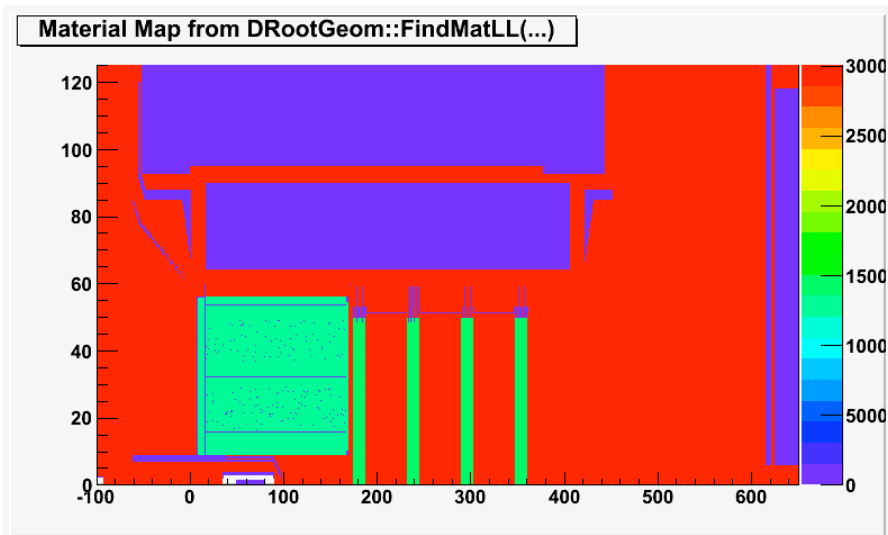


Tracking Software Update

Aug. 10, 2009

David Lawrence JLab

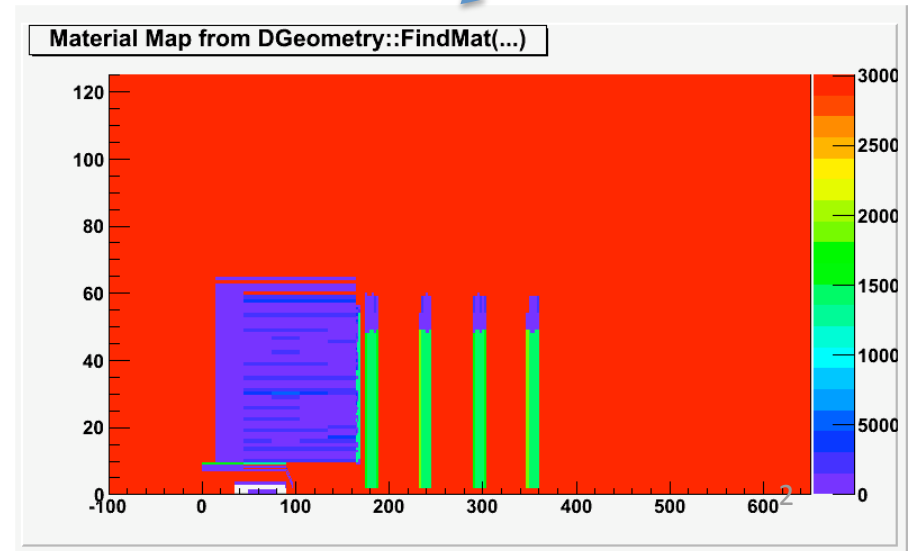
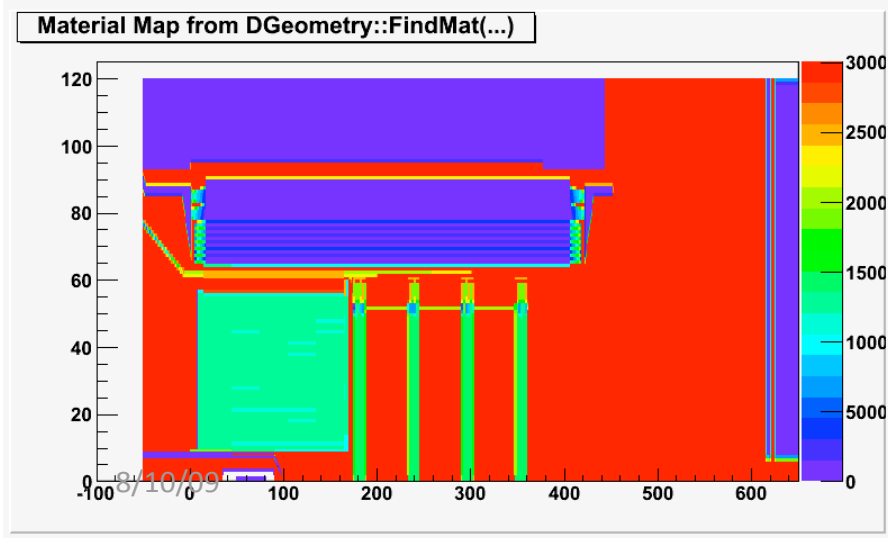
Material Map: Radiation Length



DRootGeom

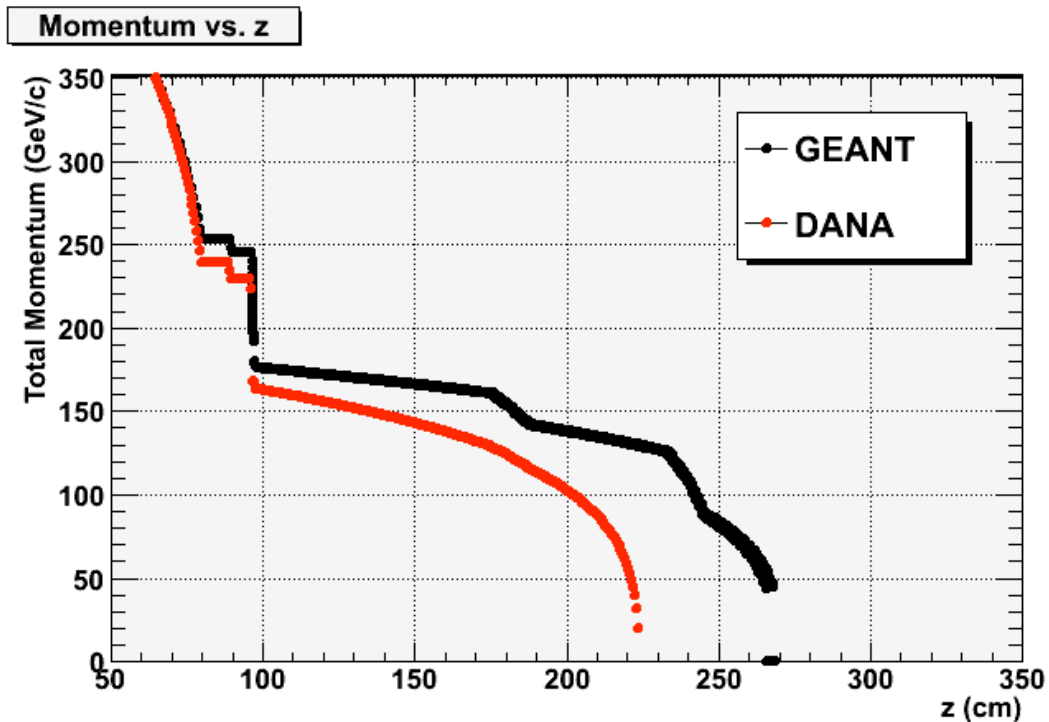
Detailed map

Sparse map (current)



Energy loss compared to GEANT

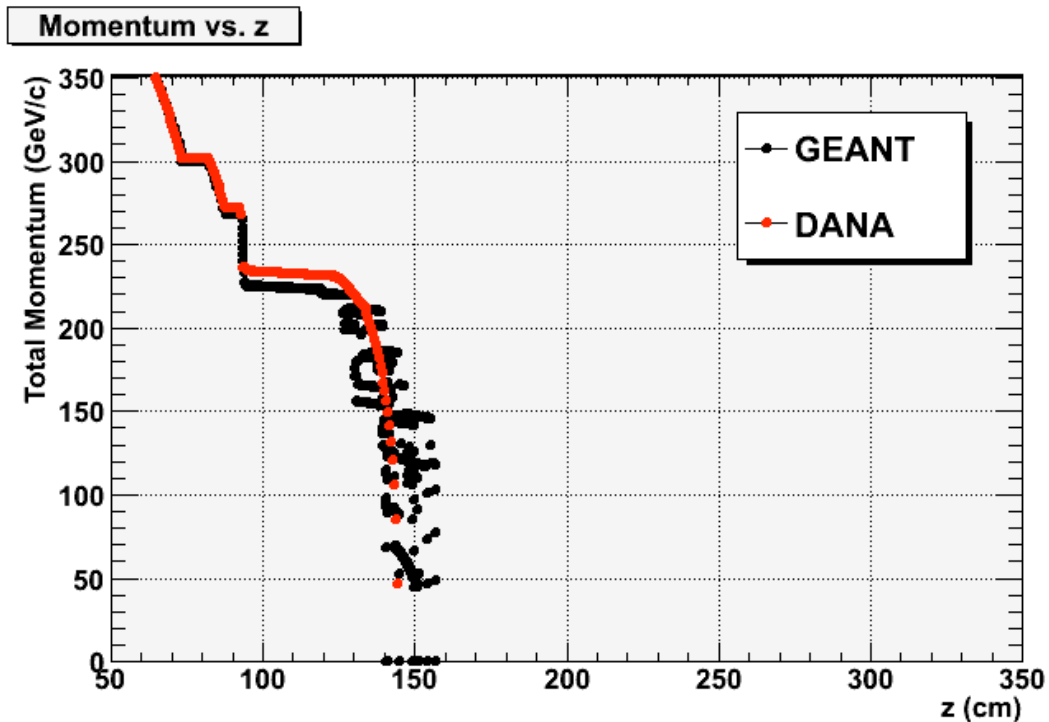
Here is a comparison of the momentum loss of a 350 MeV/c proton as calculated by GEANT and by the Hall-D reconstruction code. For GEANT, 10 tracks are plotted from varying ϕ angles. For DANA, only one angle is plotted since the material map is ϕ -symmetric.



$\theta = 5^\circ$
 $\theta = 10^\circ$
 $\theta = 15^\circ$
 $\theta = 20^\circ$
 $\theta = 25^\circ$

Energy loss compared to GEANT

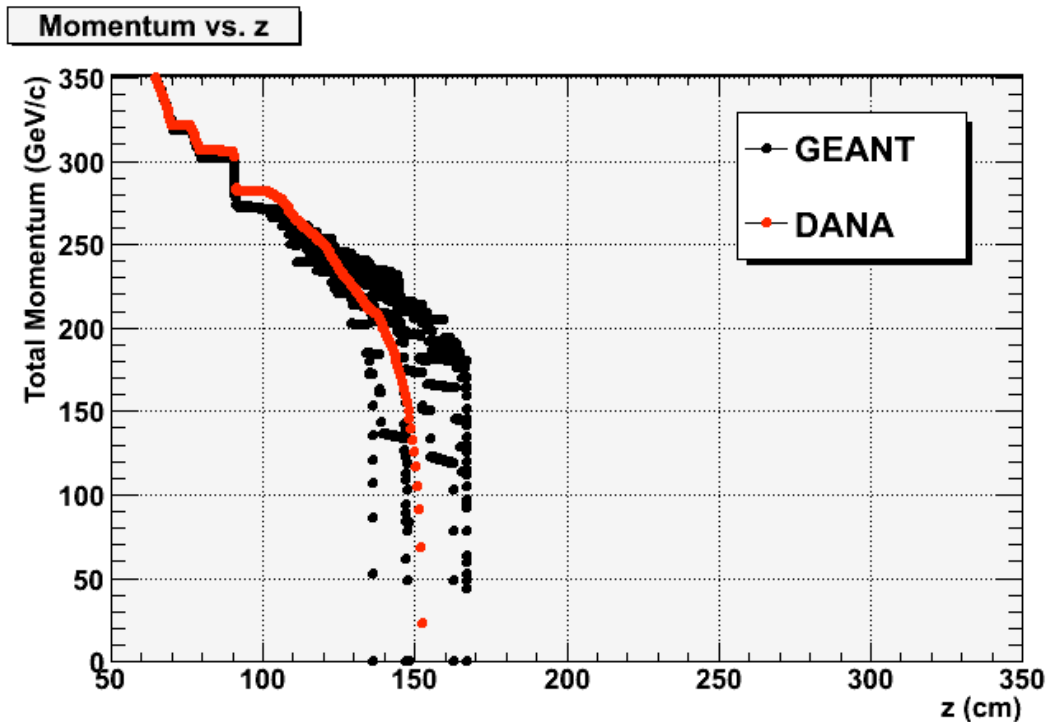
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Energy loss compared to GEANT

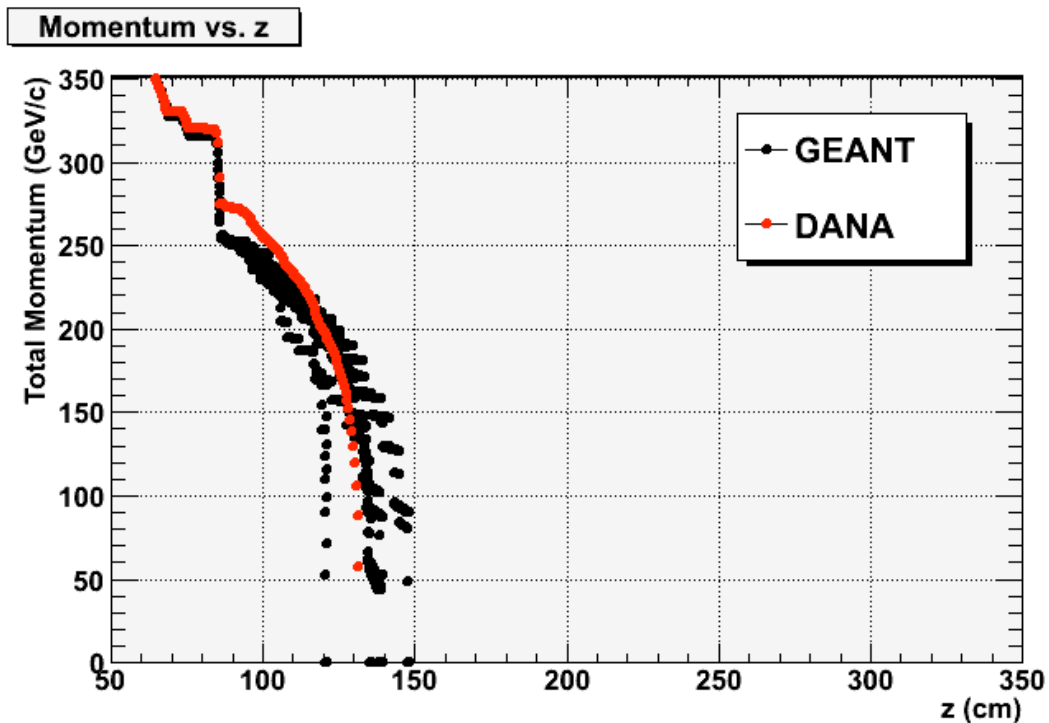
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Energy loss compared to GEANT

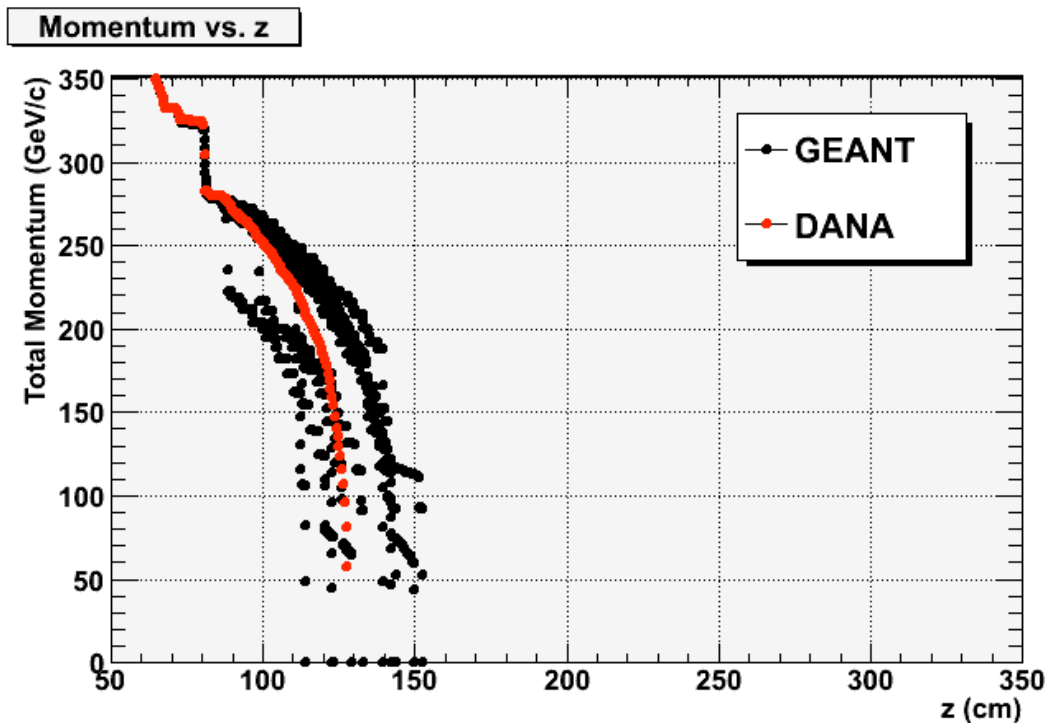
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Energy loss compared to GEANT

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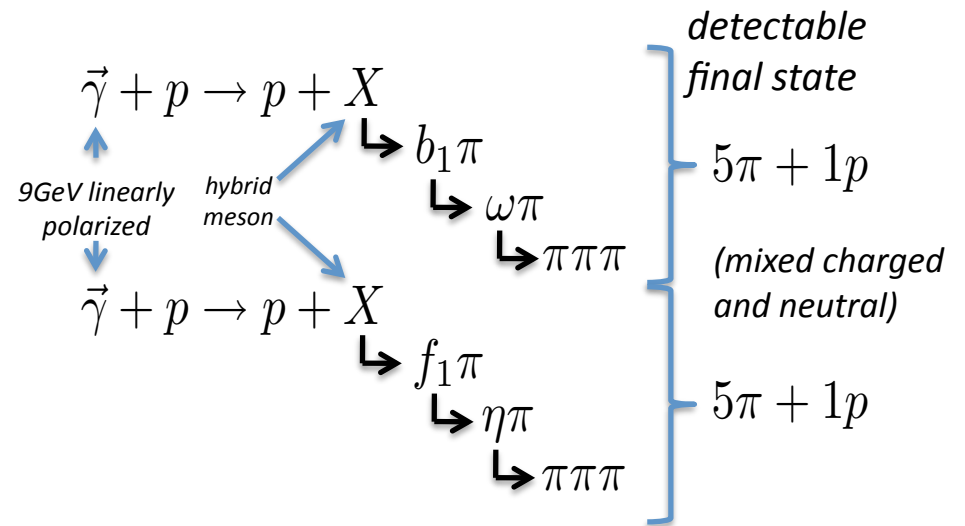


$\theta = 5^\circ$
 $\theta = 10^\circ$
 $\theta = 15^\circ$
 $\theta = 20^\circ$
 $\theta = 25^\circ$

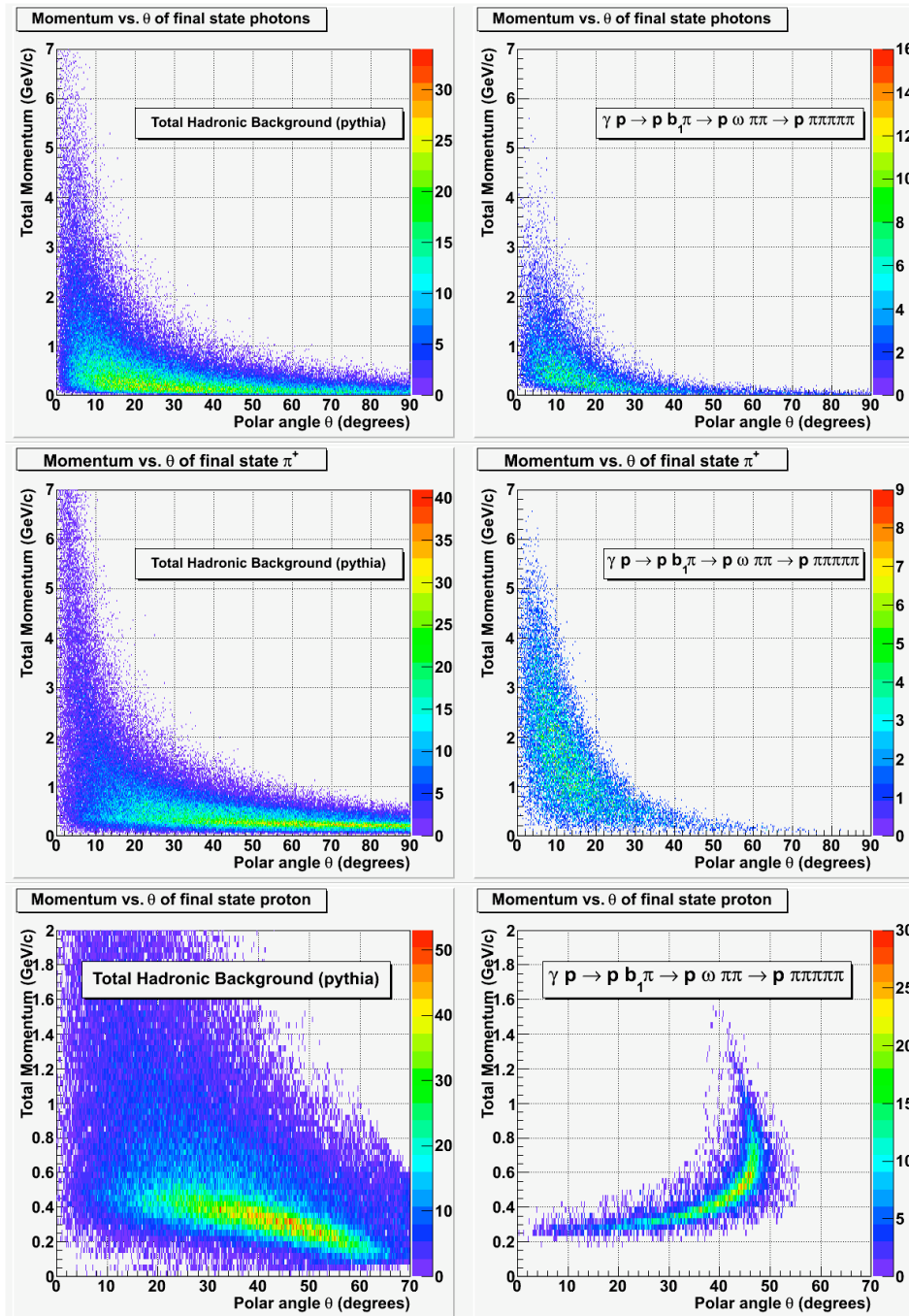
The GlueX Experiment

Goal: map the spectrum of exotic hybrid mesons

Method: Photo-produce hybrids off proton target and identify the quantum states using Partial Wave Analysis of decay product distributions



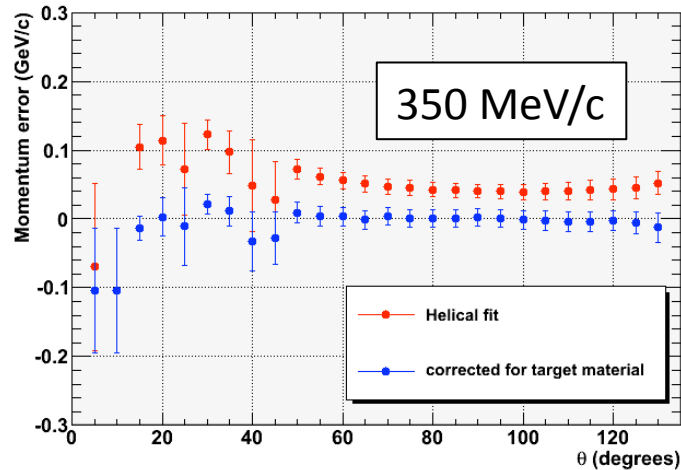
See Matt Shepherd's and Jo Dudek's talks Saturday @ 16:30 "QCD, Hadron Spectroscopy and Exotics" session



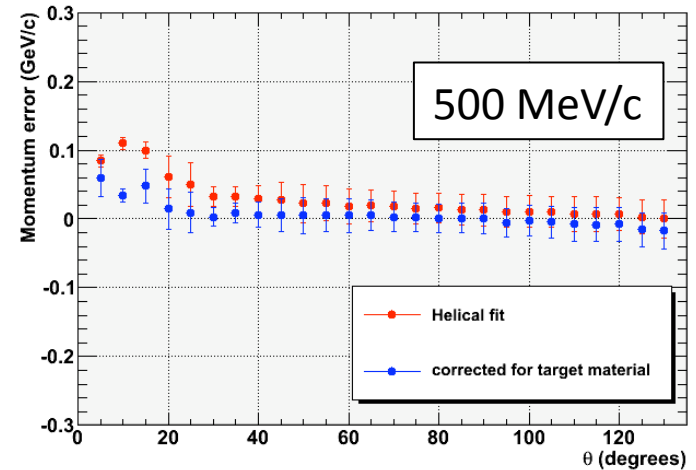
proton

Momentum loss in target/start-counter

Momentum error for 350MeV/c protons

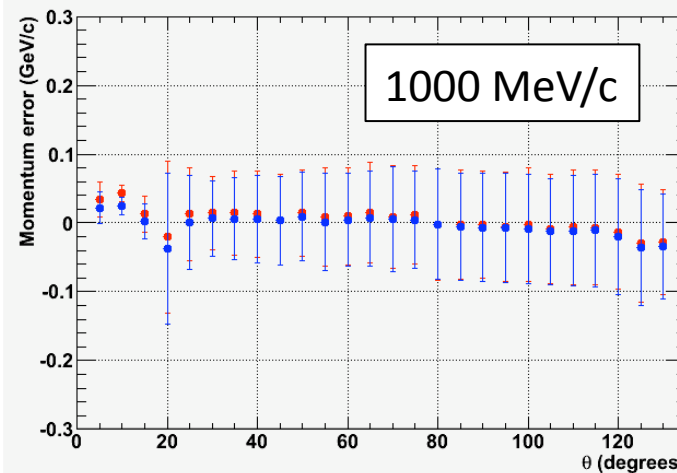


Momentum error for 500MeV/c protons



Candidate parameters from helical fit are poorly defined for low momentum particles.

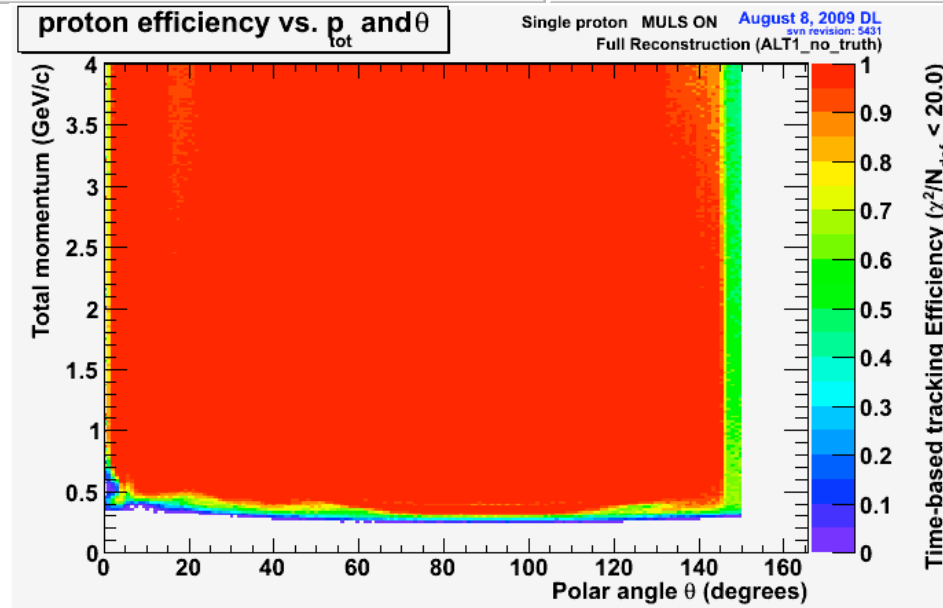
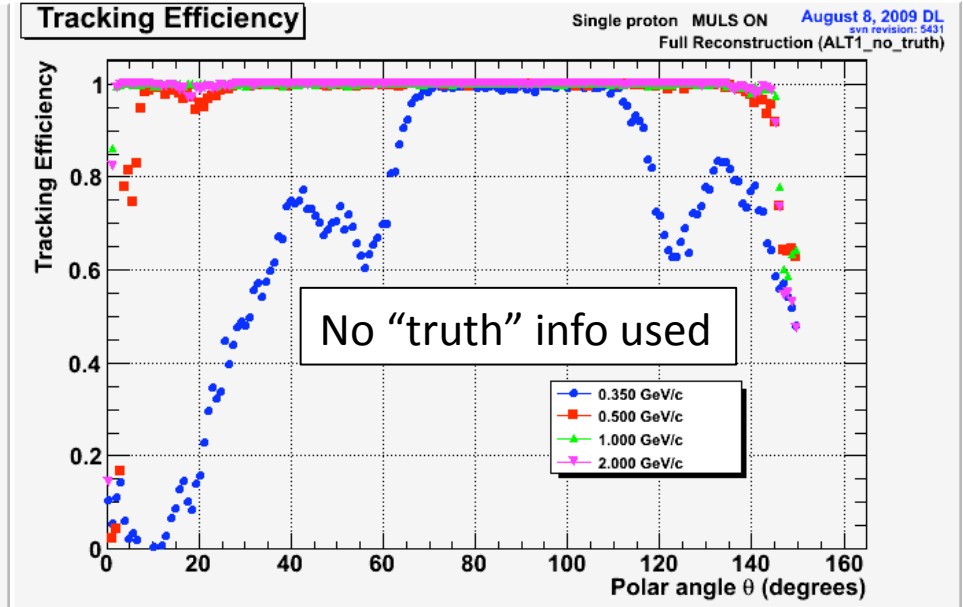
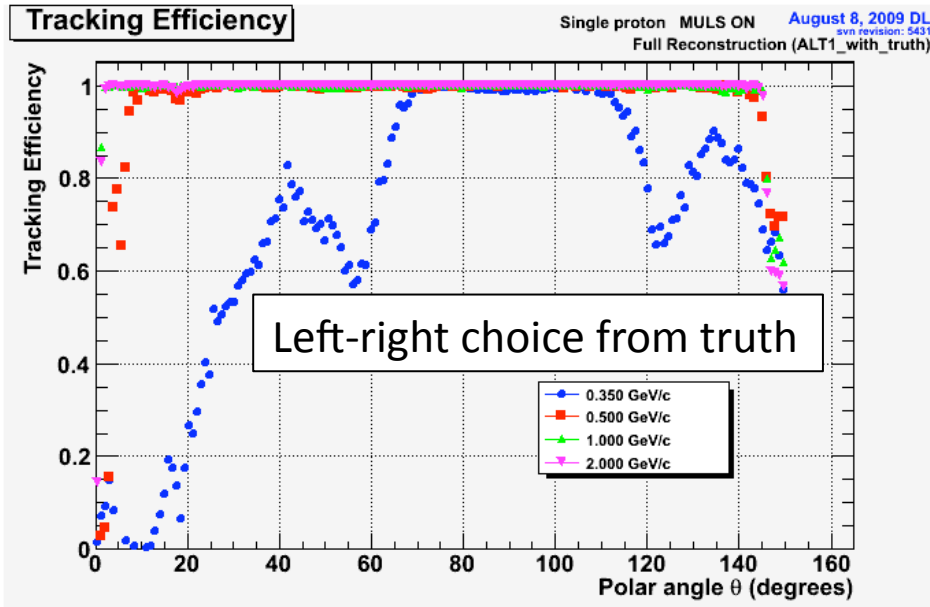
Momentum error for 1GeV/c protons



Tracks are swum out from target with no e-loss and then back in with e-gain to correct parameters at target before starting wire-based fitting pass.

proton

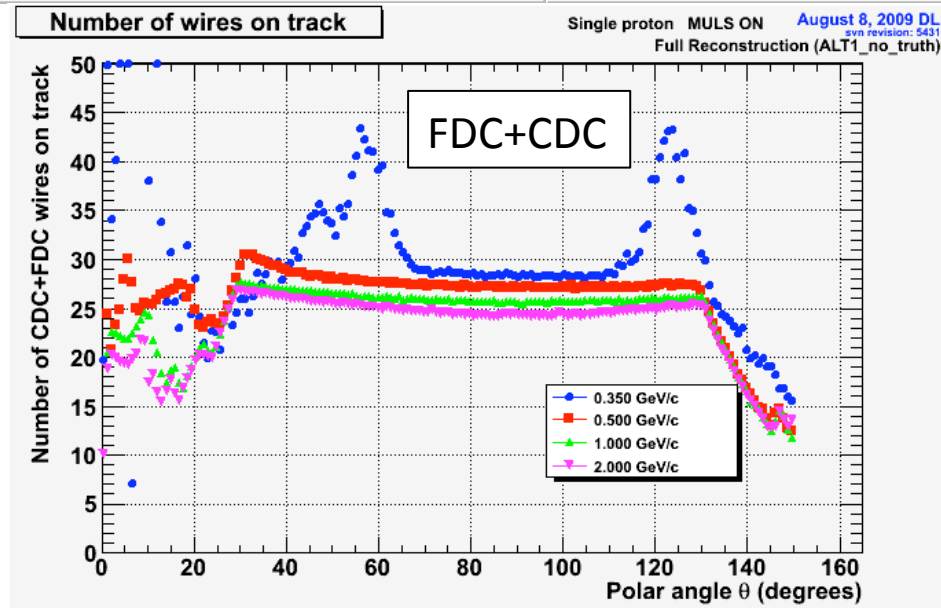
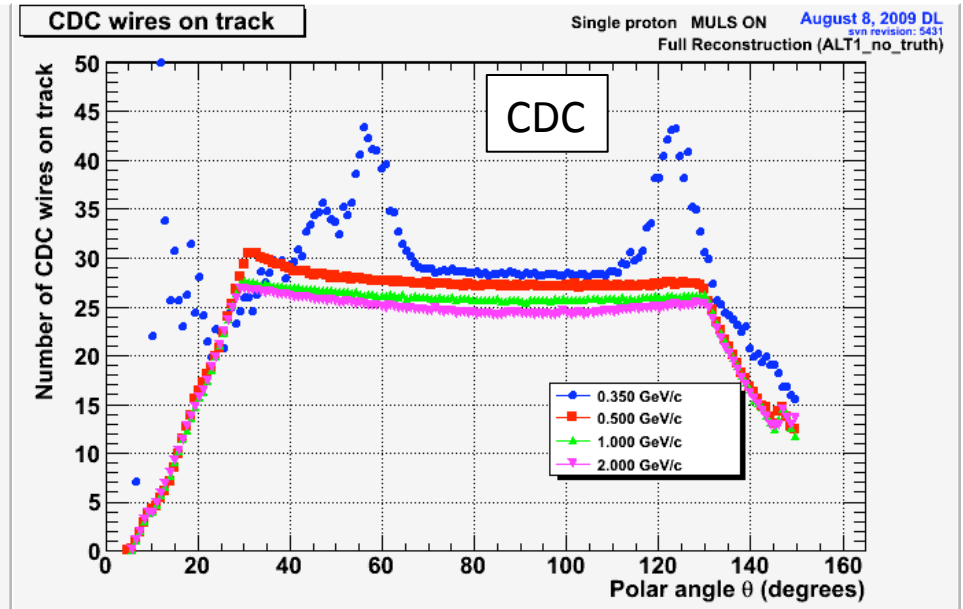
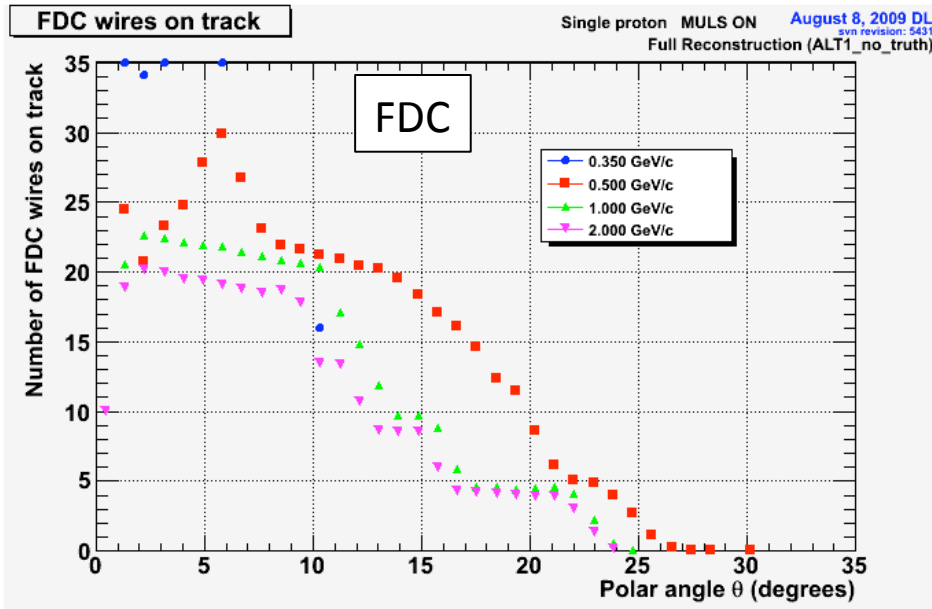
Proton tracking efficiency



Tracking efficiency
based on chi-sq/
Ndof cut of 20

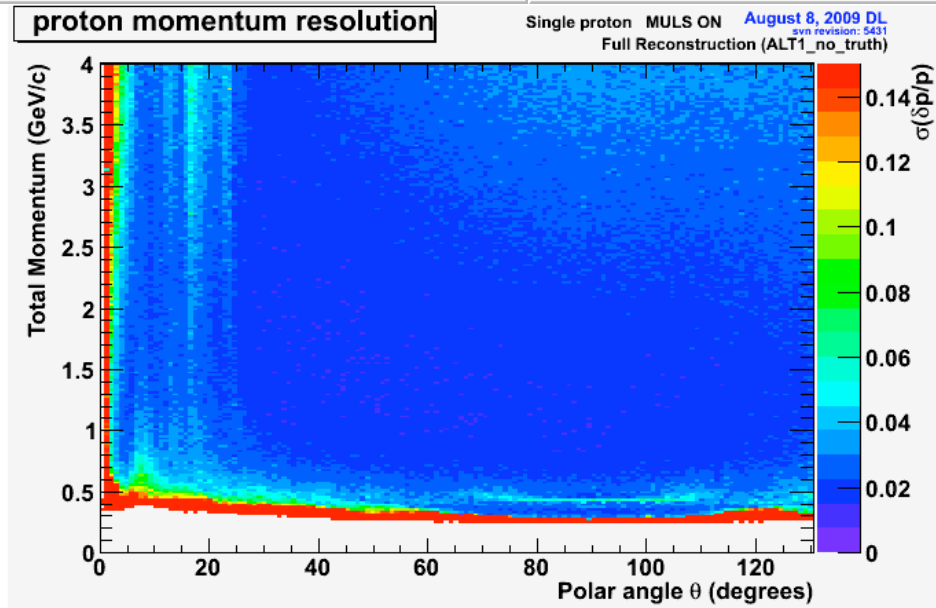
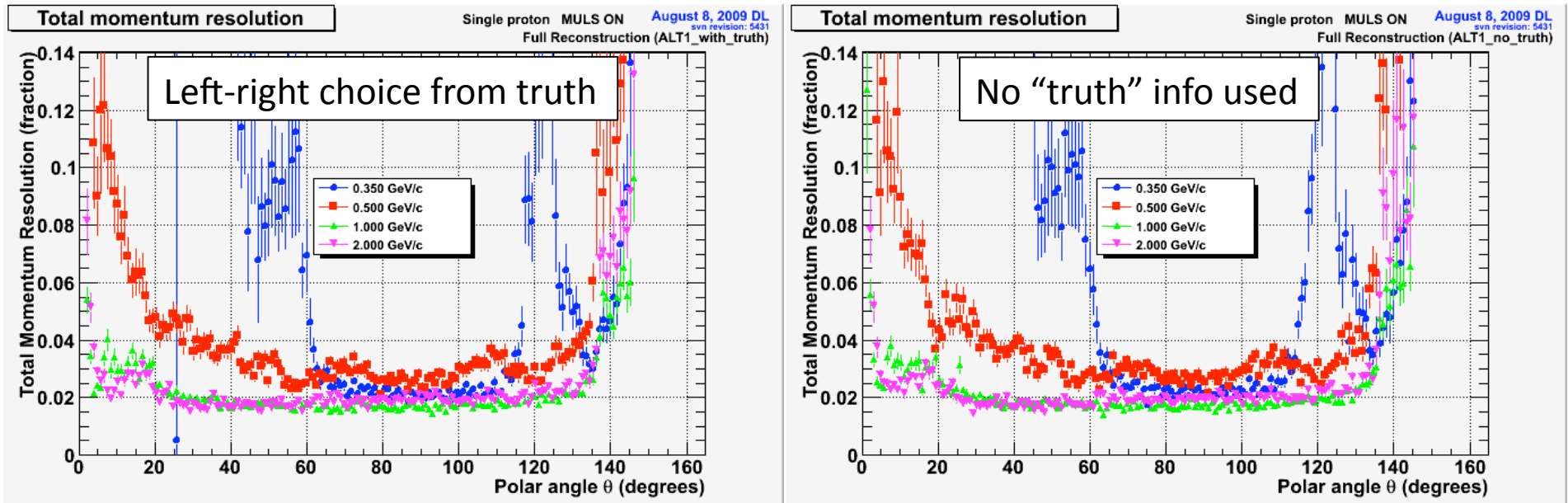
proton

Number of wires per track



proton

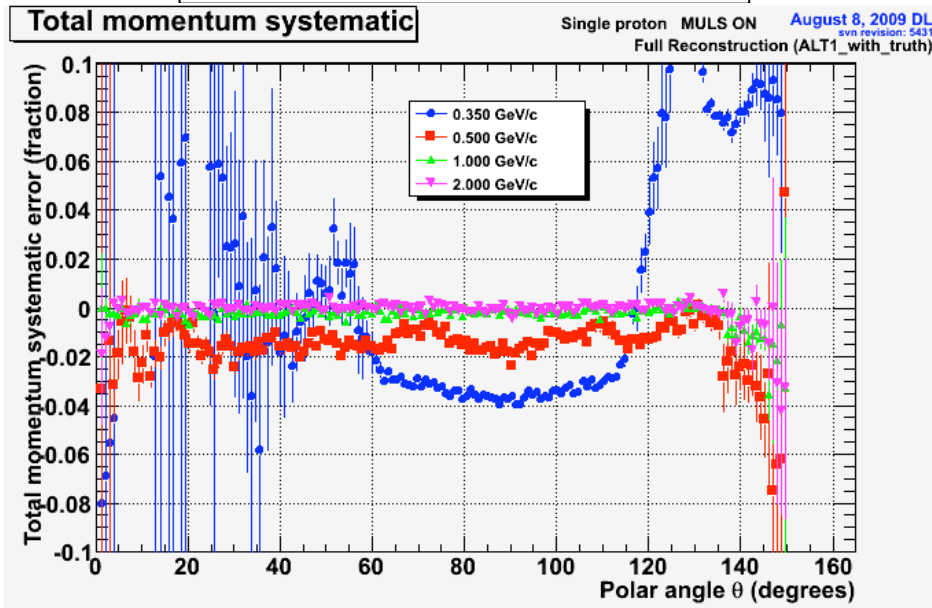
Total Momentum Resolution



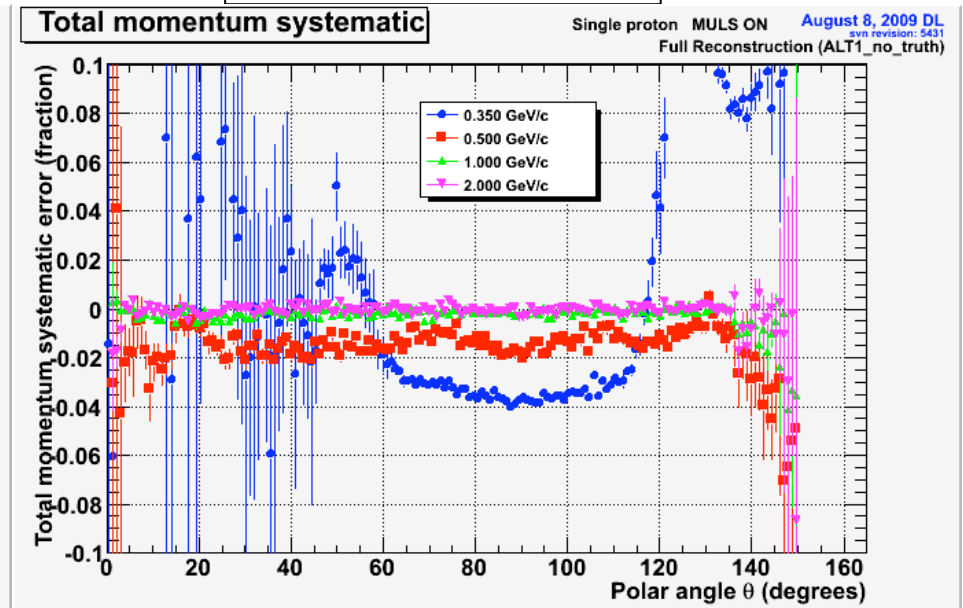
proton

Systematic Error on Total Momentum

Left-right choice from truth

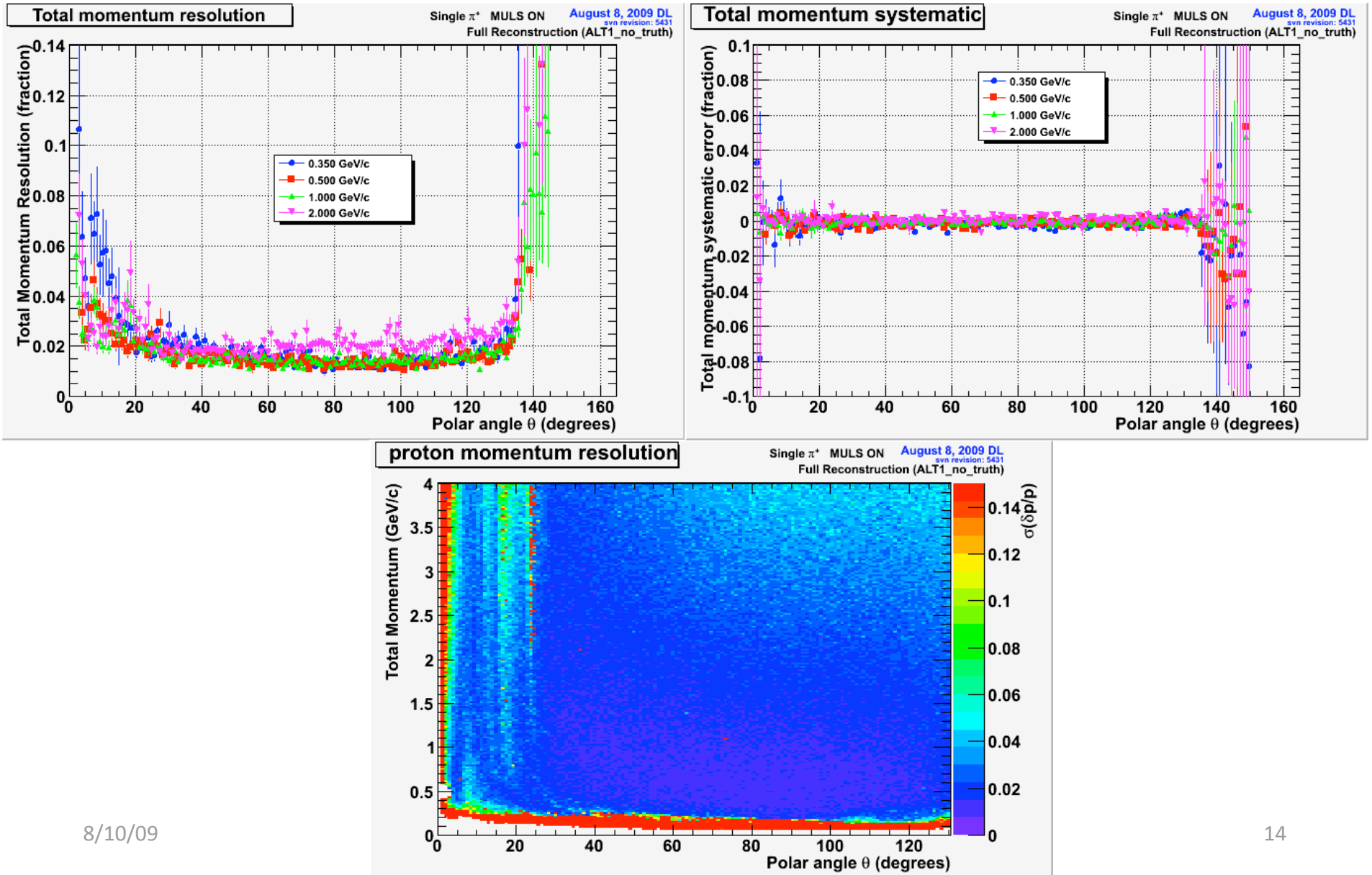


No "truth" info used



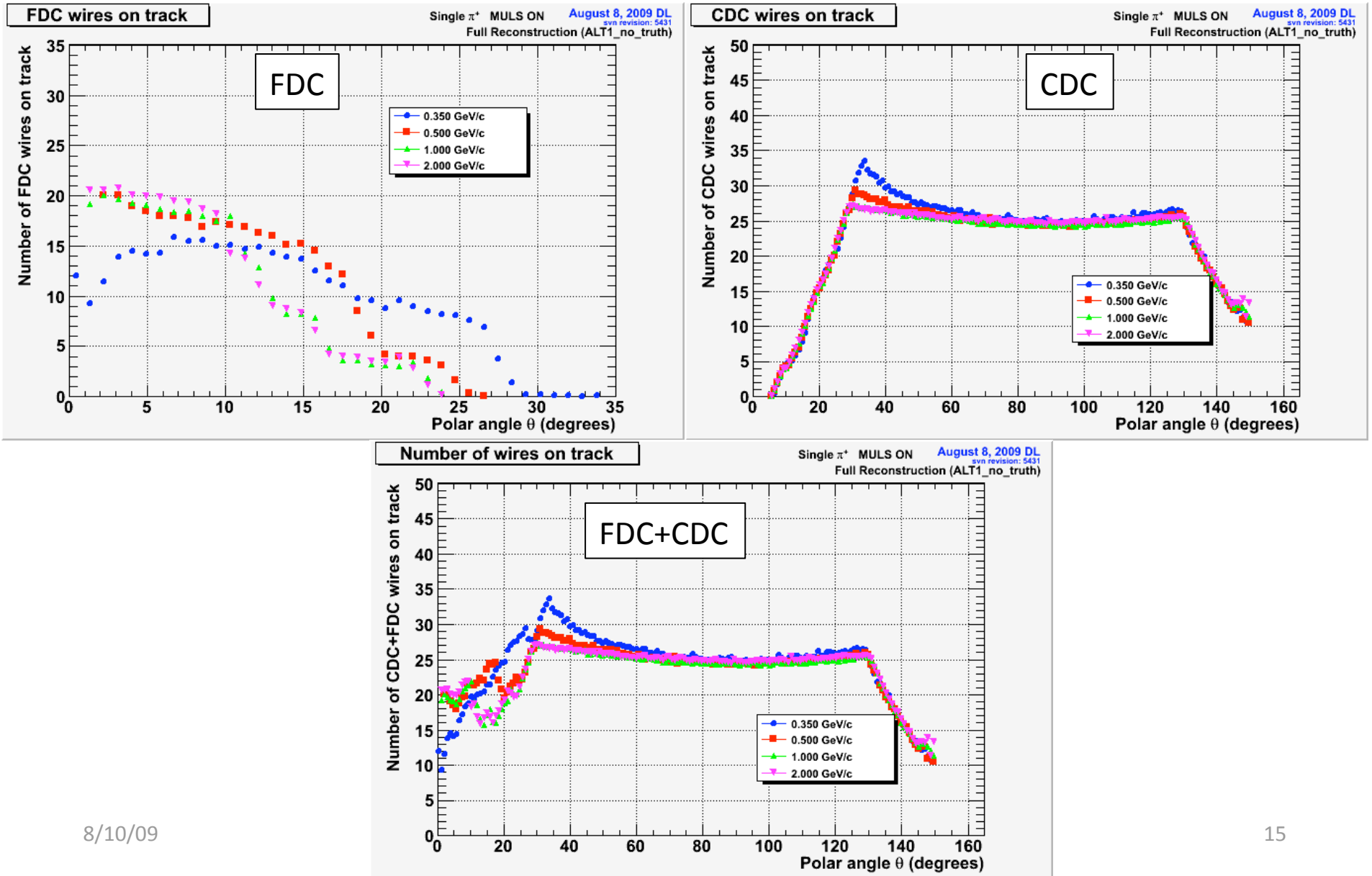
π^+

Pi plus total momentum resolution

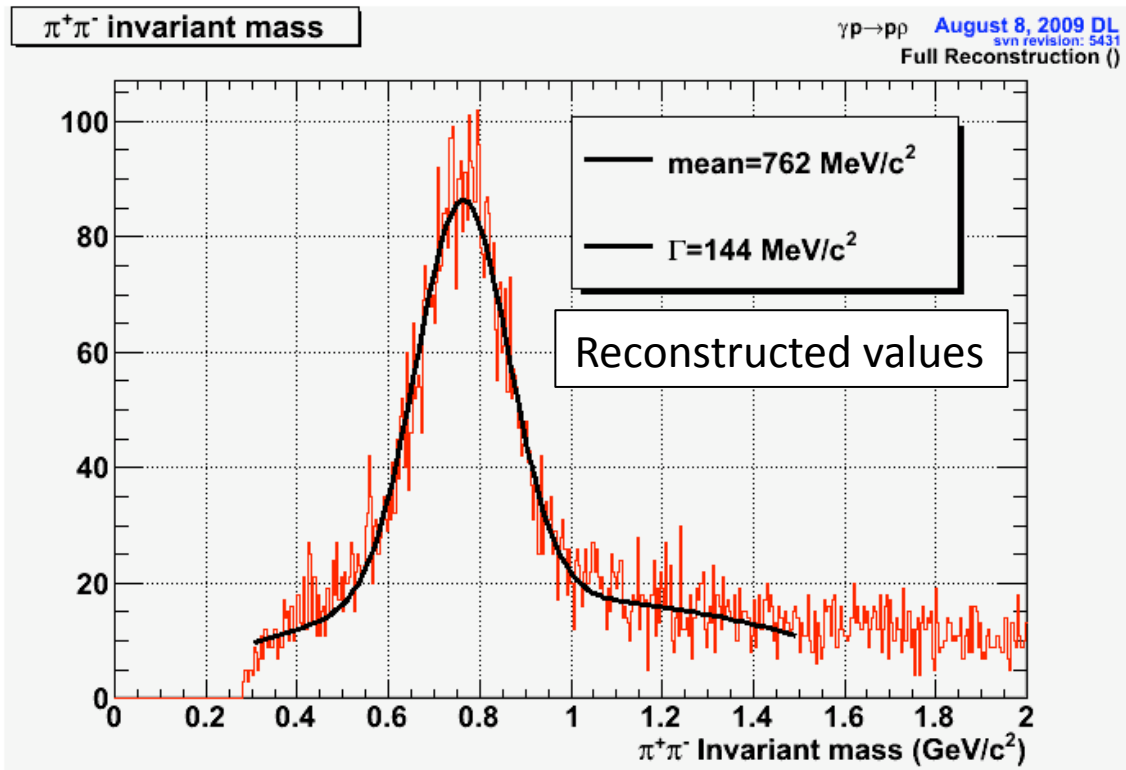


π^+

Number of wires per track

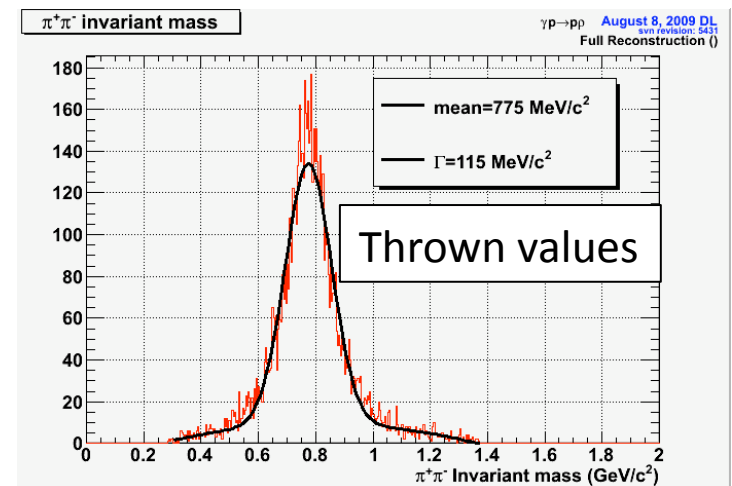


Single ρ production



Signal represents about 4.4k of the 10k events thrown without acceptance cut.

Input width is supposed to be 150MeV. Mass width from combining thrown values is 115MeV/c²



... next...

- Compare to Kalman (after issues are ironed out)
- Map resolution and efficiency for π^- and Kaons
- Replace resolution/efficiency maps used by *hdparsim*
- Study ρ channel in more detail (particularly acceptance)
- Document in new tracking note

- The following 3 slides show typical events (not “typical” ones)
- The lines are the reconstructed tracks.
- All tracks were fit assuming pion mass (even the protons)

Source: hdgeant_rho_smeared.hddm

View Controls

ZOOM

Transverse Coordinates
 x/y
 r/phi

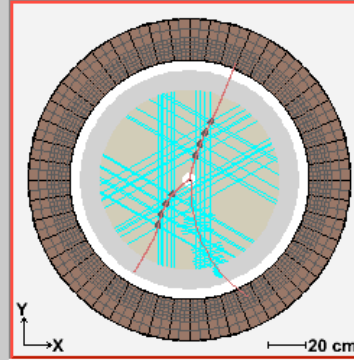
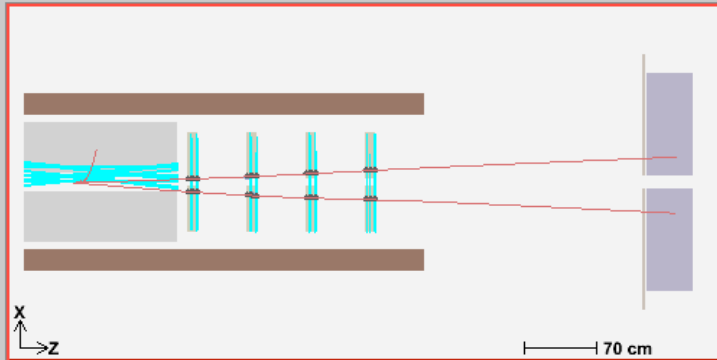
Event Controls

continuous
 delay: 0.25

Info

Run: -----
Event: 2

Inspectors

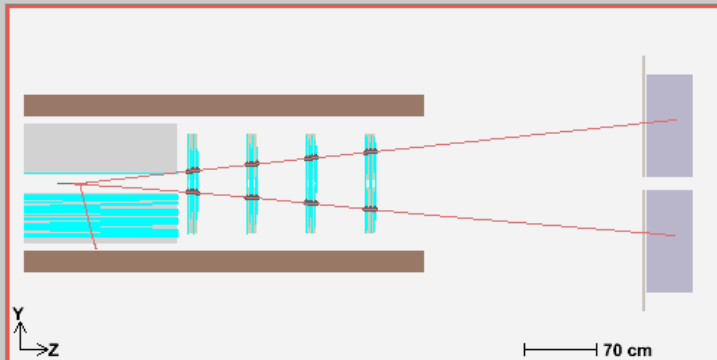


Track Draw Options

DTrackCandidate: <default>
 DTrack: <default>
 DParticle: <default>
 DMCThrown
 DMCTrajectoryPoint

Hit Draw Options

CDC
 CDC Drift Time
 CDCTruth
 FDC Wire
 FDC Pseudo
 FDC Intersection
 FDCTruth
 TOF
 TOFTruth
 FCAL
 FCALTruth
 BCAL
 BCALTruth



Track Info

Thrown

trk:	type:	p:	theta:	phi:	z:
1	pi-	6.576	6.609	1.353	65
2	pi+	2.199	6.062	3.699	65
3	proton	0.6781	65.48	4.766	65
---	---	---	---	---	---
---	---	---	---	---	---
---	---	---	---	---	---

Reconstructed

trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:	DParticle:
1	pi-	6.928	6.633	1.344	65.12	5.238	38	<default>
2	pi+	2.246	6.08	3.705	65.39	7.035	37	<default>
3	pi+	0.3919	77.79	4.614	71.81	108.6	22	<default>
---	---	---	---	---	---	---	---	<default>
---	---	---	---	---	---	---	---	<default>
---	---	---	---	---	---	---	---	<default>

Source: hdgeant_rho_smeared.hddm

View Controls

-X X+ ZOOM - + Transverse Coordinates
 -Y Y+ x/y
 -Z Z+ r/phi
 Reset

Event Controls

continuous
 << Prev Next >> delay: 0.25

Info

Run: -----
 Event: 3

Inspectors

Track Inspector
 TOF Inspector
 BCAL Inspector
 FCAL Inspector

Quit

70 cm

20 cm

Track Draw Options

DTrackCandidate: <default>
 DTrack: <default>
 DParticle: <default>
 DMCThrown
 DMCTrajectoryPoint

70 cm

30 cm

Hit Draw Options

CDC
 CDC Drift Time
 CDCTruth
 FDC Wire
 FDC Pseudo
 FDC Intersection
 FDCTruth
 TOF
 TOFTruth
 FCAL
 FCALTruth
 BCAL
 BCALTruth

Track Info

Thrown						Reconstructed								
trk:	type:	p:	theta:	phi:	z:	trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:	DParticle:
1	pi-	5.118	3.48	1.998	65	1	pi-	5.361	3.464	2.002	65.32	4.479	35	
2	pi+	3.876	4.818	4.993	65	2	pi+	3.83	4.847	4.982	65.09	5.55	33	
3	proton	1.0570E	59.1	0.6618	65									
--						--								
--						--								
--						--								

Source: hdgeant_rho_smeared.hddm

View Controls

ZOOM Transverse Coordinates
 x/y r/phi

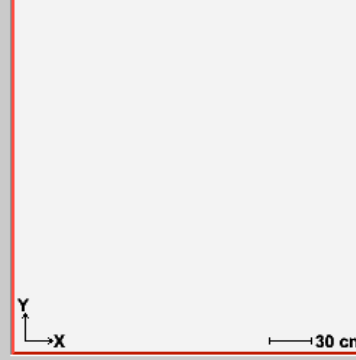
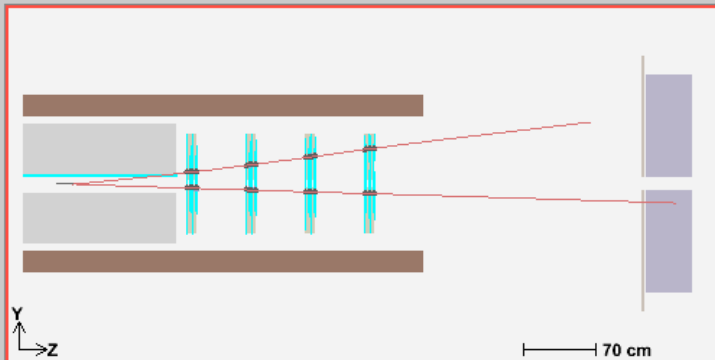
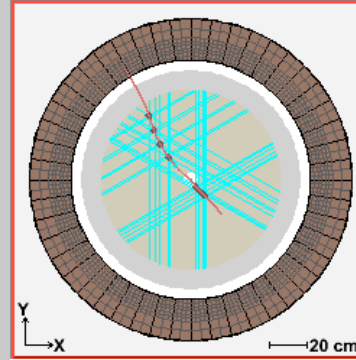
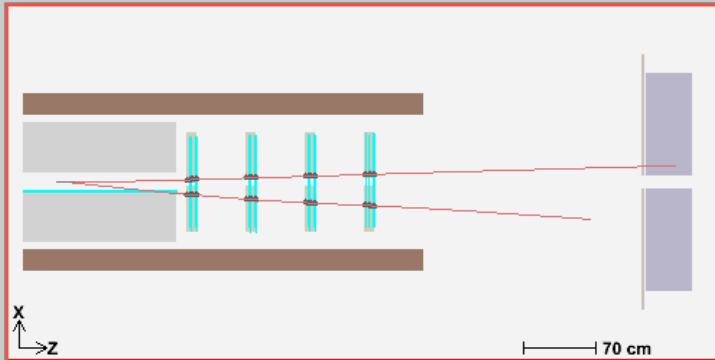
Event Controls

continuous
 delay:

Info

Run: -----
Event: 4

Inspectors



Track Draw Options

DTrackCandidate: <default>
 DTrack: <default>
 DParticle: <default>
 DMCThrown
 DMCTrajectoryPoint

Hit Draw Options

CDC
 CDC Drift Time
 CDCTruth
 FDC Wire
 FDC Pseudo
 FDC Intersection
 FDCTruth
 TOF
 TOFTruth
 FCAL
 FCALTruth
 BCAL
 BCALTruth

Track Info

Thrown

trk:	type:	p:	theta:	phi:	z:
1	pi-	2.859	8.168	2.483	65
2	pi+	6.116	2.389	5.272	65
3	proton	0.198	72.36	6.111	65
--	-----	-----	-----	-----	-----
--	-----	-----	-----	-----	-----
--	-----	-----	-----	-----	-----

Reconstructed

trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:
1	pi-	2.836	8.264	2.476	65.37	0.6276	37
2	pi+	6.522	2.447	5.285	67.6	6.649	39
--	-----	-----	-----	-----	-----	-----	-----
--	-----	-----	-----	-----	-----	-----	-----
--	-----	-----	-----	-----	-----	-----	-----

DParticle: