

Reconstruction of simulated and experimental data in the Drift Chambers of the BM@N experiment

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Drift Chambers Reconstruction Chain



Some selected residuals [Measurement – segmentFit]

C beam, empty target, B = 1200A



MC and data residuals are in agreement for all coordinates

Angle values and resolution

C beam, empty target, B = 1200A



Coordinates values and beam width



Difference in slopes between DC1 & DC2

C beam, empty target, B = 1200A



MC slope difference distributions are adequate to SRC data

Difference in coordinates for matching DC1 with DC2



Smearing for MC coordinates is adequate to SRC data

C Beam momentum resolution estimation

C Beam, empty target, B = 1200A



Reconstruction Efficiency vs. MC hit probability

ION generator (single particle in event)

	dc1, %	dc2, %	dcGlobal, %
100% hit on layer probability	100	100	100
92% hit on layer probability	86.32	86.37	69.18



$^{12}C + p \rightarrow 2p + ^{10}B / ^{10}Be + (n / p)$

Dubna Cascade Model (DCM-QGSM)

Layer hit reconstruction probability	Particle type	dc1, %	dc2, %	dcGlobal, %
100% hit on layer probability	lons(¹² C, ¹⁰ B, ¹⁰ Be)	95.6	96.6	91.5
	p , e, π⁺, π⁻	96.1	98.3	91.3
92% hit on layer probability	lons(¹² C, ¹⁰ B, ¹⁰ Be)	81.7	82.9	67.7
	p , e, π⁺, π⁻	81.9	84.7	65.3

Feature. The probability that there is a detector response on layer corresponding to a particular MC point can be adjusted.

Implementation into bmnroot

🦊 GitLab Projects Groups Snip	opets Help
bmnroot	NICA > mnroot > Commits
✿ Project overview	dev v bmnroot / dch
Repository	23 Oct, 2020 4 commits
Files	Update BmnDchHitProducer.cxx Nikolay Voytishin authored 2 weeks ago
Commits	
Branches	BmnDchTrackFinder.cxx adjusted for reconstruction of MC and experimental data Nikolay Voytishin authored 2 weeks ago
Tags	BmnDchTrackFinder.h adjusted for reconstruction of MC and experimental data
Contributors	Nikolay Voytishin authored 2 weeks ago
Graph	BmnDchHitProducer.cxx adjusted MC hit reconstruction
Compare	Nikolay Voytishin authored 2 weeks ago
	22 Oct, 2020 1 commit
D Issues 29	adjusting simulation for DCH
11 Merge Requests 0	Nikolay Voytishin authored 2 weeks ago

Unified DCH tracking for SRC/BM@N/MC/EXP was implemented into bmnroot.

Conclusions

- Realistic response of DCH added in simulation procedure
- Residuals and segment parameters are in agreement between MC and data
- The differences for matching between two DCH chambers in slopes and coordinates are quite similar for MC and data
- Tracking unified for SRC/BM@N/MC/EXP
- The full reconstruction chain for Dift Chambers is available in *bmnroot* package.
- Detailed investigation of reconstruction efficiency and resolution adjustments is ongoing.



backup

Ar beam e.m. contaminated MC data vs. Ar data

Ar beam, empty target, B = 1250A

DCH1 reconstructed segments local coordinates



Remark. Cut on beam region applied in order for reconstruction to work properly

Difference in slopes for DC1 & DC2



MC slope difference distributions are adequate to Ar data

Difference in coordinates for matching DC1 with DC2



Smearing for MC coordinates is adequate to Ar data

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Drift Chambers coordinate reconstruction on a layer



Drift Chambers Reconstruction & Performance





$$X = rac{V-U}{\sqrt{2}};$$

 $X = rac{V+U}{\sqrt{2}};$

- 4 double coordinate planes;
- wire angles 0°,90°,±45°;
- wire pitch 10 mm;
- Yout ± 1.35 m, Xout ± 1.35 m
- $R_hole = 10 \text{ cm};$
- 2048 wires per chamber.

MCHit -> smeared SimHit



2 RecHits are obtained from the smeared SimHit