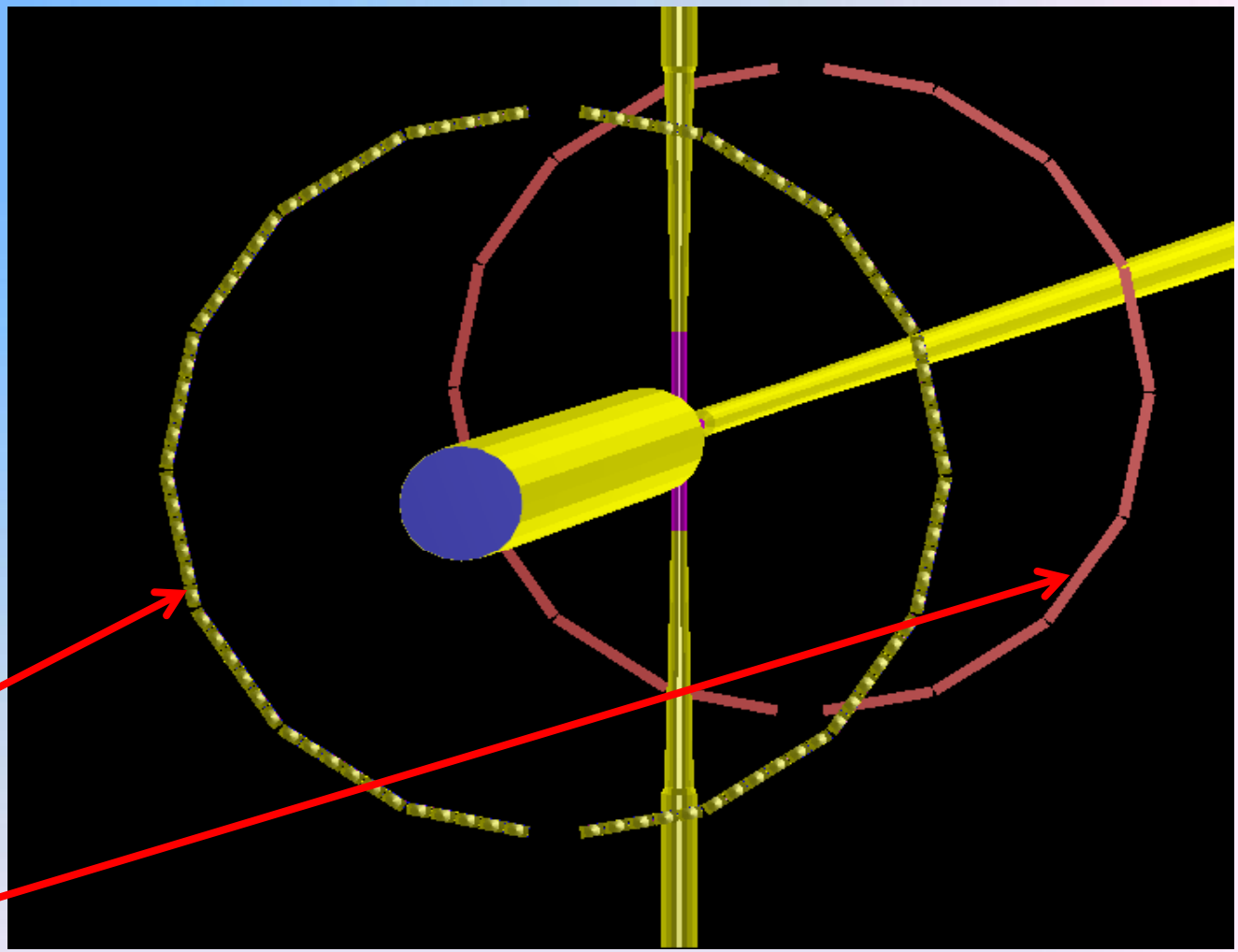
(2) Visible Geometry for Photon Propagation Medium (Marcol82)

DIRC Barrel (cross-sectional view)



Lenses and Mirror

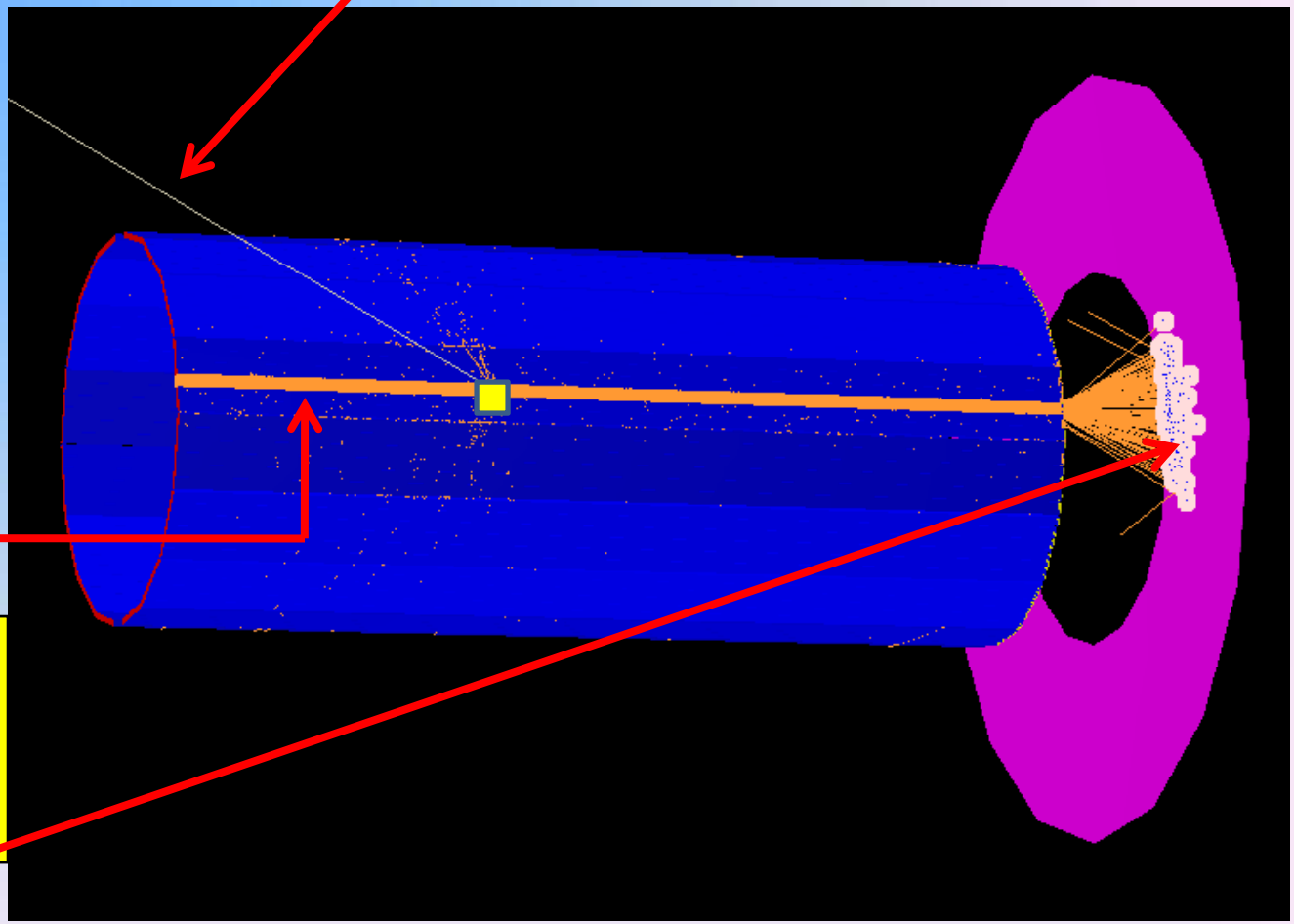




Lenses

Mirror

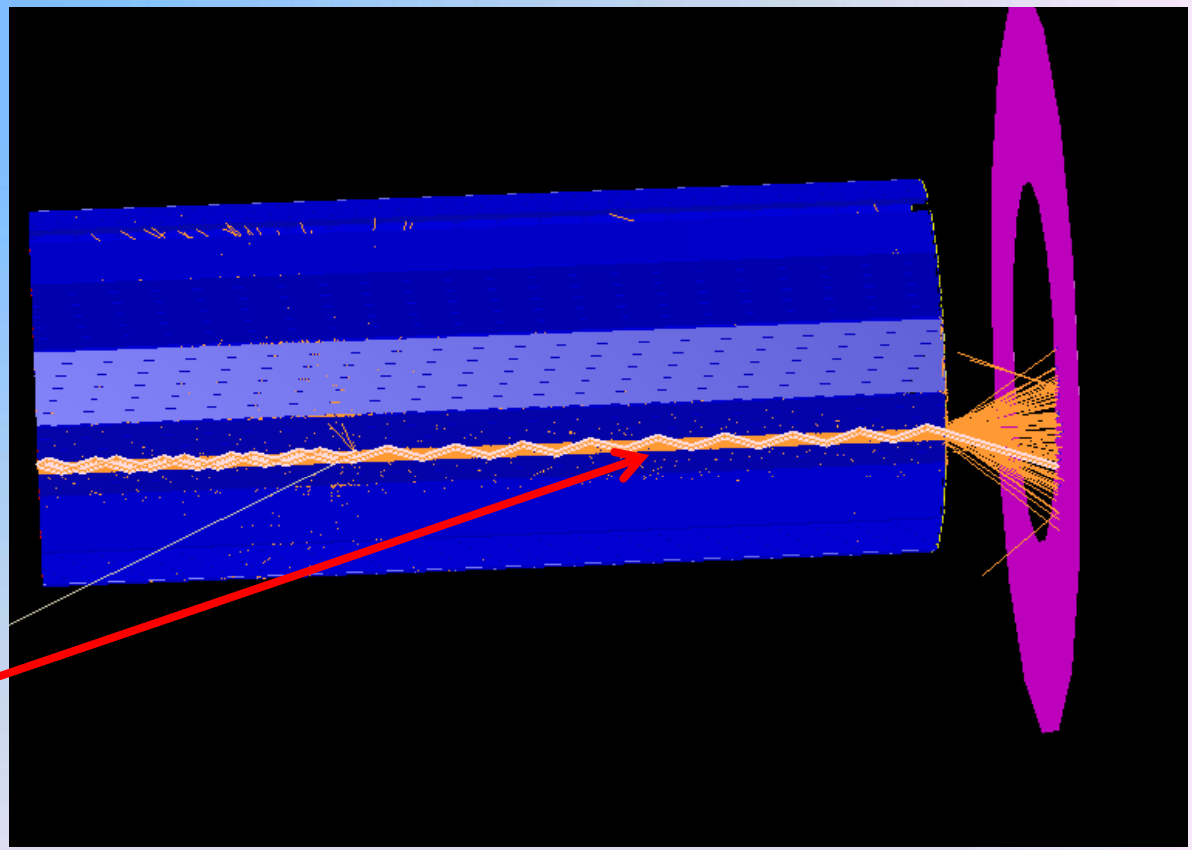
Cherenkov Photons



Cherenkov Photons

Kaon of mom 2 GeV, hit DIRC Barrel

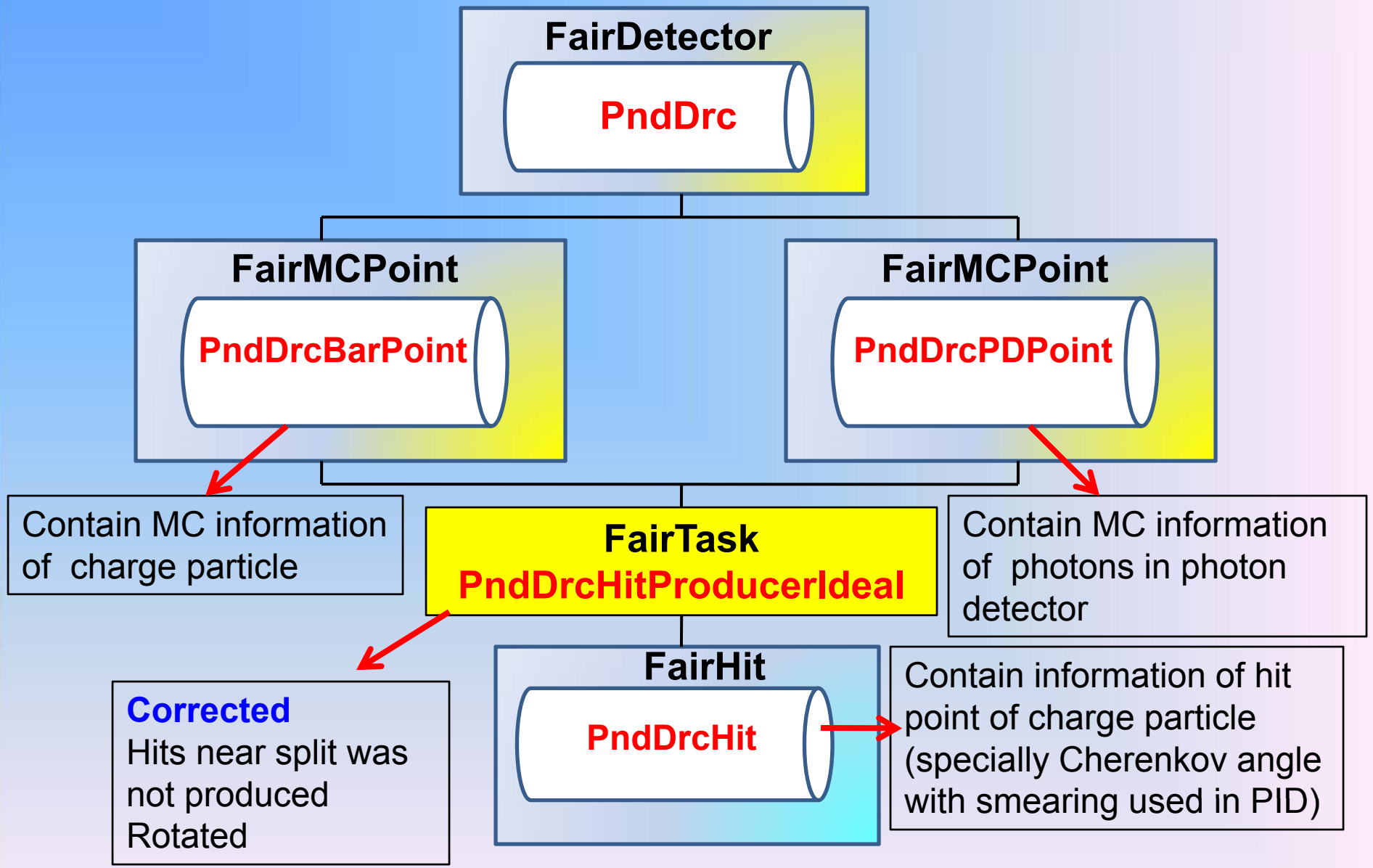
Cherenkov Photons Produced and Propagated in bar



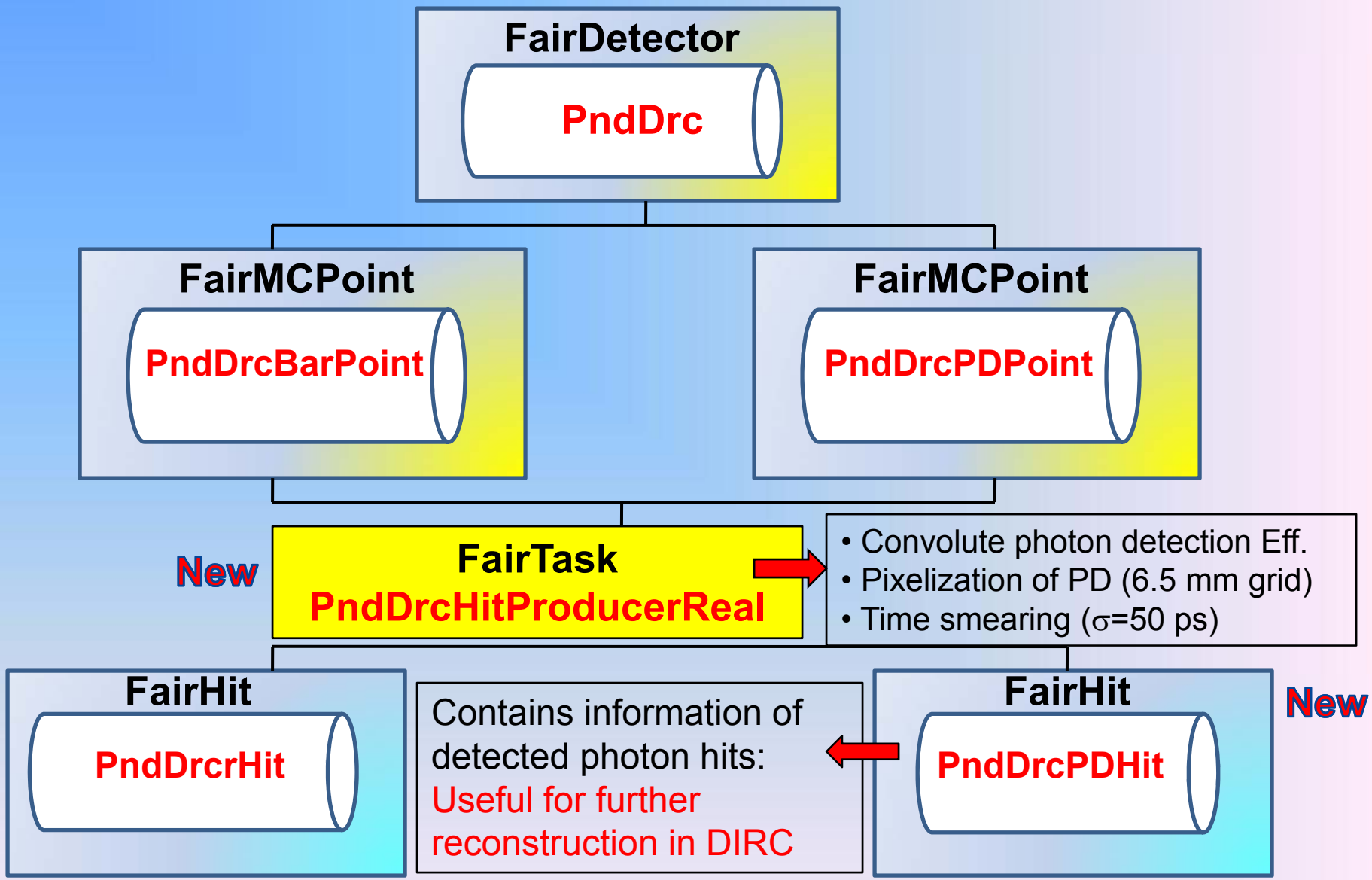
View the Tracks of the Photons

DRC Classes in PANDAROOT

Flow Chart : DRC Classes in PANDAROOT

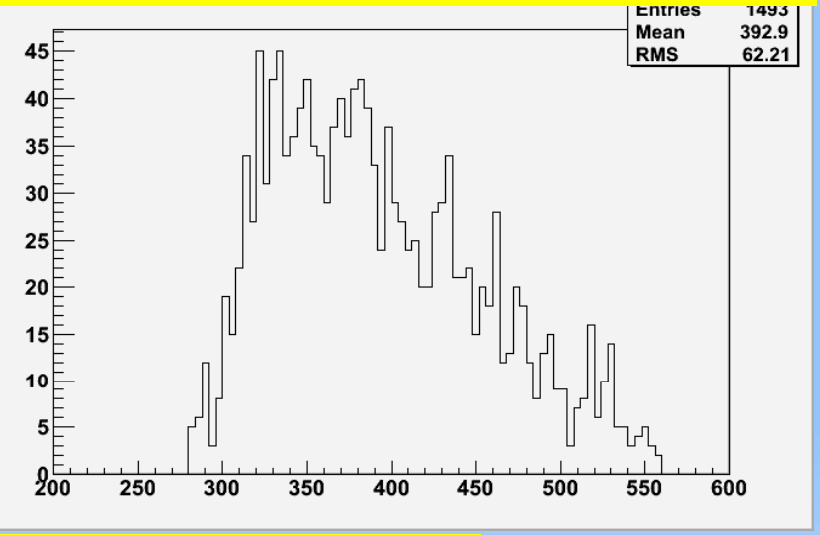


Flow Chart : DRC Classes in PANDAROOT

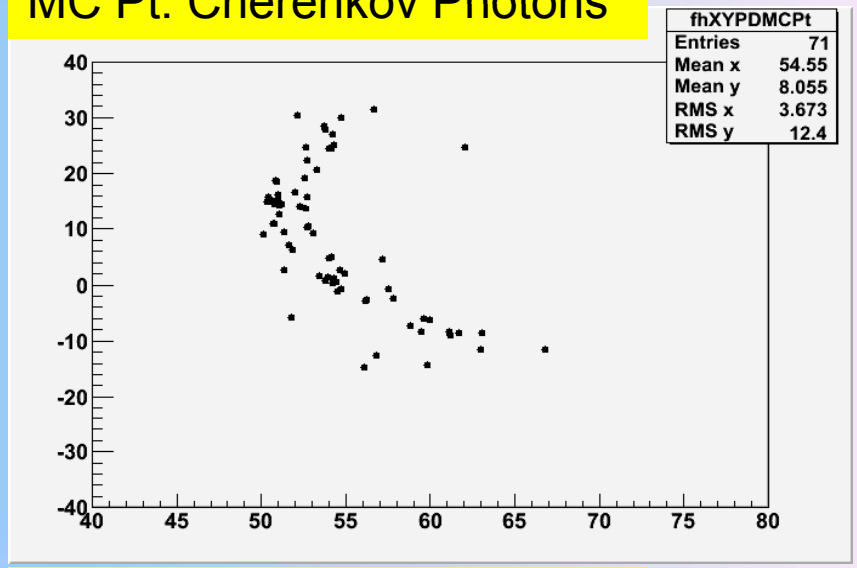


Results Hit Producer

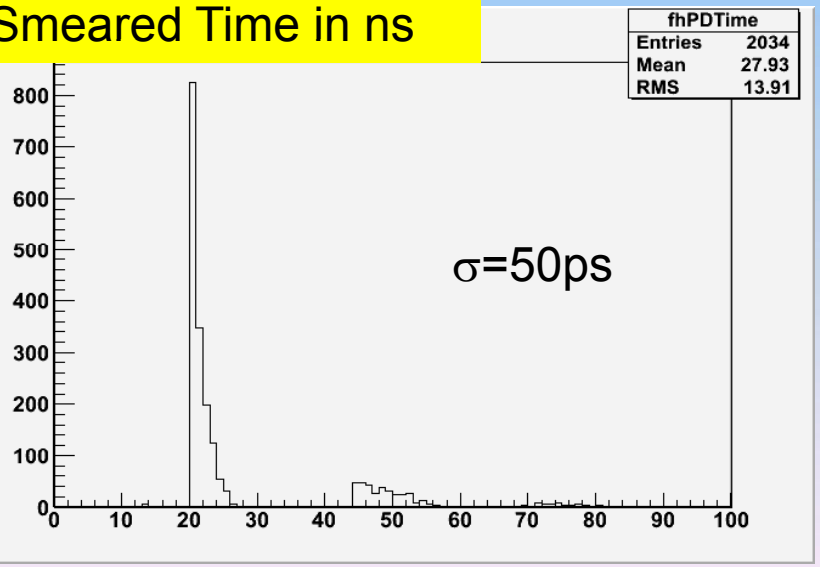
Wavelength Dist.of Detected Photons



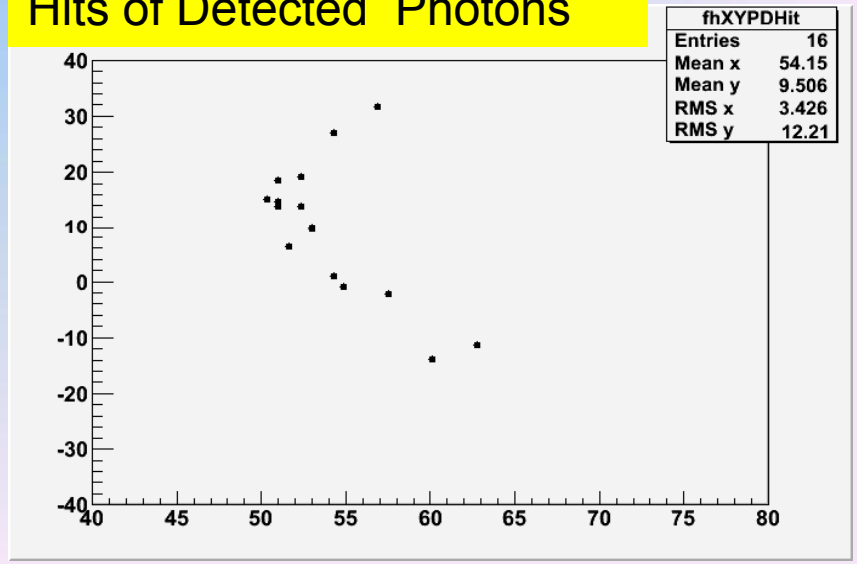
MC Pt. Cherenkov Photons



Smeared Time in ns



Hits of Detected Photons



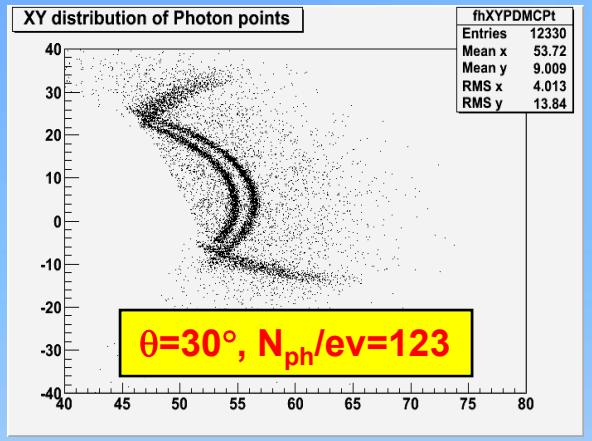
Patterns in Photon Detector Plane

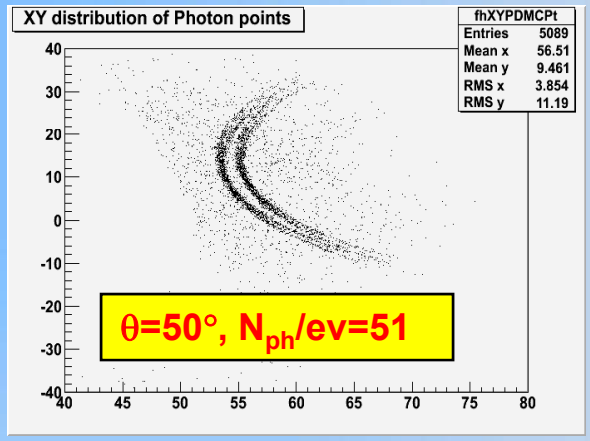
Patterns in Photon Detector Plane

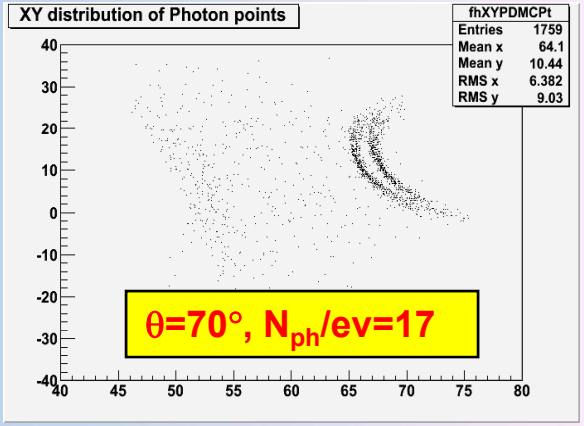
Kaon

1GeV

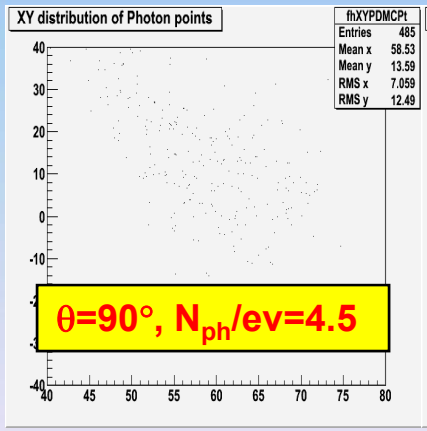
Box Generator: Mom =**1 GeV**, φ =10°, nEvents=100

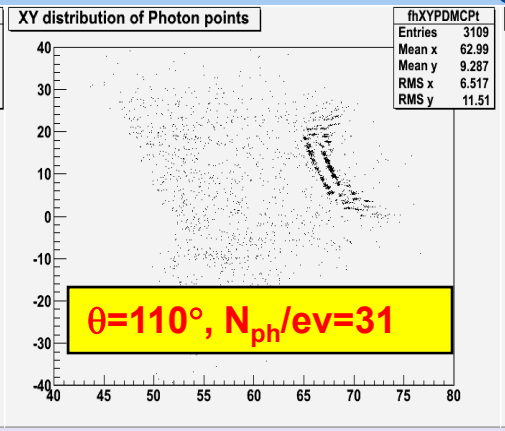


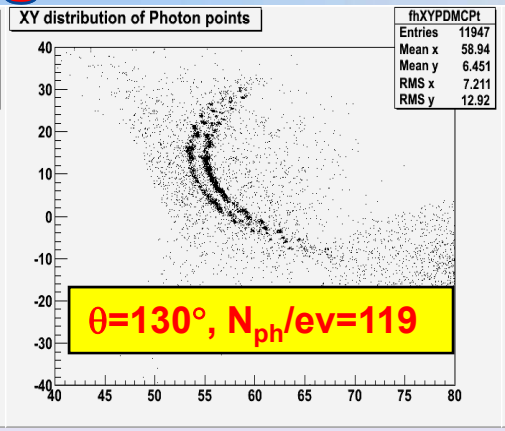


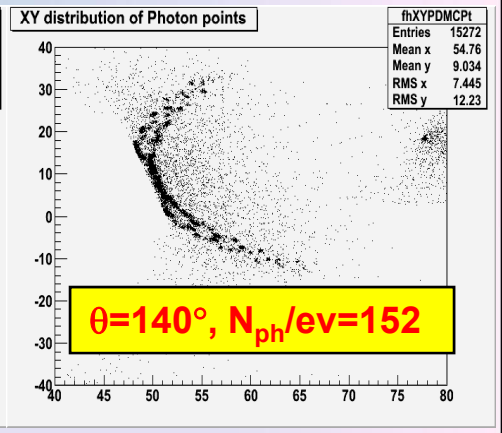


Without Magnetic Field









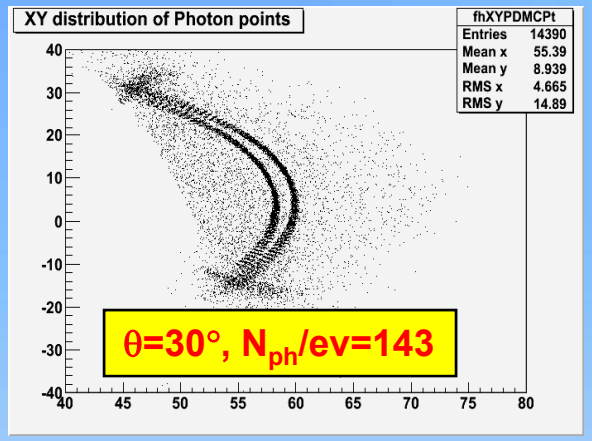
Problem: Two ring structure

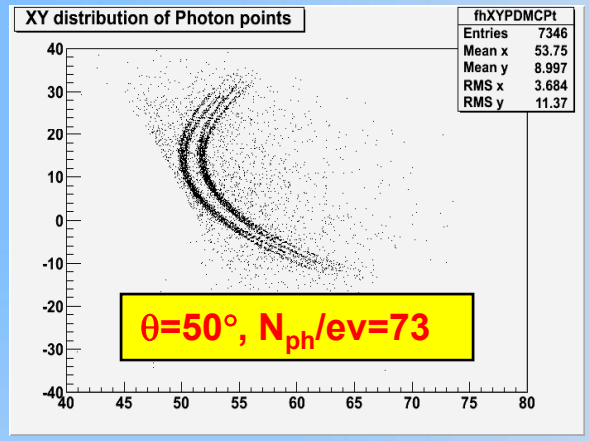
Patterns in Photon Detector Plane

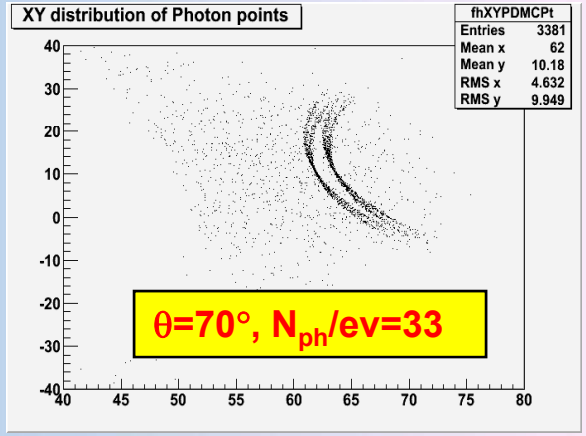
Kaon

4GeV

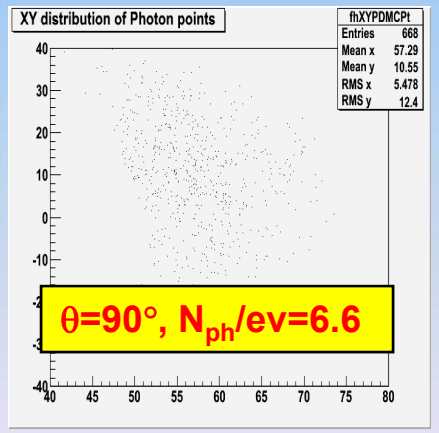
Box Generator: Mom =**4 GeV**, φ =10°, nEvents=100

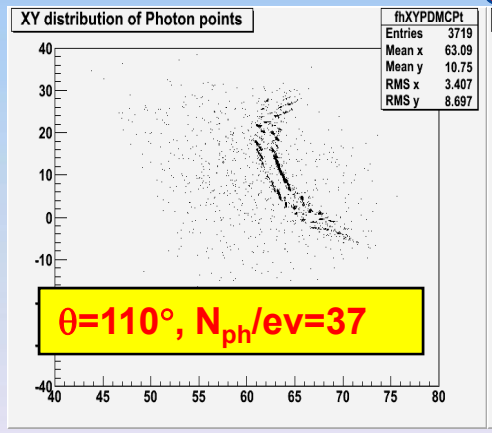


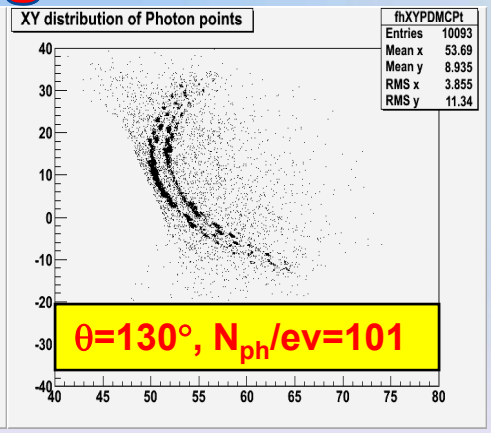


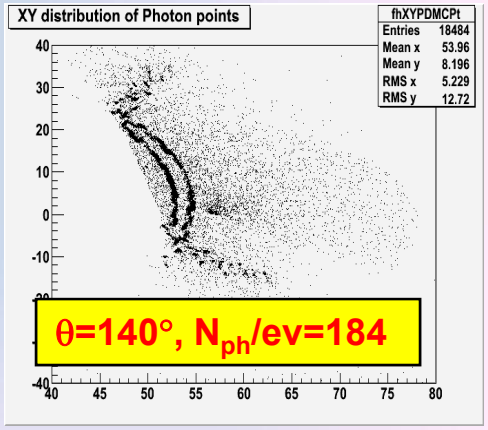


Without Magnetic Field







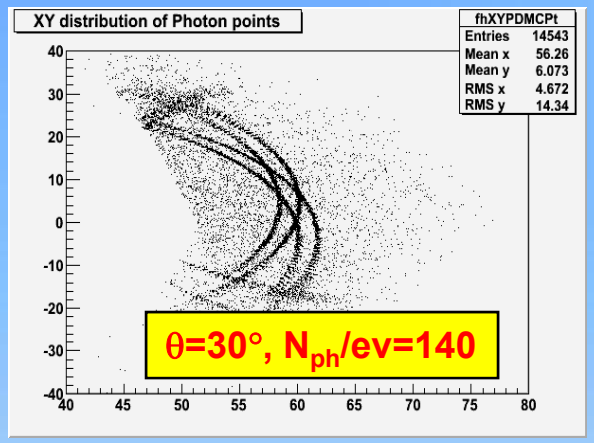


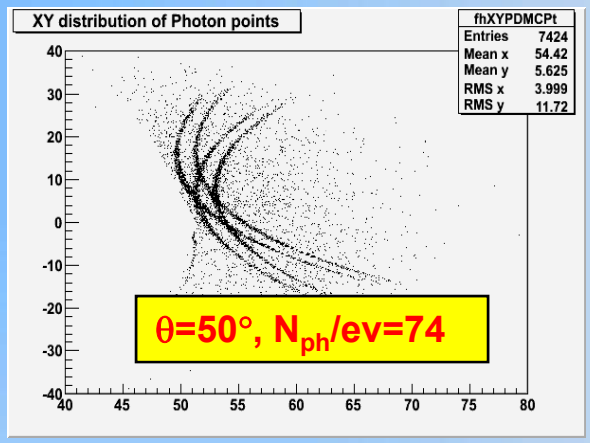
Patterns in Photon Detector Plane

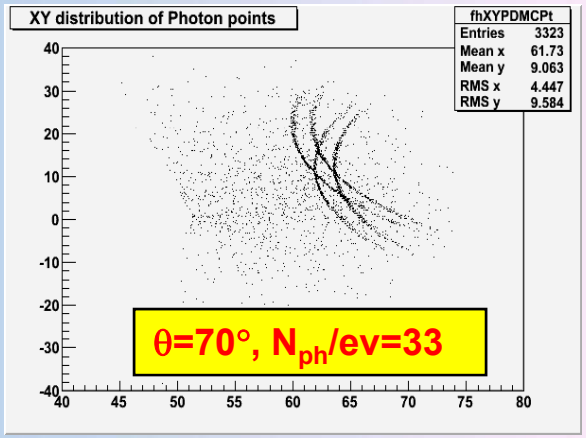
Kaon

4GeV

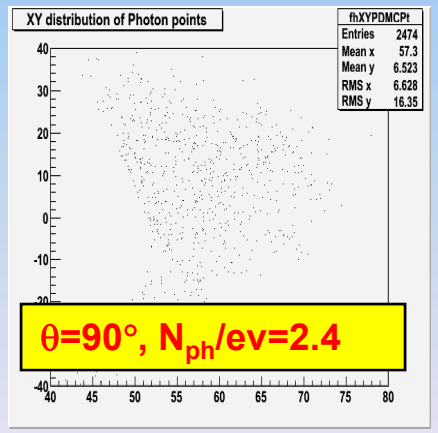
Box Generator: Mom =**4 GeV**, φ =10°, nEvents=100

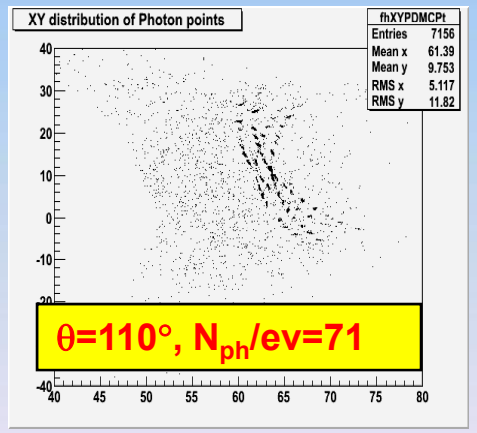


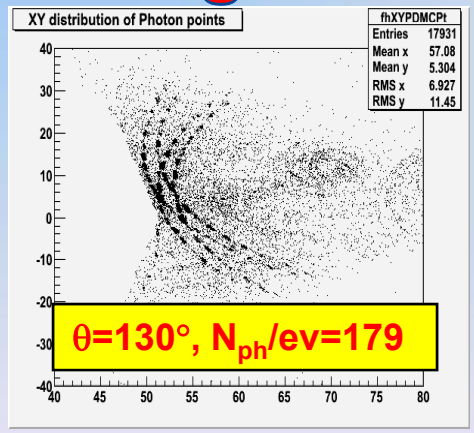


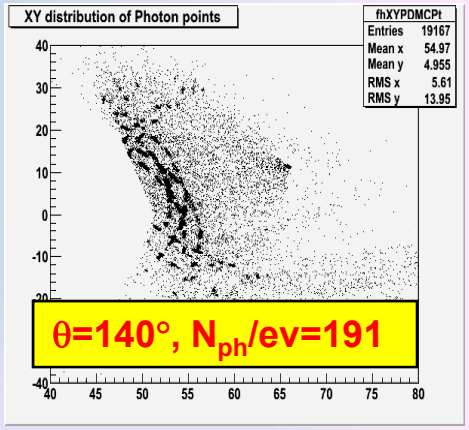


With Solenoid Magnetic Field









Summary and Outlook

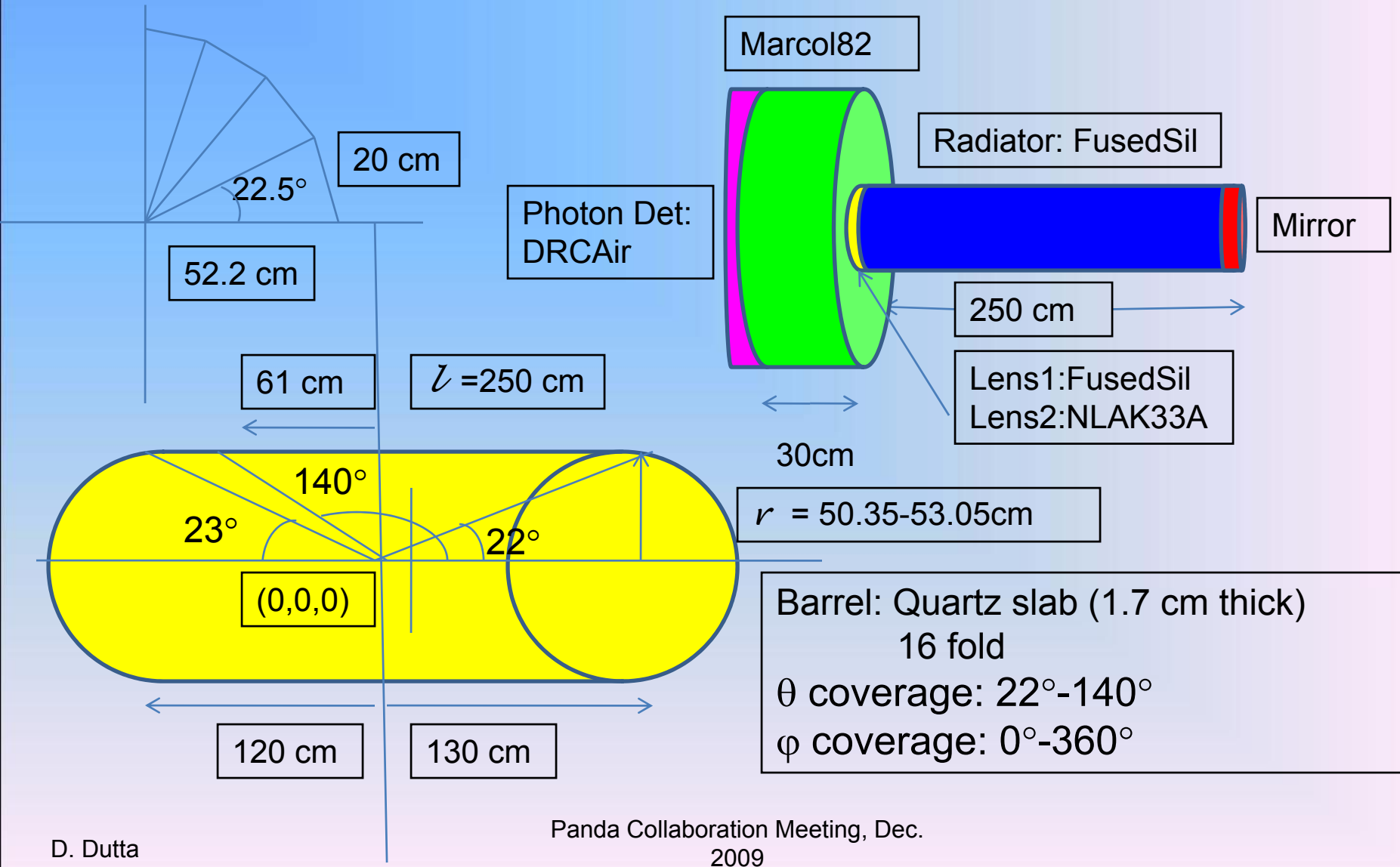
- New Geometry with splitting of Barrel DIRC for Beam Pipe --**Working fine**
- A Real Drc Hit Producer introduced : **Working fine**
  - Photon Detection Efficiency
  - Simplified Pixelisation of Photon Detector
  - Time Smearing
- Patterns in Photon Detector Plane- **Studied**
  - Double Ring structure observed

- **Patterns in the Photon Detector Plane – to be understood**
- **Study for Real Signal and Background events**
- **Pattern Recognition and Reconstruction – next step**

Thank you

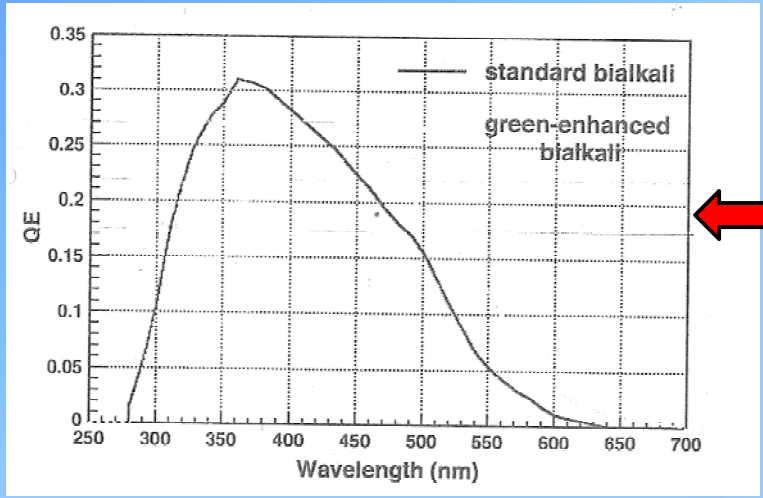
Back up Slides

Barrel DIRC Dimensions



Barrel: Quartz slab (1.7 cm thick)
16 fold
θ coverage: 22°-140°
φ coverage: 0°-360°

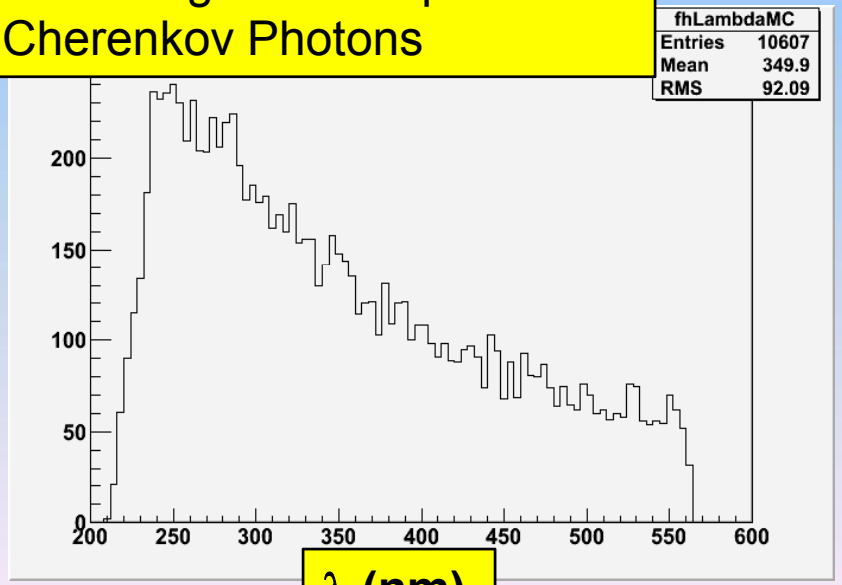
Results from Hit Producer



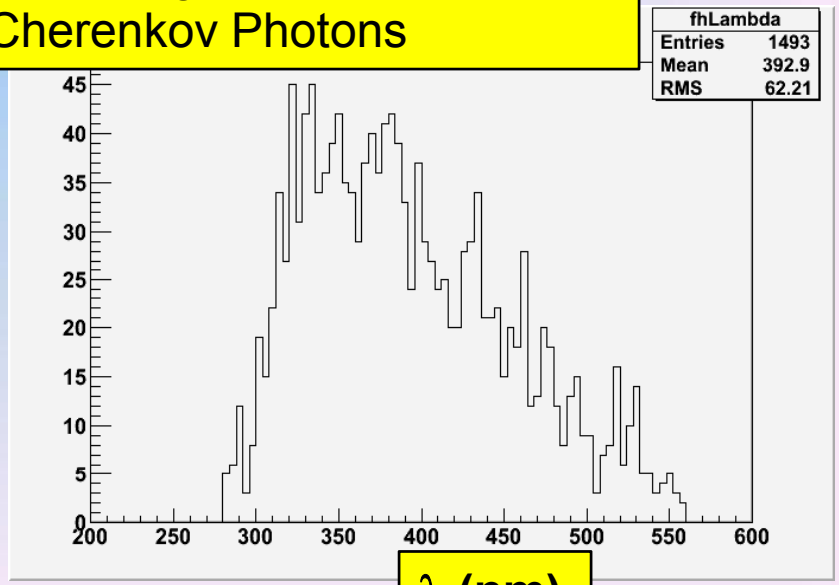
Quantum Efficiency of Bialkali Photocathode

Ref. D. Motta and S. Schoenert, NIM A539 (2005) 217

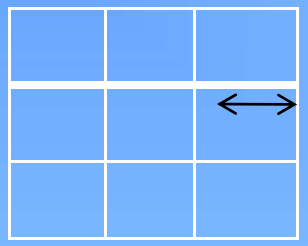
Wavelength dist. of produced Cherenkov Photons



Wavelength dist. of detected Cherenkov Photons

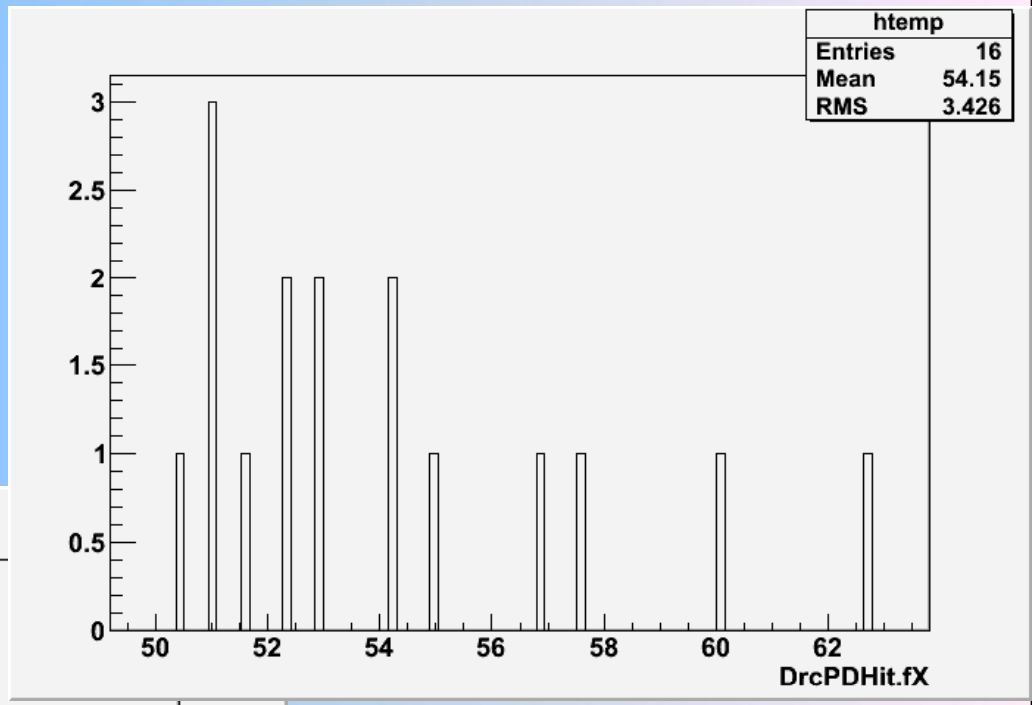


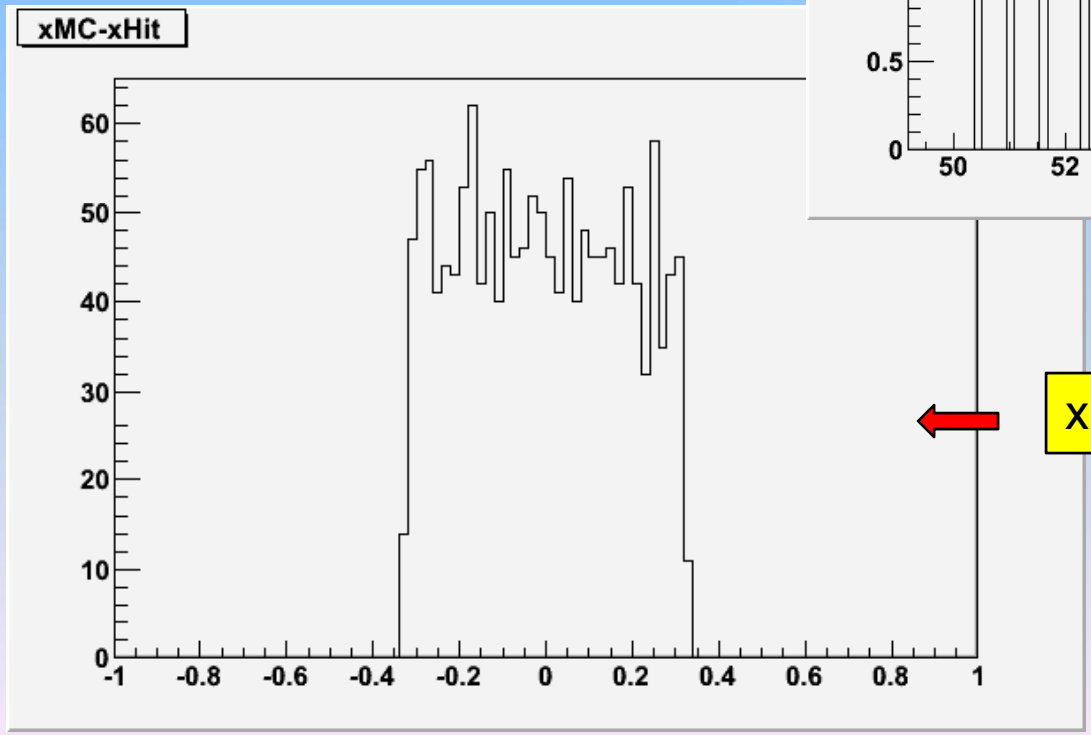
Results from Hit Producer



6.5mm × 6.5mm

x distribution of detected photon hits (grid 6.5 mm)





x_{MC}-x_{Hit} distribution