

T517 Results on NEM Calorimeter

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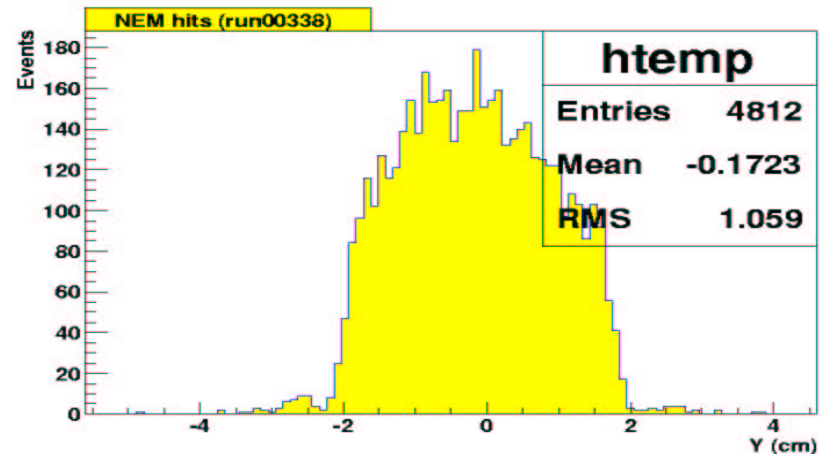
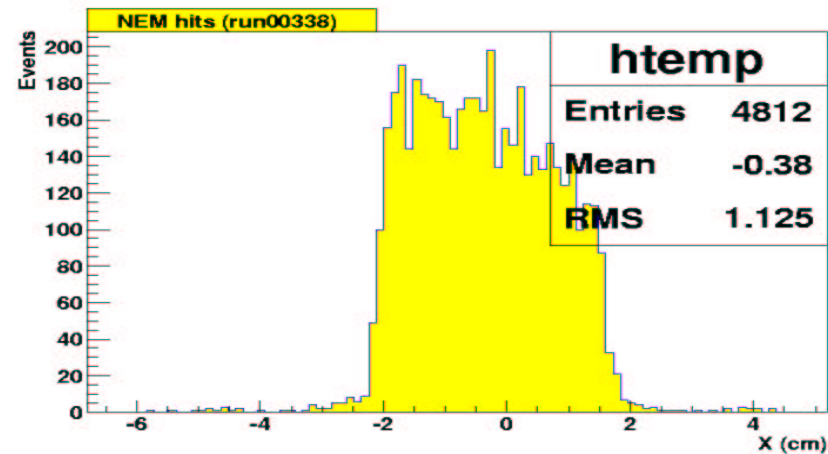
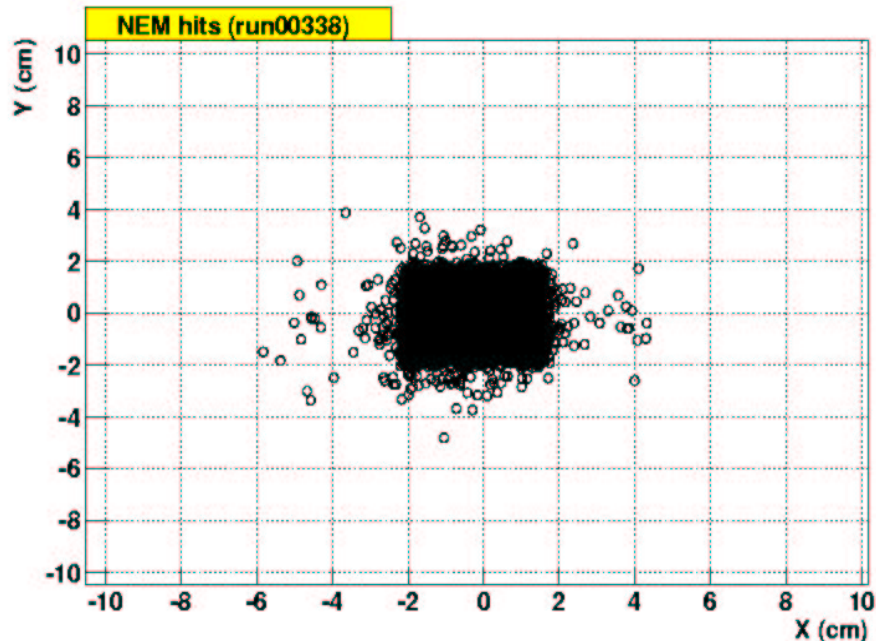
JLC CAL Meeting @ 信州大学
Dec. 18, 2002

Outline

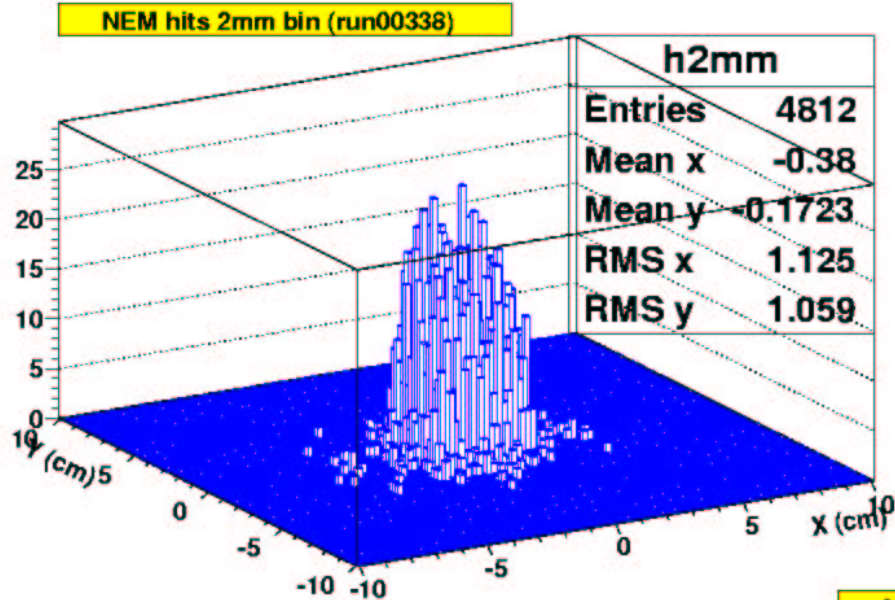
1. Drift chamber (DC) analysis
 - Track fitting, DC correlation, DC resolution, NEM hit distribution
2. NEM ADC re-calibration with DC data
3. Response Linearity and Energy Resolution
4. Tile Uniformity
5. Uniformity Near the WLS Fiber
6. Future Plan

1. Drift Chamber Analysis: Track Fitting

- Correct TDC hit position by t_0 from the TDC calibration data at the directory `/home/beamtest/t517/data/tdcdc`
- Loop over all the wire hits with `TDCDC < 3500` and do a linear fit of each 4-hit (or 3-hit, if only 3 wires have hits) combination using ROOT's `TGraph::Fit("pol1")`. The best combination corresponds to the fit with the smallest χ^2 .



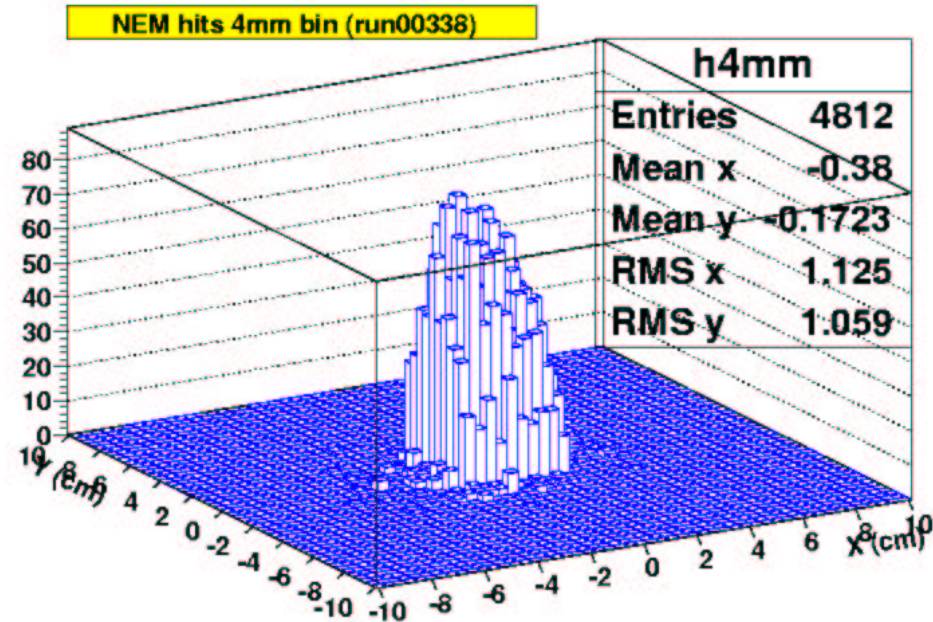
1. Drift Chamber Analysis: Track Fitting (2)



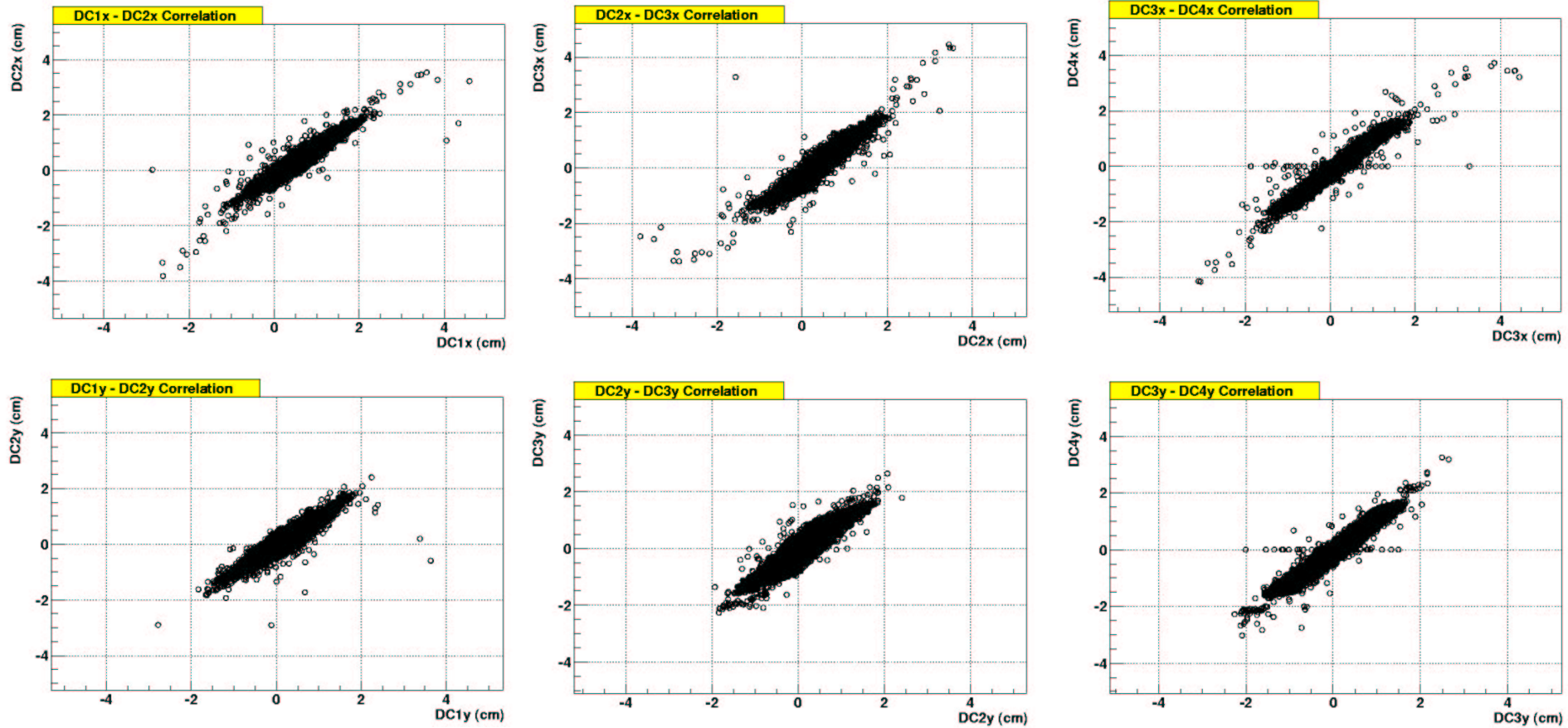
← 2mmx2mm binning

Note: low statistics per bin

4mmx4mm binning →



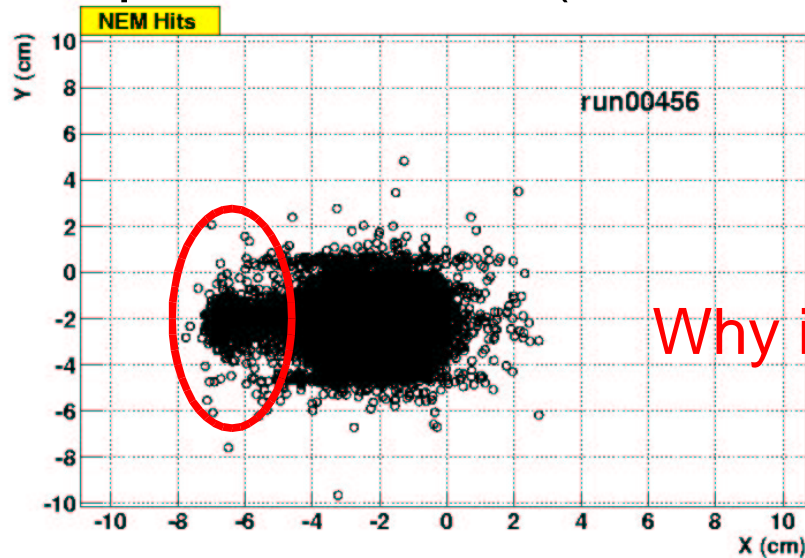
1. Drift Chamber Analysis: Position Correlation



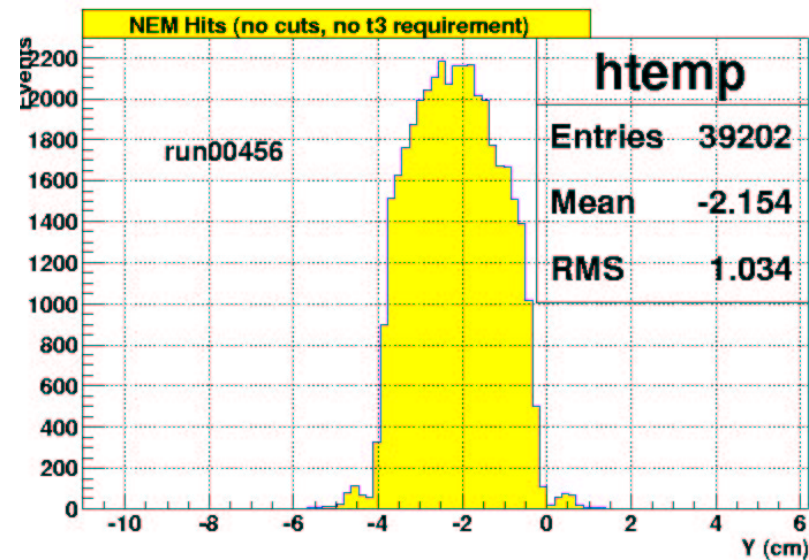
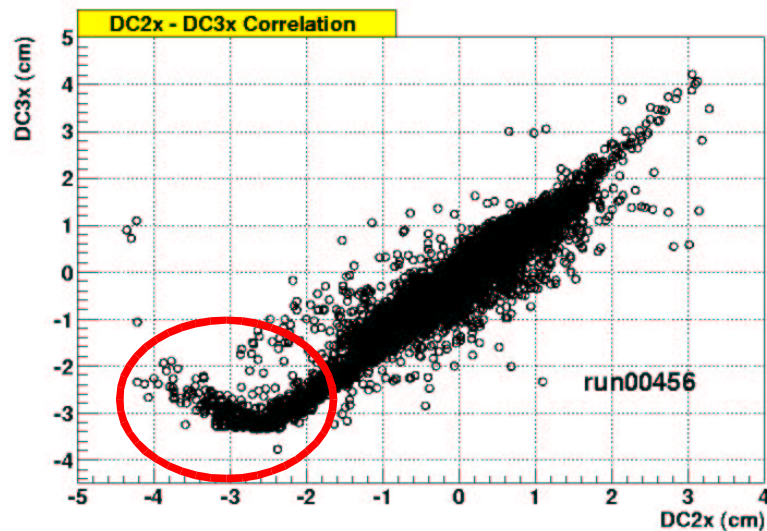
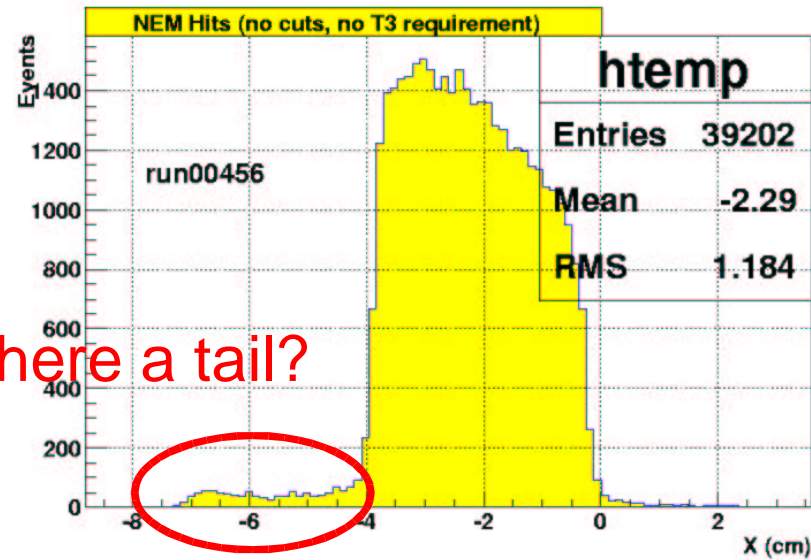
Sample distribution (run00338)

1. Drift Chamber Analysis: Position Correlation (2)

Sample distribution (run00456)



Why is there a tail?

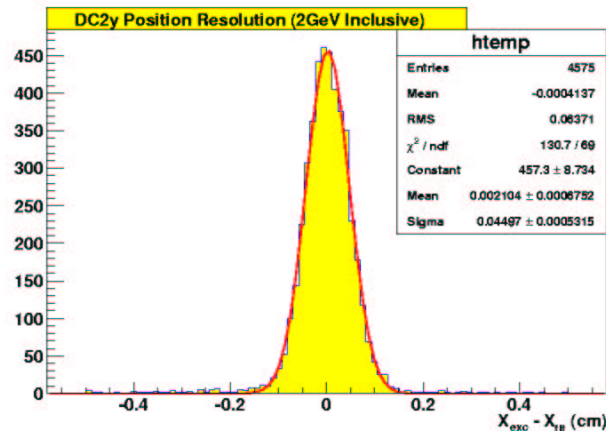


This DC correlation is present in runs 447 to 459 (and afterwards?)

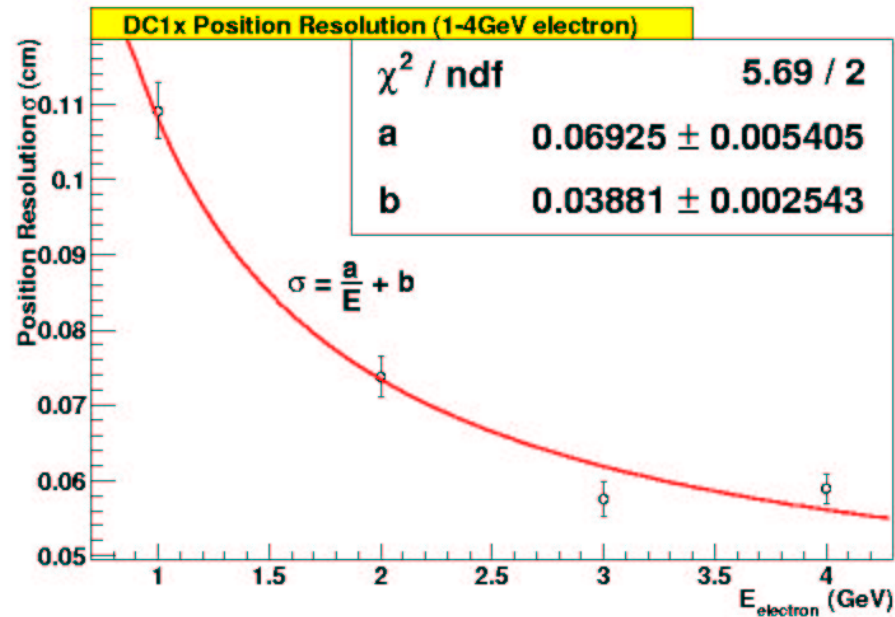
1. Drift Chamber Analysis: Position Resolution

- First get the best 4-hit fit, then get the distance of each wire's hit position from the linear fit of the other three hits. For the y-axis wires, only the first TDC hits are used.

DC wire $R_{\text{excluded}} - R_{\text{fit}}$ distributions: $\sigma \sim O(100\mu\text{m})$



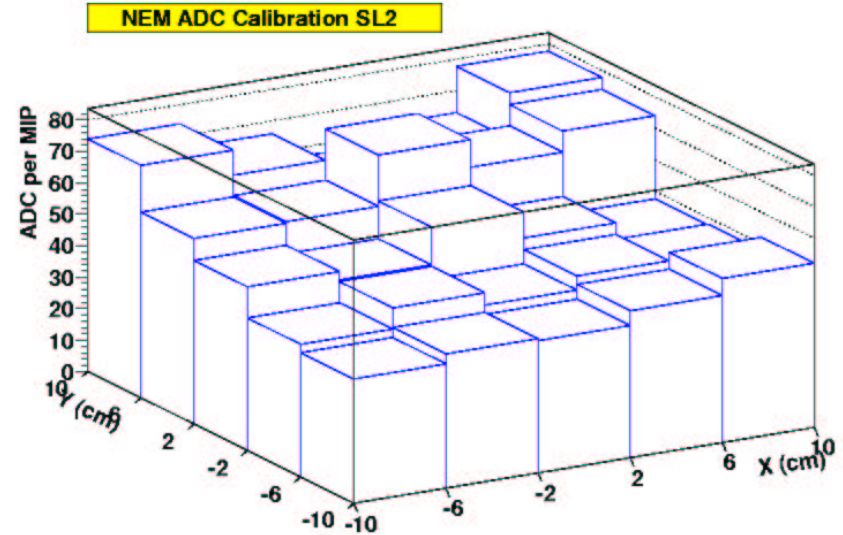
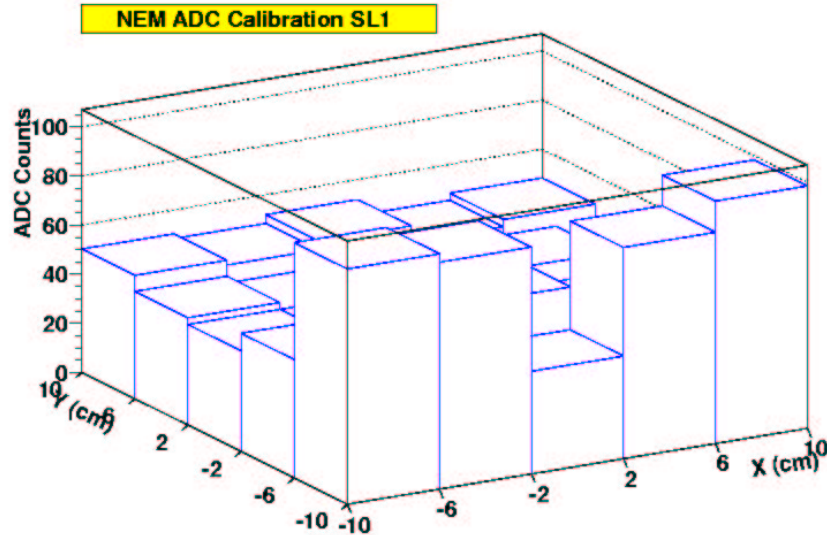
DC wire position resolution is
400~700 microns



DC1x Resolution vs. Electron Energy

2. NEM ADC Calibration

- After getting DC data, we can get the ADC calibration for each tile using the events where the beam hits the targeted tile (runs: 338-347, 349-364)



NEM ADC Calibration SL1

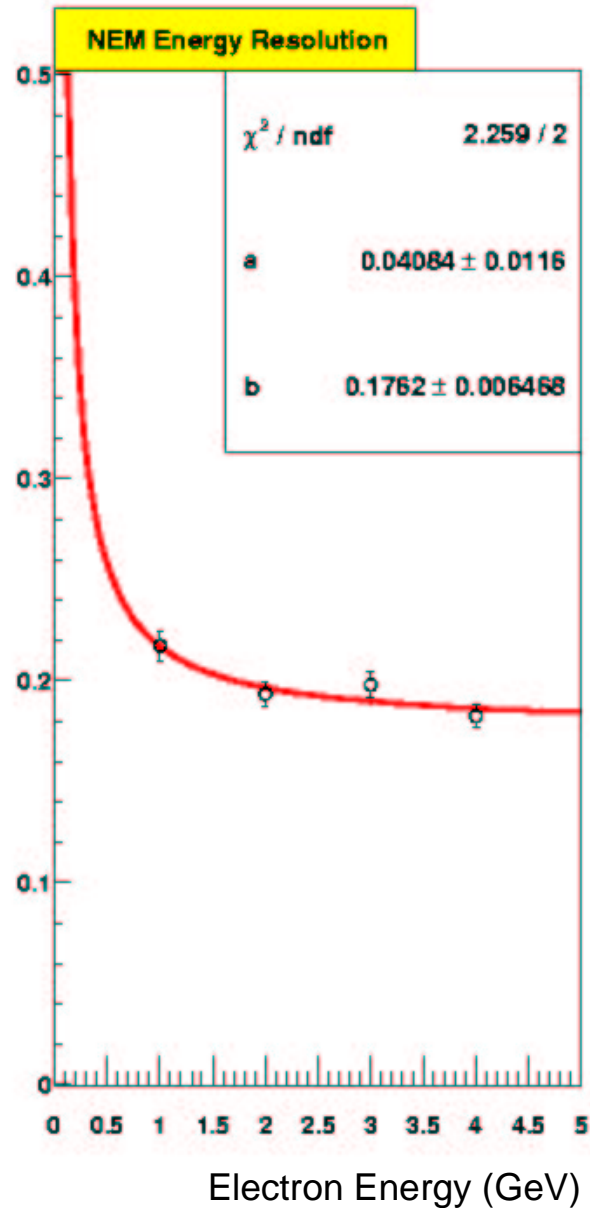
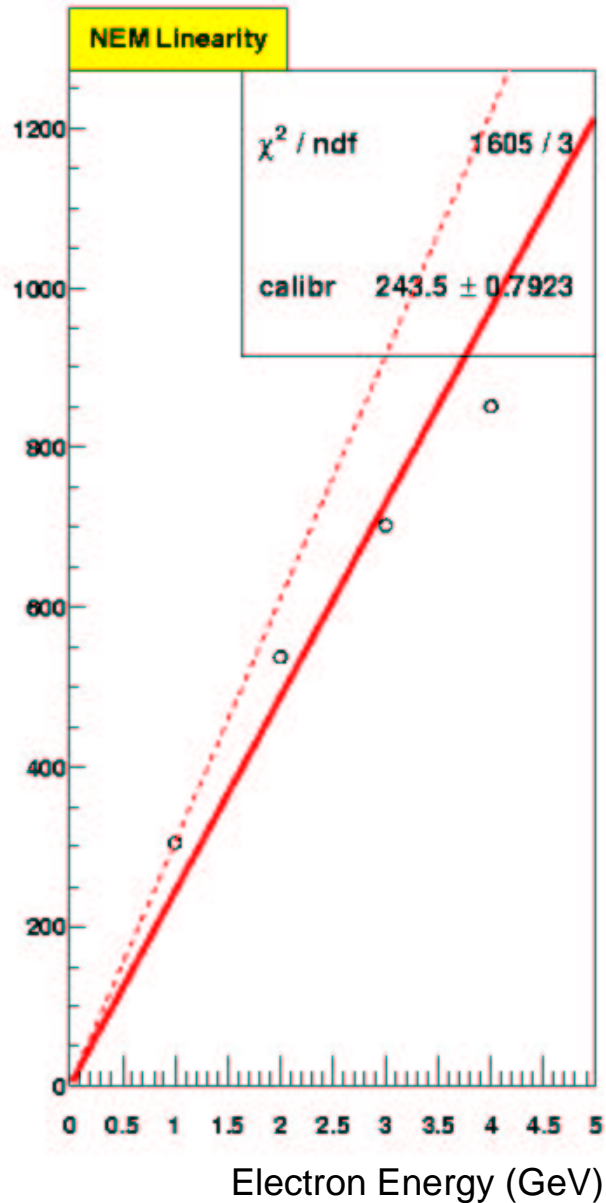
Y (cm)	10	50.21	48.34	51.84	45.4	48.3	
	6	43.67	41.01	40.19	39.03	35.86	
	2	41.01	29.63	40.38	56.2	50.89	
	-2	48.11	43.1	59.11	48.05	48.58	
	-6	95.66	92.26	41.69	85.89	98.48	
	-10						
		-10	-6	-2	2	6	10
							X (cm)

NEM ADC Calibration SL2

Y (cm)	10	73.98	66	57.28	63.04	77.76	
	6	59.07	59.53	75.91	67.19	73.89	
	2	52.04	49.34	61.35	53.07	47.5	
	-2	42.19	48.87	44.88	49.42	47.88	
	-6	39.49	42.69	41.95	46.74	52.1	
	-10						
		-10	-6	-2	2	6	10
							X (cm)

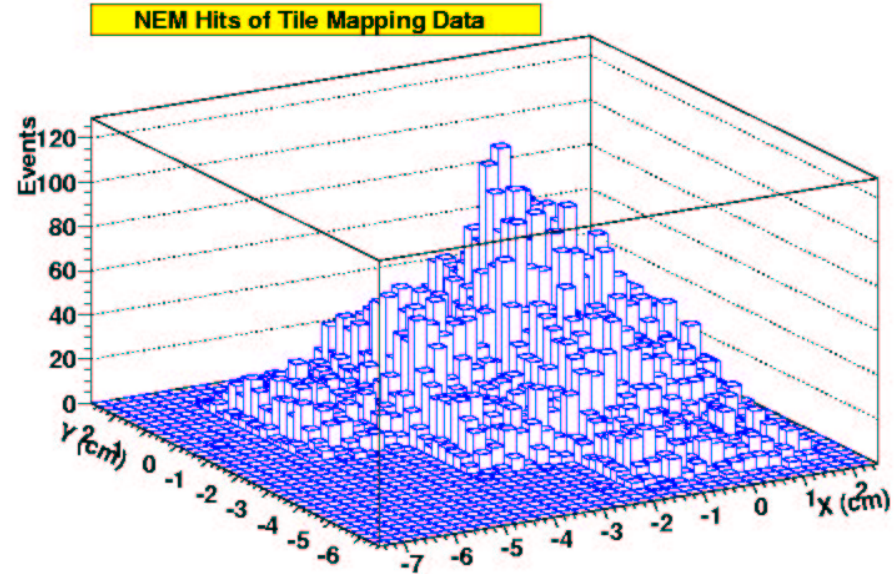
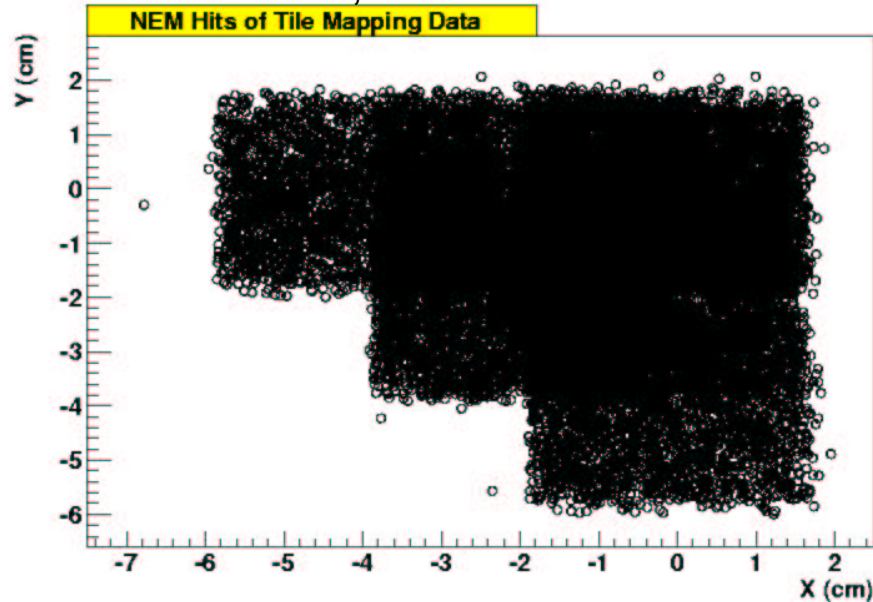
Note: Gain calibration errors are from 0.4~1.1% (average=0.7%)

3. NEM Response Linearity & Energy Resolution

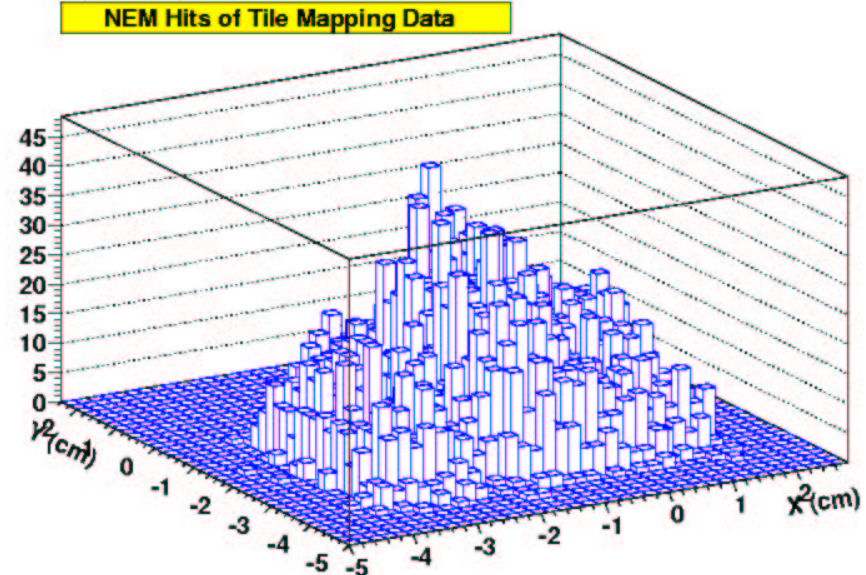
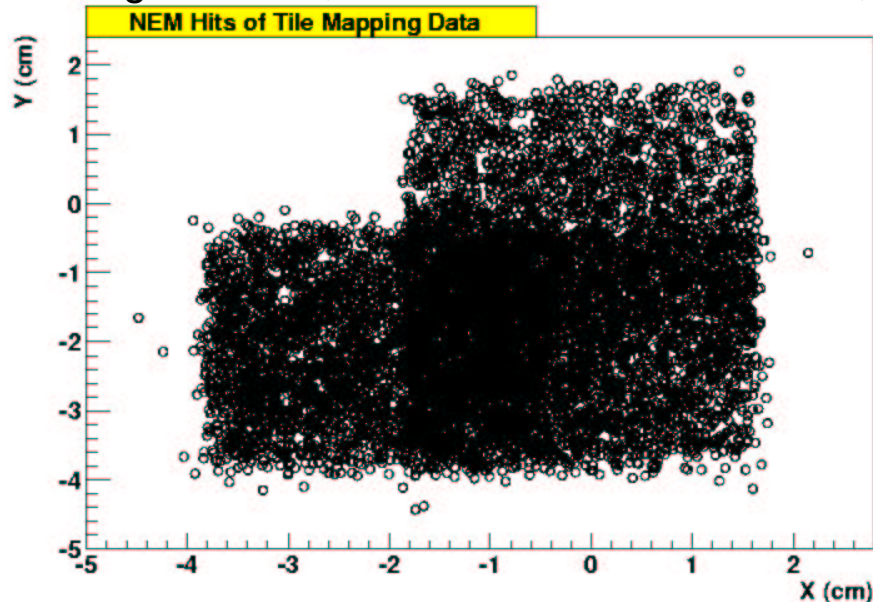


4. Tile Uniformity Mapping Data Set (electron)

Alternate WLS, 22715 events from runs 364, 370, 378, 380, 381, 384, 386, 387, 389, 392



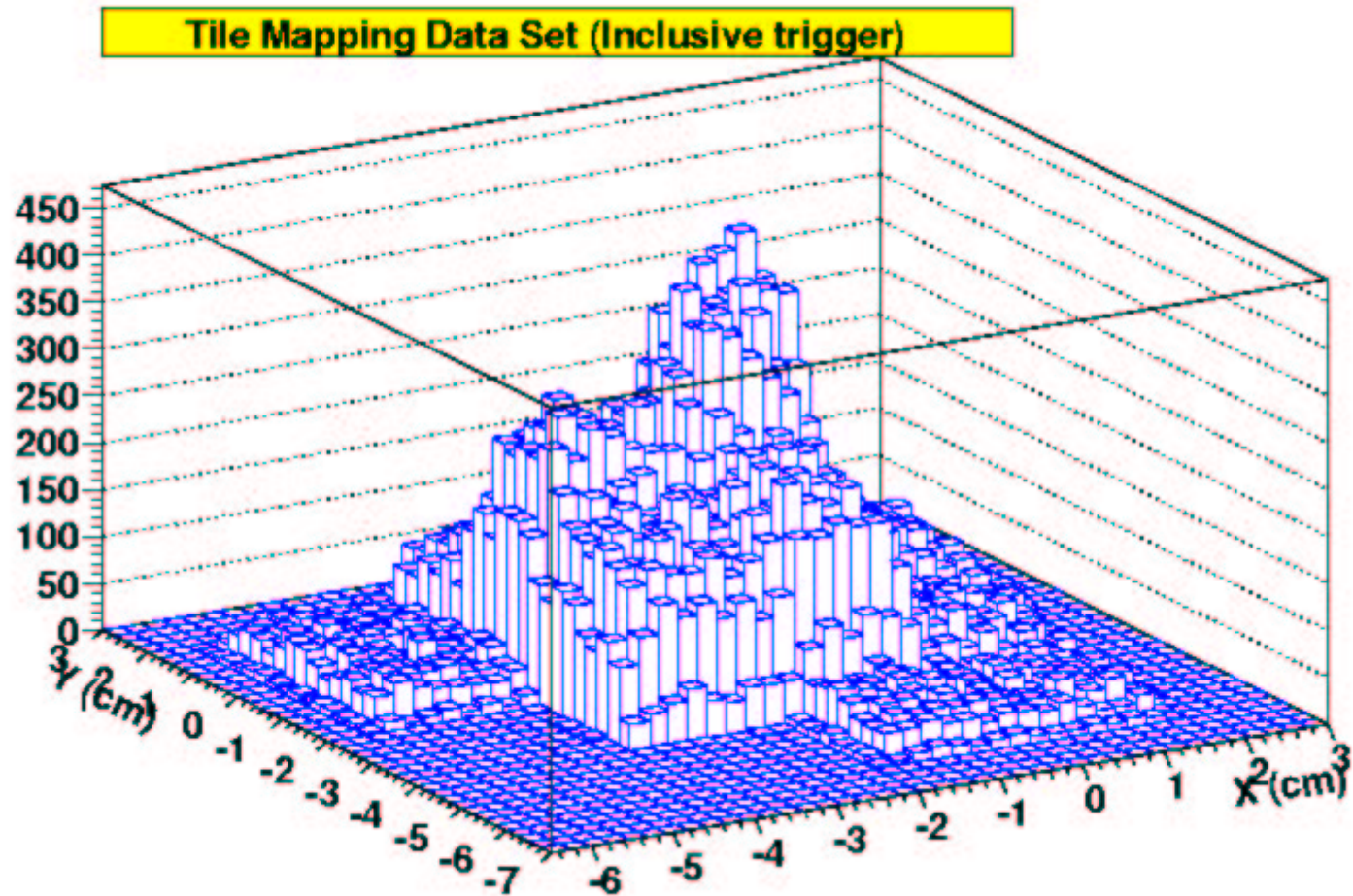
Aligned WLS, 9563 events from runs 448, 452, 454, 455, 457



Note: events where the track fit is outside the T3 area are already removed.

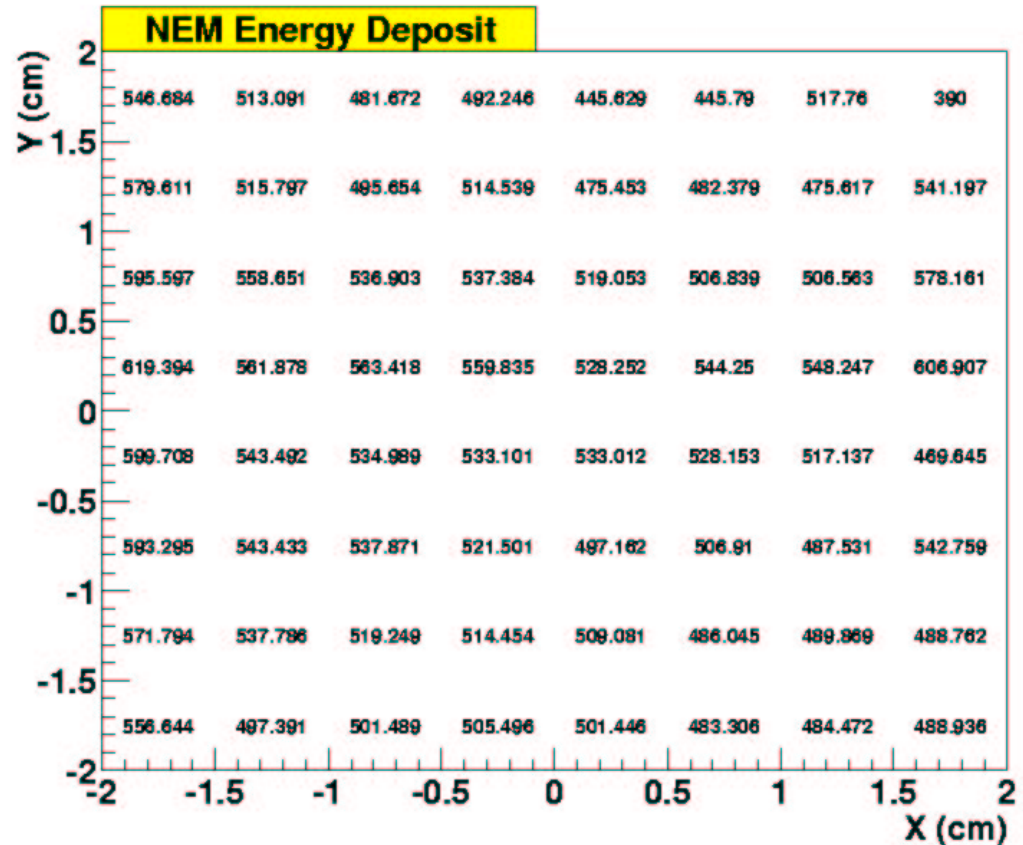
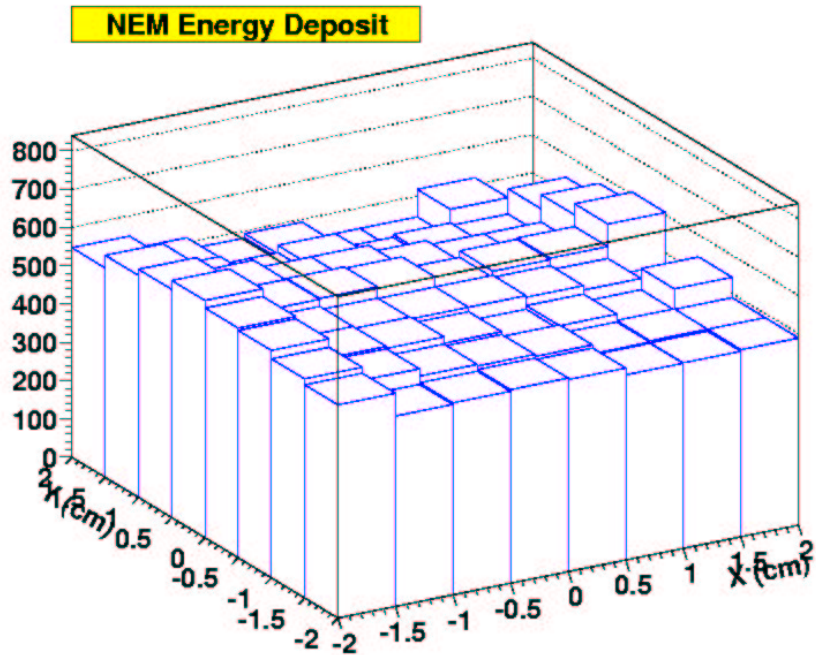
4. Tile Uniformity Mapping Data Set (inclusive)

Alternate WLS, 86334 events from runs 338, 369, 379, 382, 383, 385, 388, 390, 391, 393, 394



Note: events where the track fit is outside the T3 area are already removed.

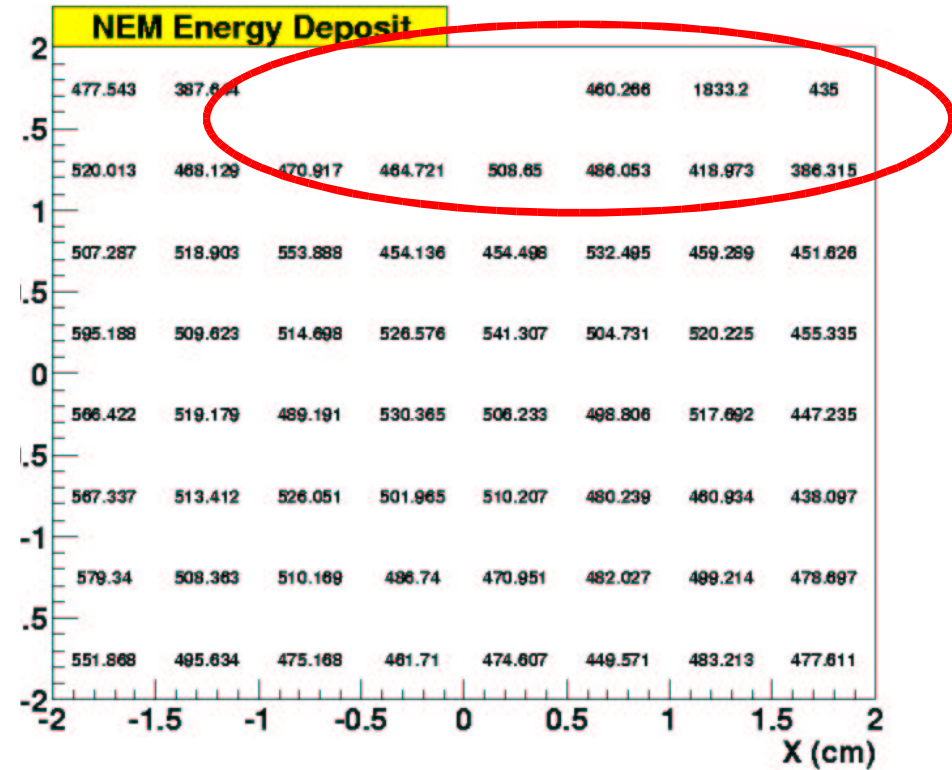
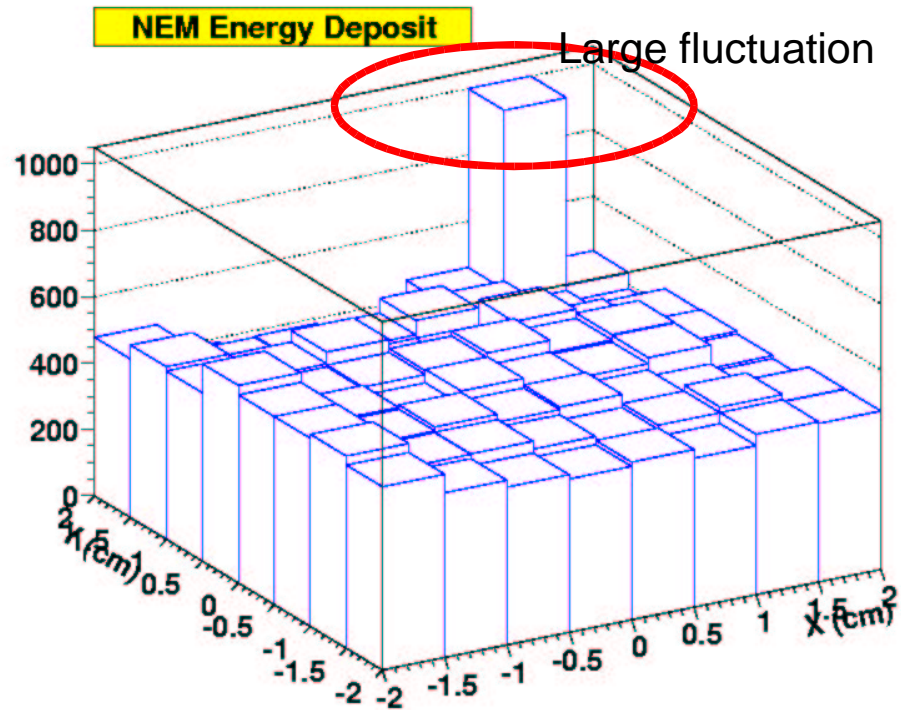
4. Tile Uniformity (Center tile, 2GeV electron, alternating WLS)



Problem: low statistics near $x=2\text{cm}$ and $y=2\text{cm}$, the hit distribution seems to be skewed towards $-x$ direction...

I'm not yet confident with my calculation of NEM hit points from drift chamber track fitting data (I better use Tsukuba people's track fit results? Does anybody have a PAW ntuple containing DC fit results per event?)

4. Tile Uniformity (Center tile, 2GeV electron, aligned WLS)

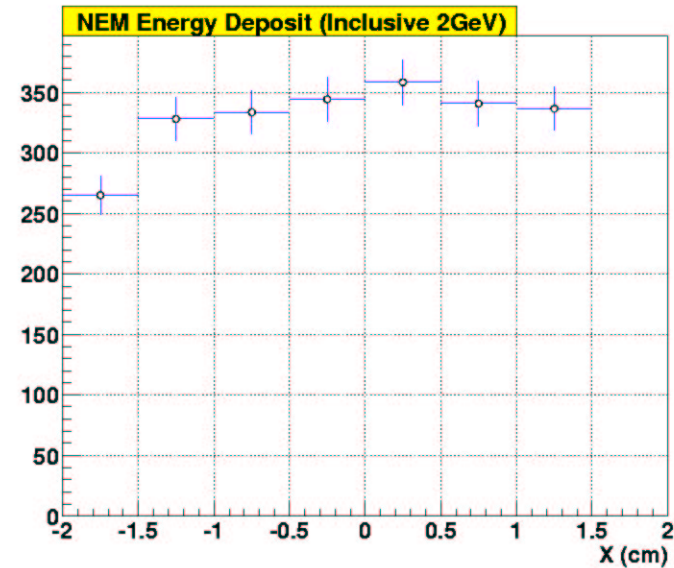
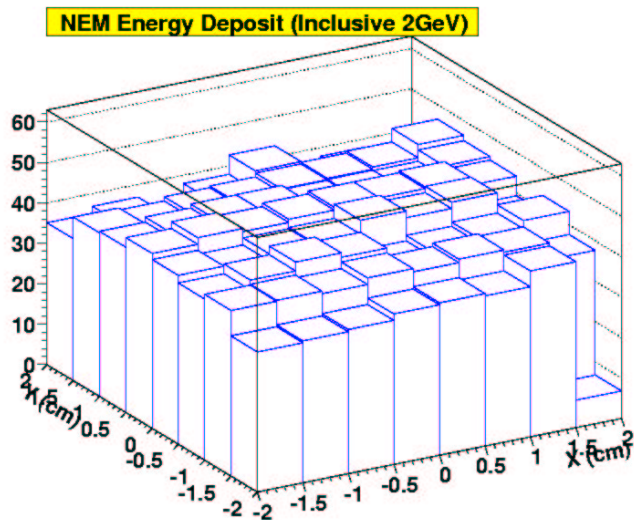
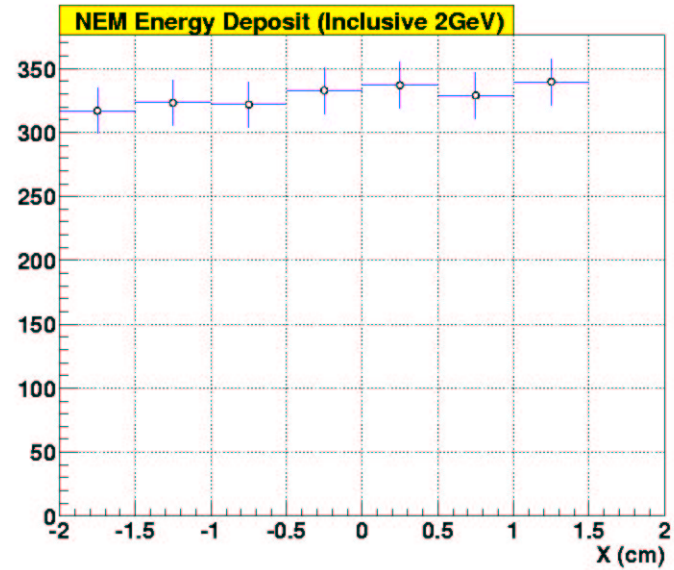


Problem: Same as for the alternating WLS case, low statistics

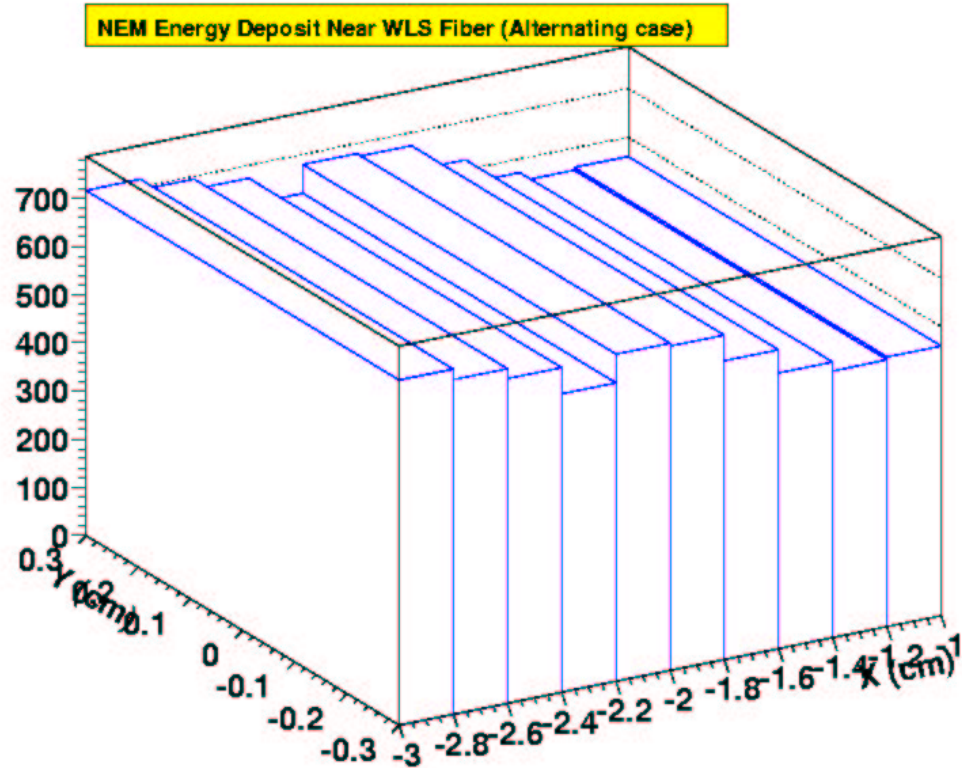
4. Tile Uniformity (Center tile, 2GeV inclusive, aligned WLS, 5mmx5mm mesh)

NEM Energy Deposit (Inclusive 2GeV)

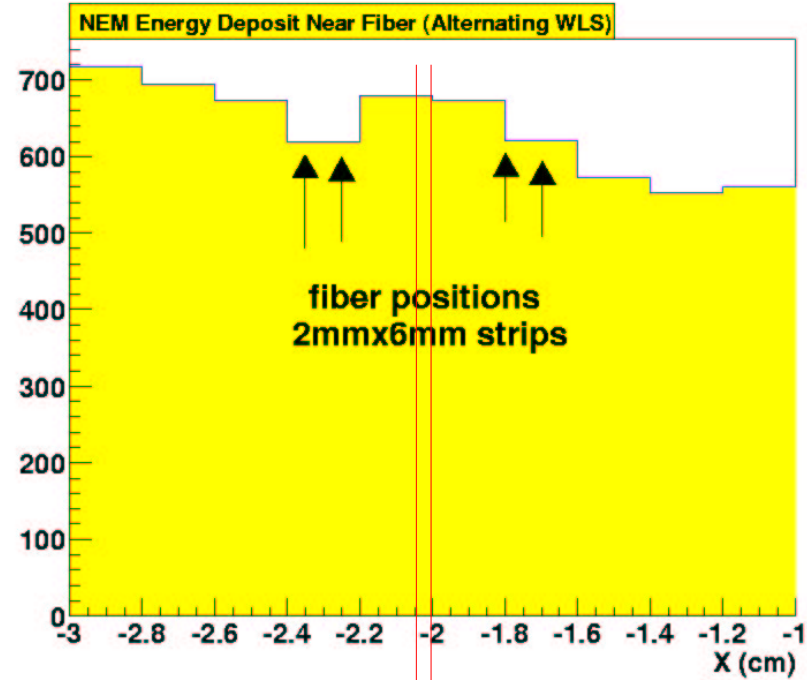
Y (cm)	2	35.0884	36.9121	30.7574	37.9403	42.7678	34.1188	37.9108	-2806.72	
1.5	40.4637	39.8733	40.9171	41.2792	42.2209	42.5781	43.0646	46.4202		
1	40.8404	42.0926	43.0553	43.0984	42.0518	42.3139	42.2657	45.0547		
0.5	43.2397	44.8847	44.0656	44.8997	45.6018	45.6463	46.0605	44.1959		
0	41.7691	40.7779	42.5409	42.8292	46.3017	44.6535	46.1914	39.3254		
-0.5	39.8687	42.2794	44.4379	43.3517	38.9595	40.2478	41.3144	43.3049		
-1	40.9803	41.2109	40.5687	42.1838	41.4376	42.3062	41.7578	37.6234		
-1.5	34.6517	35.1095	35.6043	37.1888	37.7112	37.1248	41.0021	6.78512		
-2										
	X (cm)	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2



5. Uniformity Near WLS Fiber (electron)

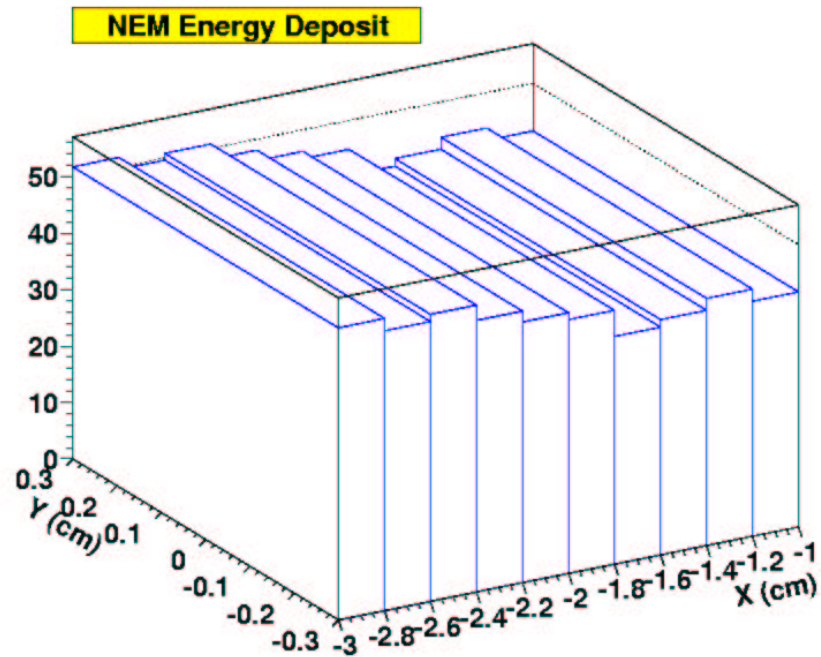


2mm x 6mm strips

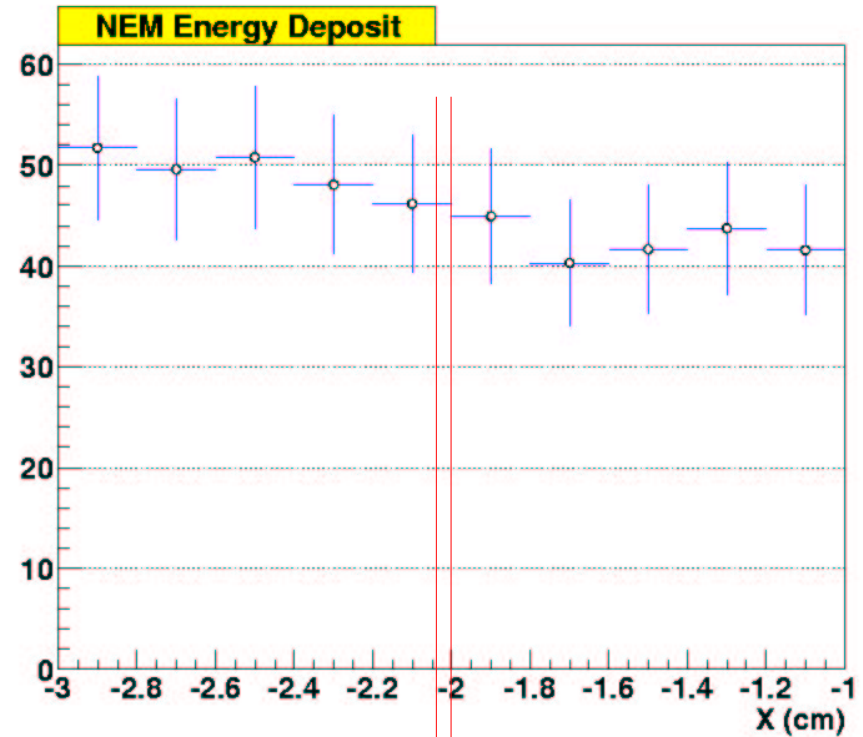


Tile boundary

5. Uniformity Near WLS Fiber (inclusive)



2mm x 6mm strips



Tile boundary

6. Future Plan

- Re-check the NEM ADC Calibration
- Check drift chamber fitting (or use Tsukuba fitting results?)
- Get uniformity of tile's response
- Do Geant4 simulation of NEM uniformity