

Outer tracker in the Xe run

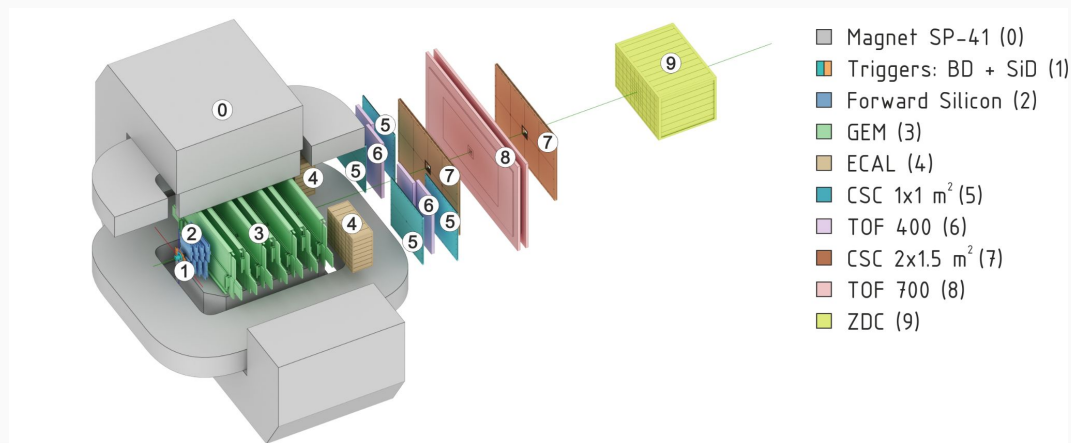
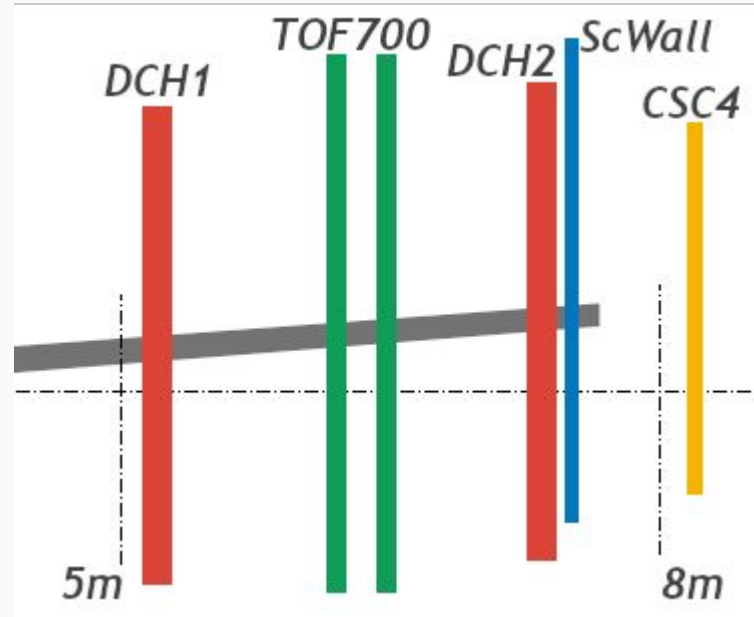
10th Collaboration Meeting of the BM@N Experiment at the NICA Facility

St Petersburg, Russia, on May 14 – 19, 2023

The Setup

Detectors located close to the beam axis were considered:

- Big cathode strip chamber (CSC4)
- Time-of-flight detector (TOF700)
- Drift chambers (DCH1 & DCH2)
- Scintillator wall detector (ScWall)

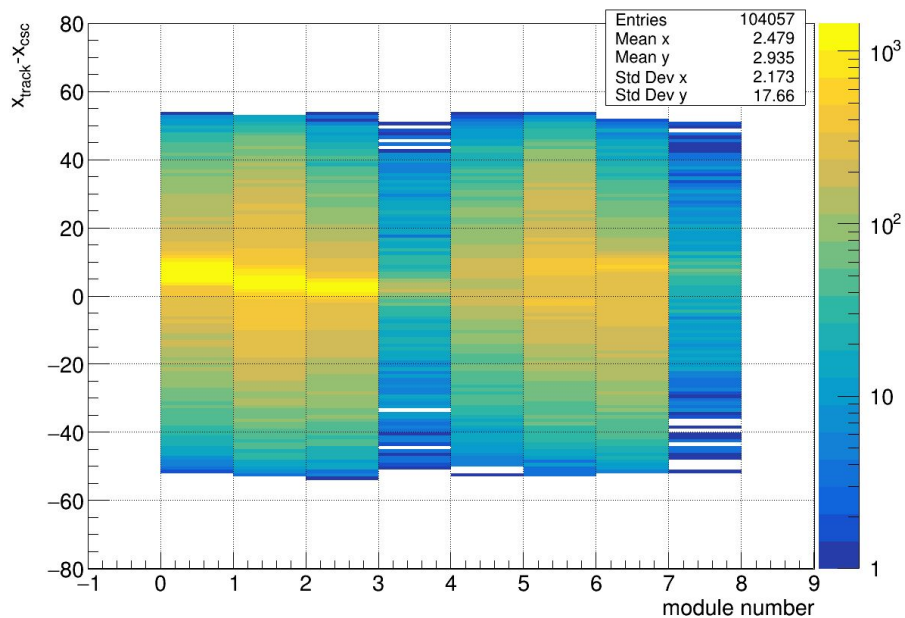


Tracks going through all or about all of that detectors may be expected

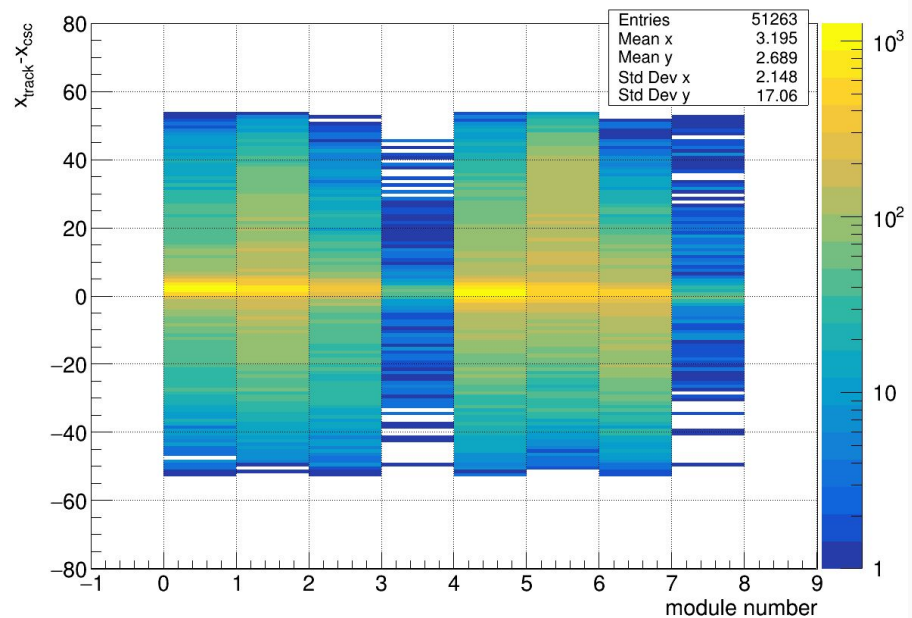
150k events from run 7830 (six raw data files) was processed

Big CSC

Residuals. GEM Track & CSC Hit (st.4)



Residuals. GEM Track & CSC Hit (st.4)



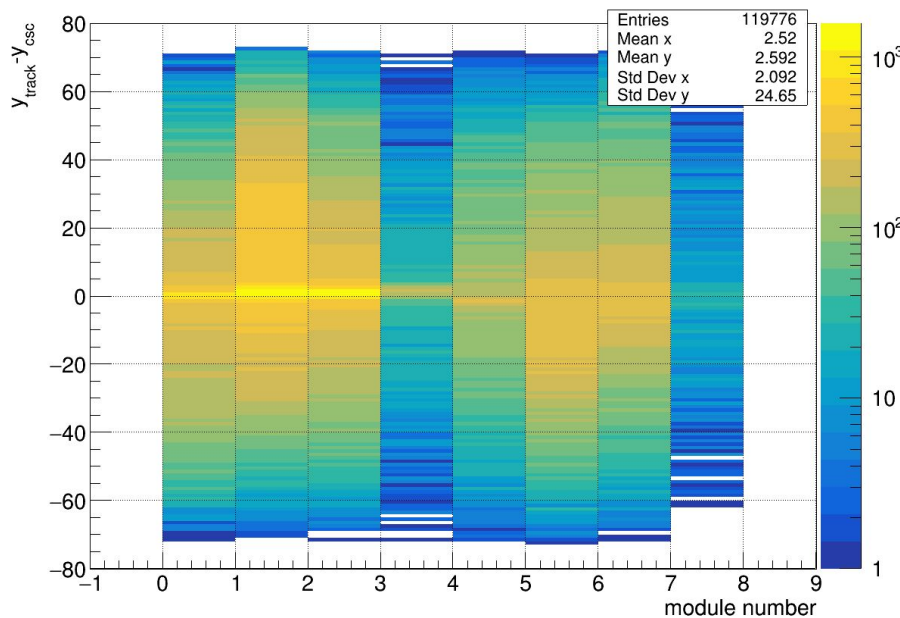
$$|y_{gem} - y_{csc}| < 10cm$$

Before bmnrroot update.

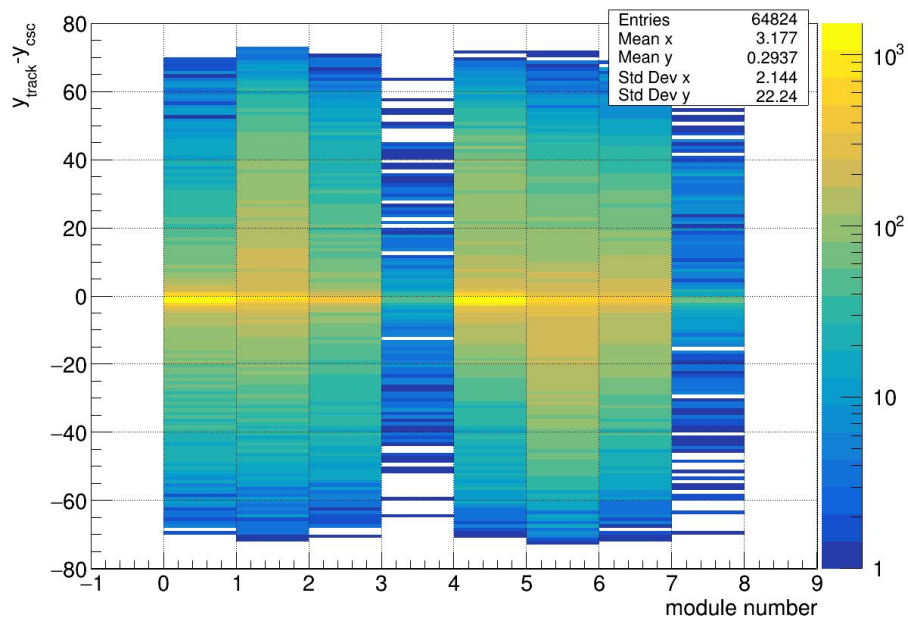
After bmnrroot update: new field map,
VF updated, GEMs alignment
improved...

Big CSC

Residuals. GEM Track & CSC Hit (st.4)



Residuals. GEM Track & CSC Hit (st.4)



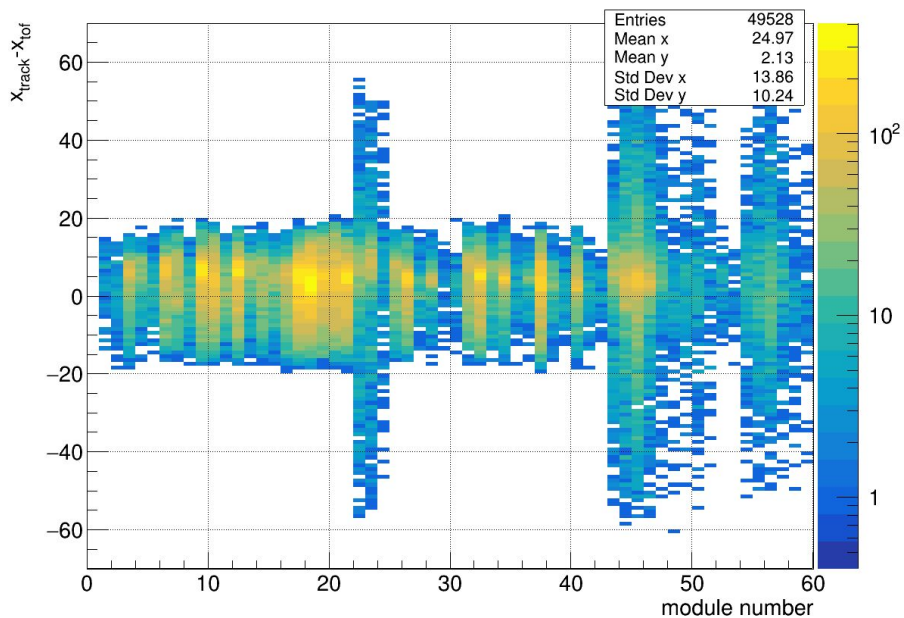
$$|x_{\text{gem}} - x_{\text{csc}}| < 10\text{cm}$$

Before bmroot update.

After bmroot update.

TOF-700

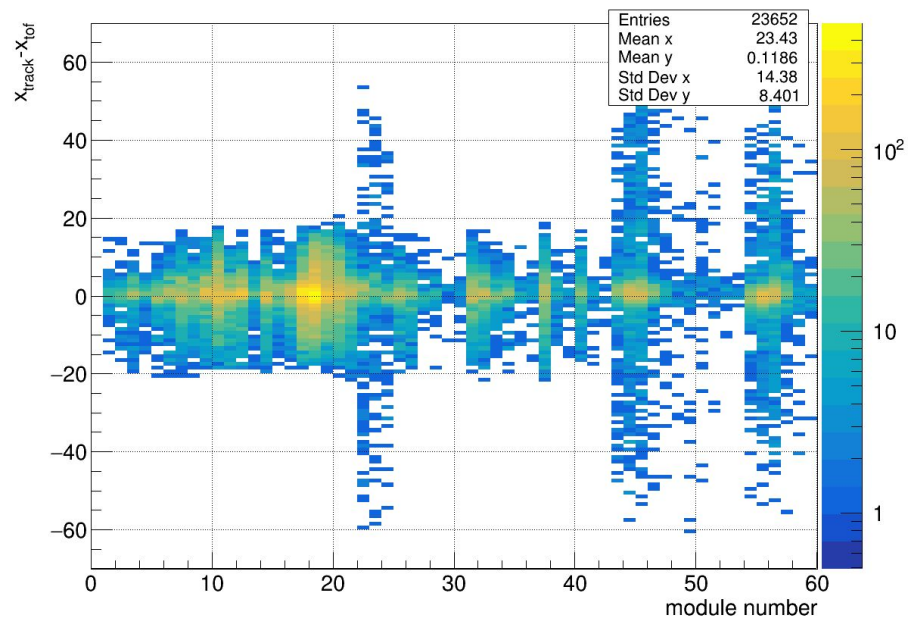
Residuals. GEM Track & TOF-700 Hit



Track & hit are in the same module

Before bmroot update.

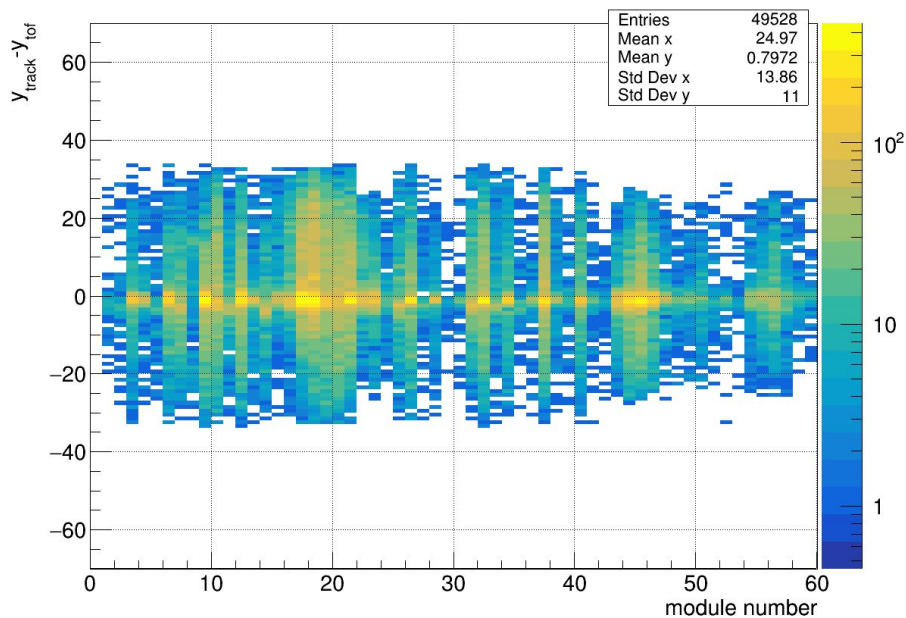
Residuals. GEM Track & TOF-700 Hit



After bmroot update.

TOF-700

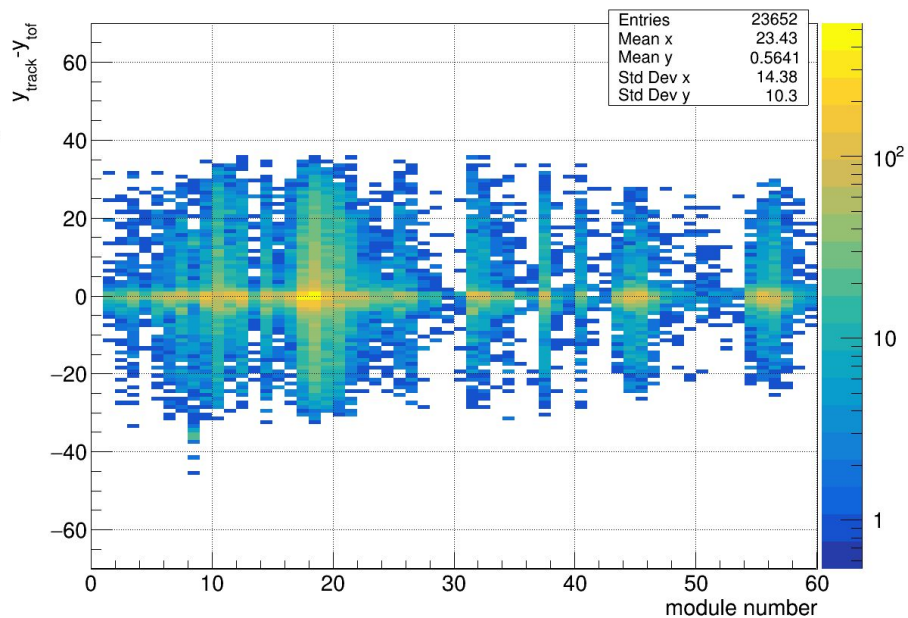
Residuals. GEM Track & TOF-700 Hit



Track & hit are in the same module

Before bmroot update.

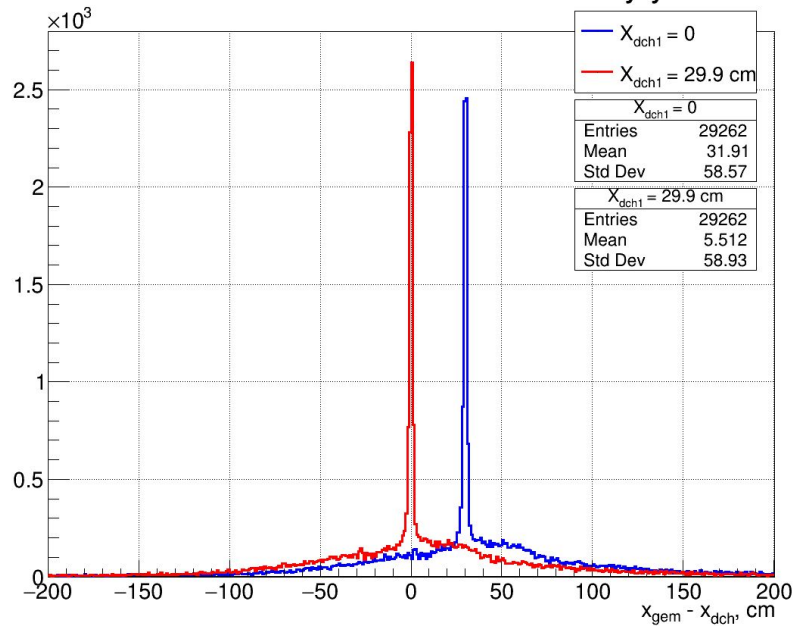
Residuals. GEM Track & TOF-700 Hit



After bmroot update.

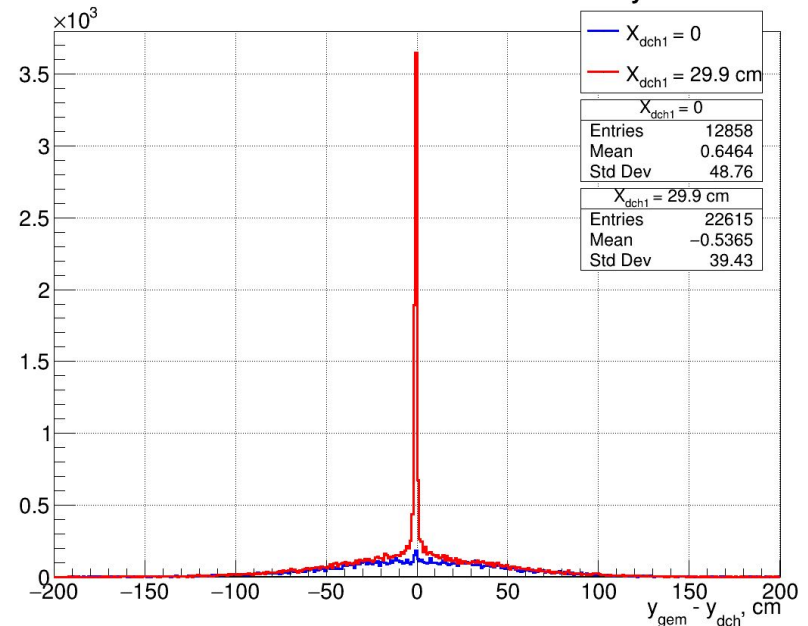
DCH1 residuals

DCH1 & GEM tracks matched by y



$$dy = |y_{gem} - y_{dch}| < 10$$

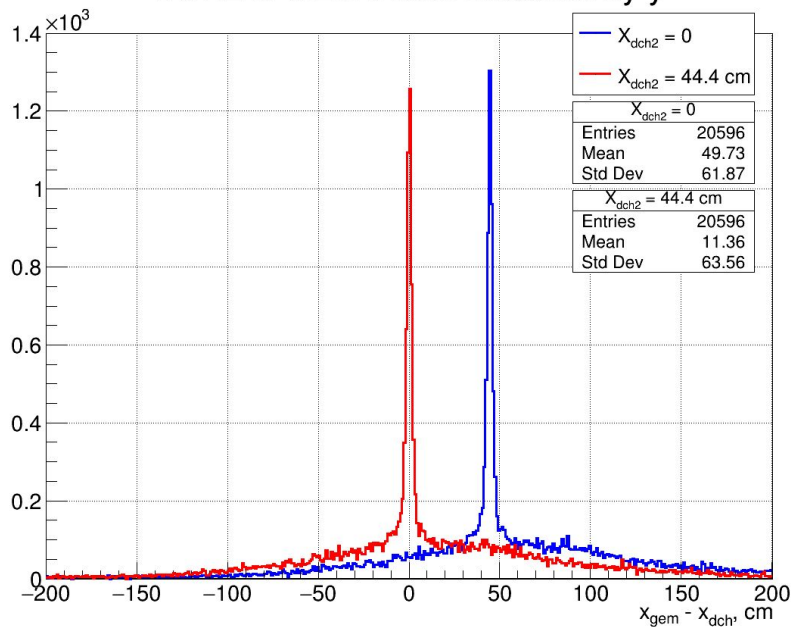
DCH1 & GEM tracks matched by x



$$dx = |x_{gem} - x_{dch}| < 10$$

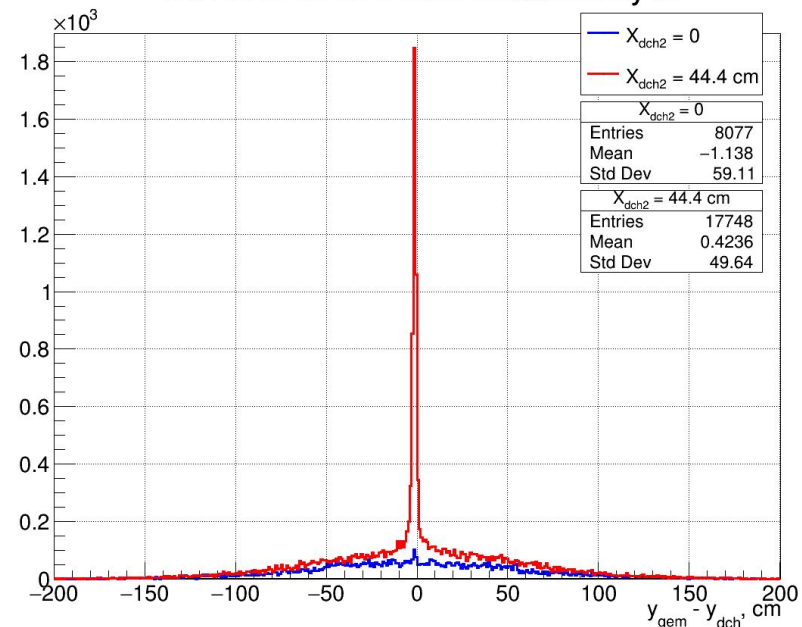
DCH2 residuals

DCH2 & GEM tracks matched by y



$$dx = |x_{gem} - x_{dch}| < 10$$

DCH2 & GEM tracks matched by x



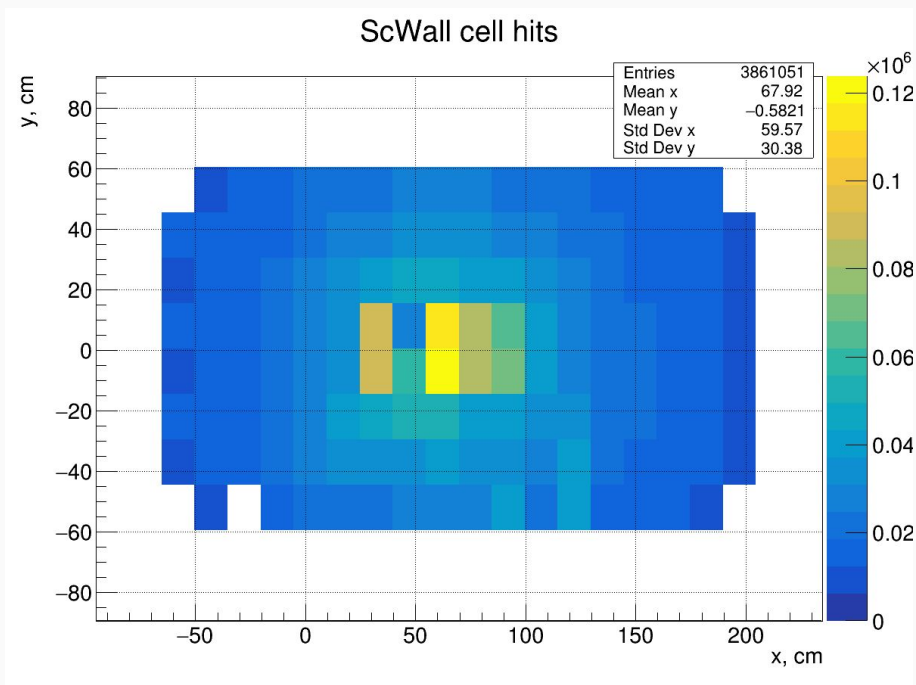
$$dy = |y_{gem} - y_{dch}| < 10$$

ScWall detector cells schematic view

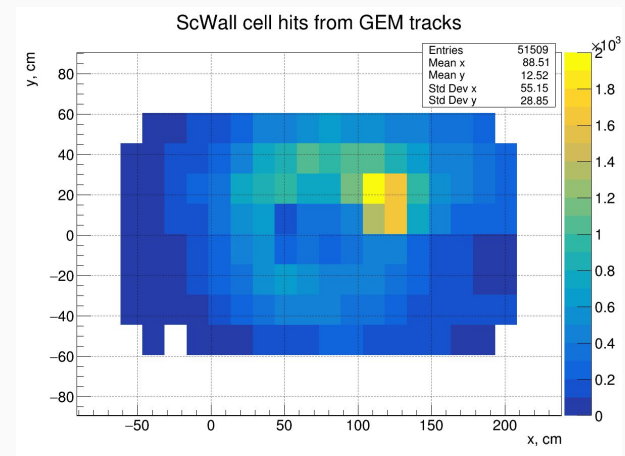
	173	172	171	170	169	168	167	166	165	164	163	162	161	160	159	158						
156	155	154	153	152	151	150	149	148	147	146	145	144	143	142	141	140	139					
138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121					
120	119	118	117	116	115	40	39	38	37	36	35	34	33	32	31	114	113	112	111	110	109	108
						30	29			26	25	24	23	22	21							
107	106	105	104	103	102	20	19			16	15	14	13	12	11	101	100	99	98	97	96	95
						10	9	8	7	6	5	4	3	2	1							
94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77					
76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59					
	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42						

Large cells 15x15 cm², small cells 7.5x7.5 cm²

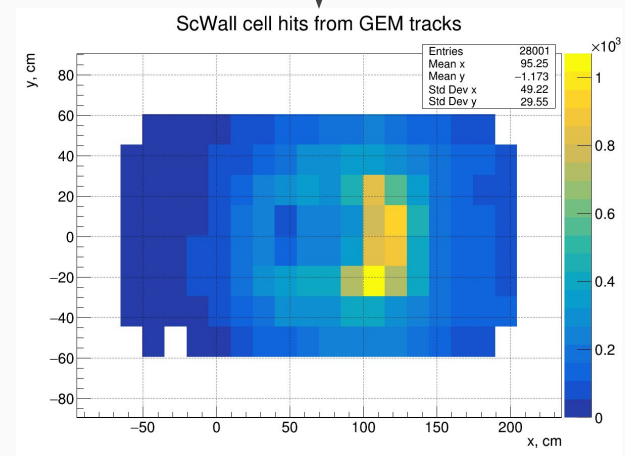
ScWall detector. Large cell hits



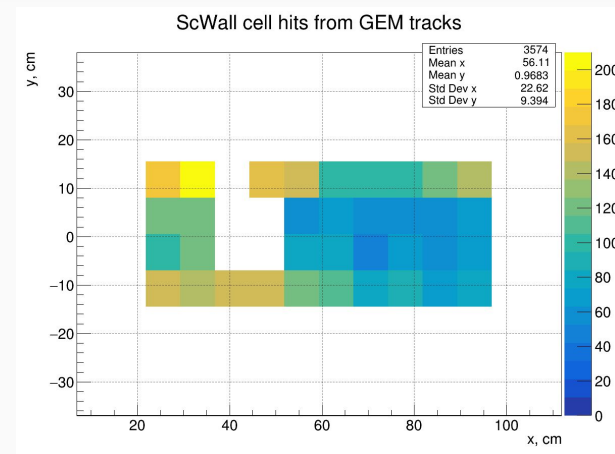
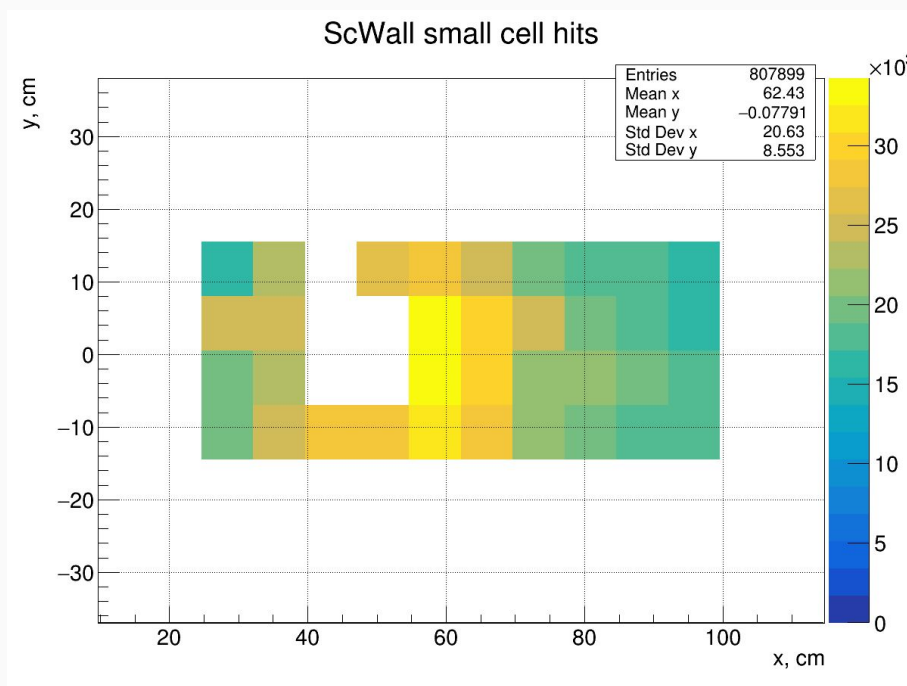
*Quads of small cells (in the central part of sc.wall) acts as a single large cell



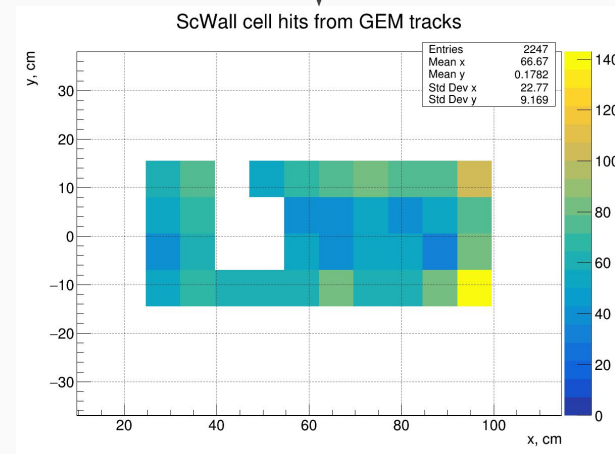
VF improved



ScWall detector. Small cell hits

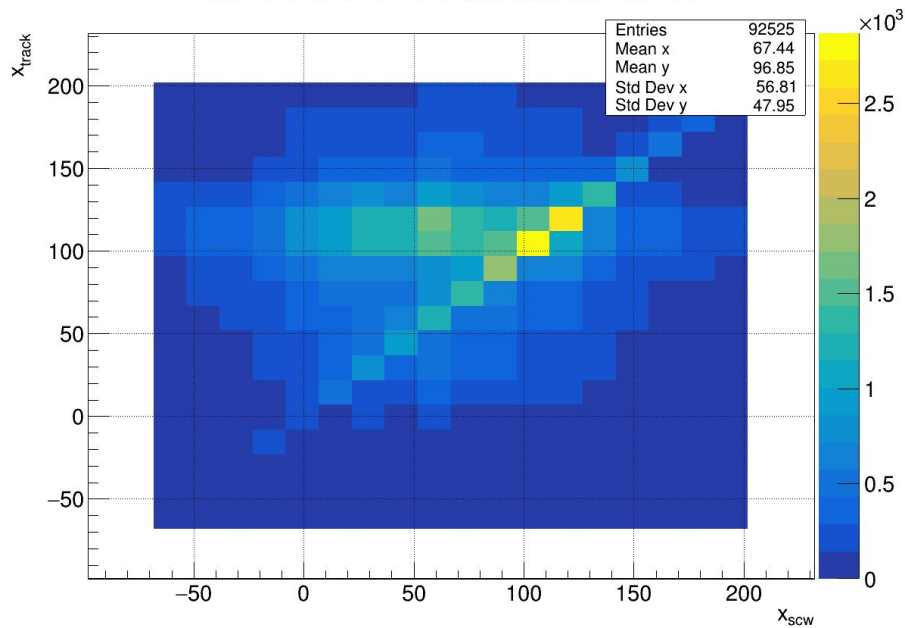


VF improved

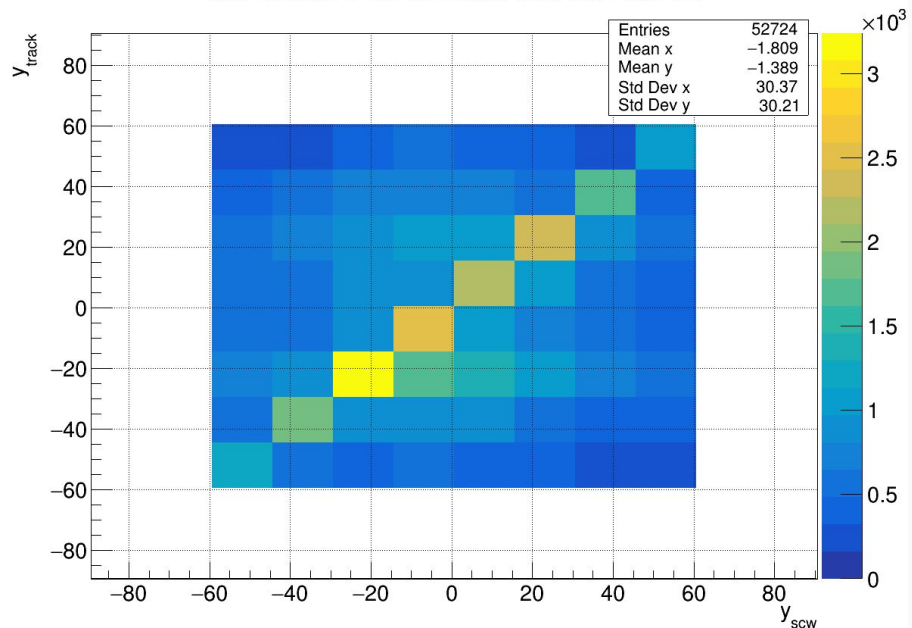


ScWall hits & GEM tracks correlations

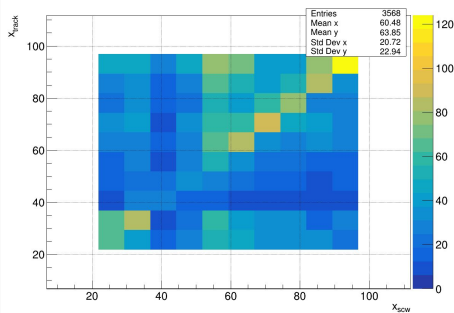
Correlation. GEM track and ScWall hit



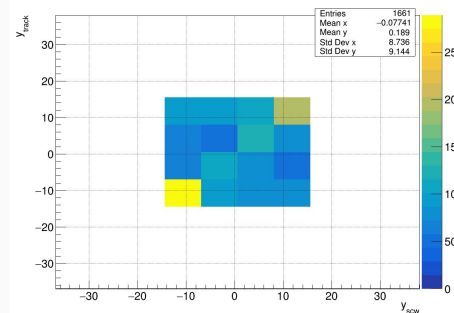
Correlation. GEM track and ScWall hit



Correlation. GEM track and ScWall hit

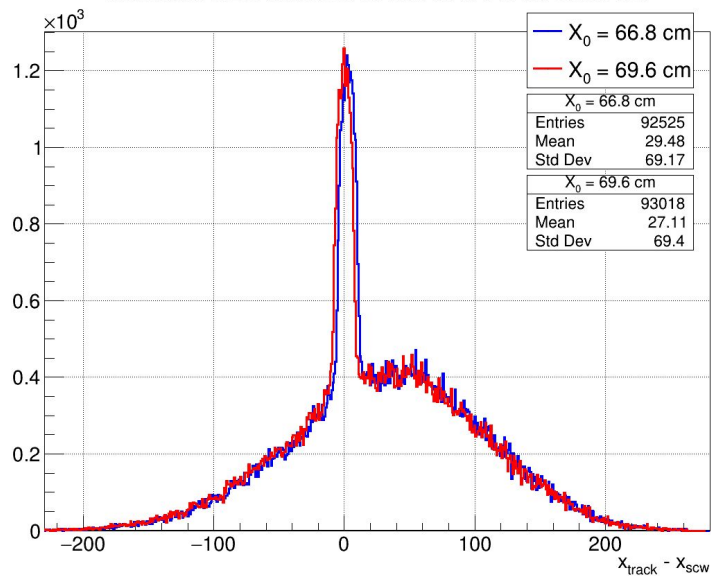


Correlation. GEM track and ScWall hit

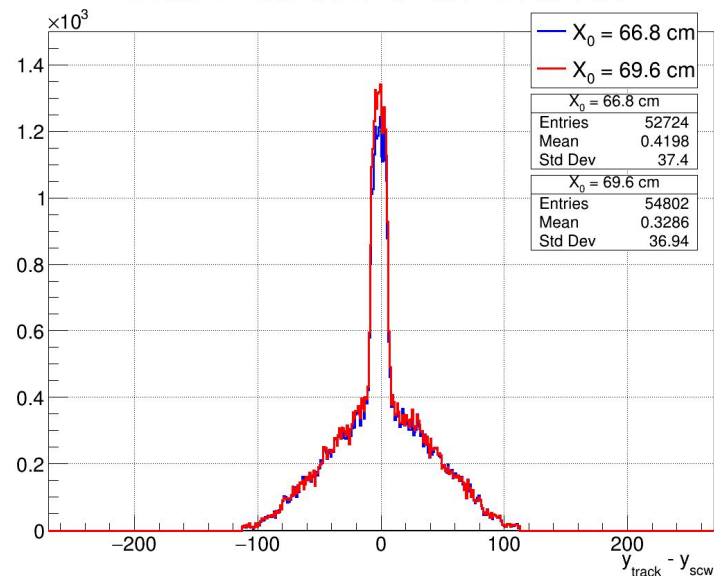


ScWall residuals

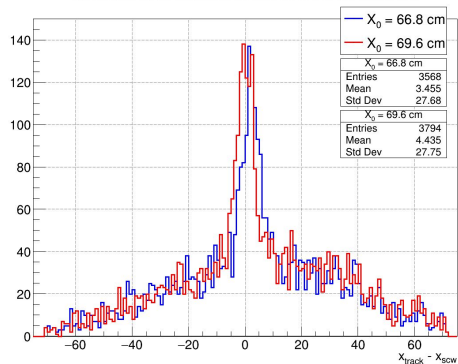
Residuals. GEM track and ScWall hit are in the same row



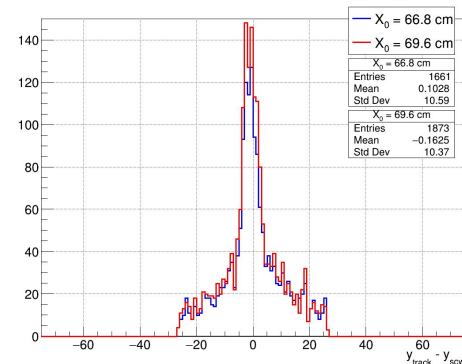
Residuals. GEM track and ScWall hit are in the same column



Residuals. GEM track and ScWall hit are in the same row



Residuals. GEM track and ScWall hit are in the same column



Summary

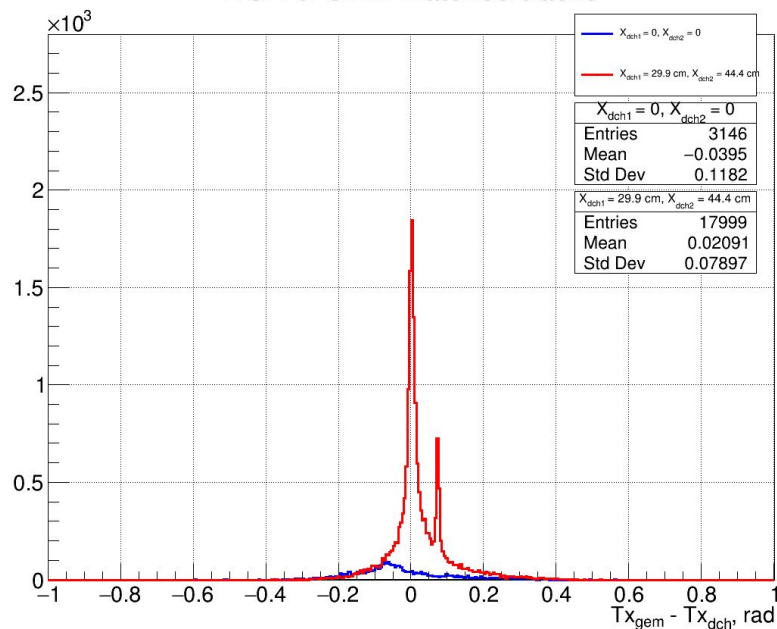
- All the detectors considered shows acceptable results
- Their alignment should be done more carefully
- Next step is to try to match tracks from different outer detectors

Thank You for Your Attention!

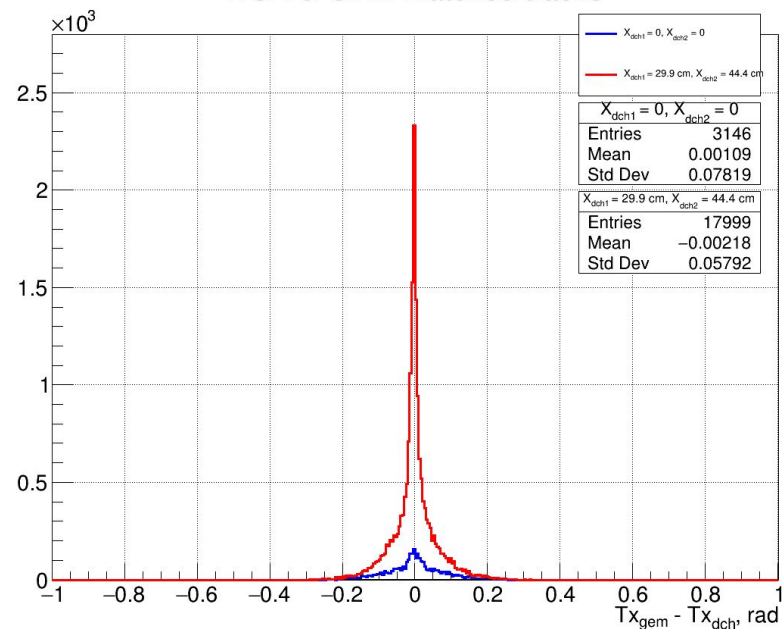
Backup

DCH, Tx Ty

DCH & GEM matched tracks



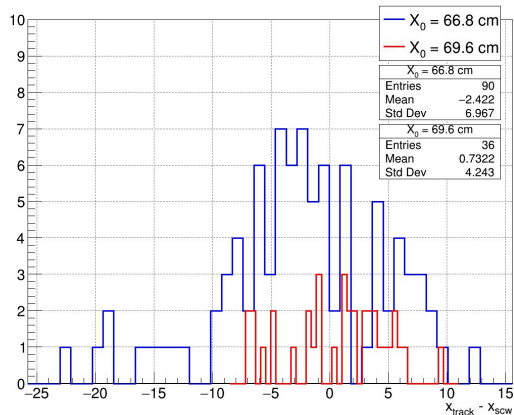
DCH & GEM matched tracks



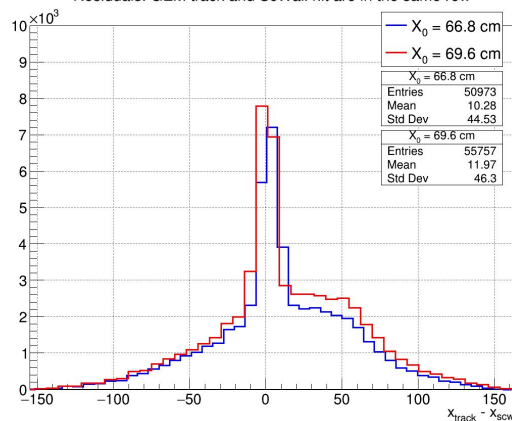
$$\sqrt{dx^2 + dy^2} < 10$$

ScWall residuals

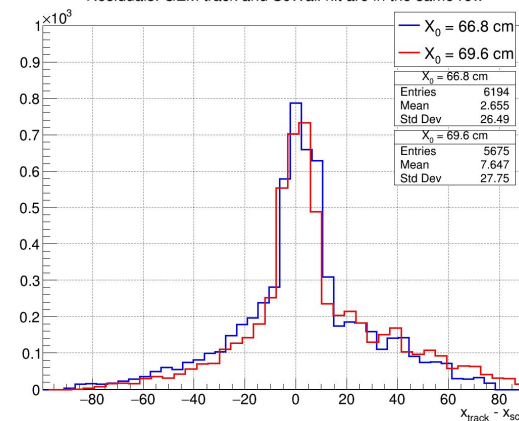
Residuals. GEM track and ScWall hit are in the same row



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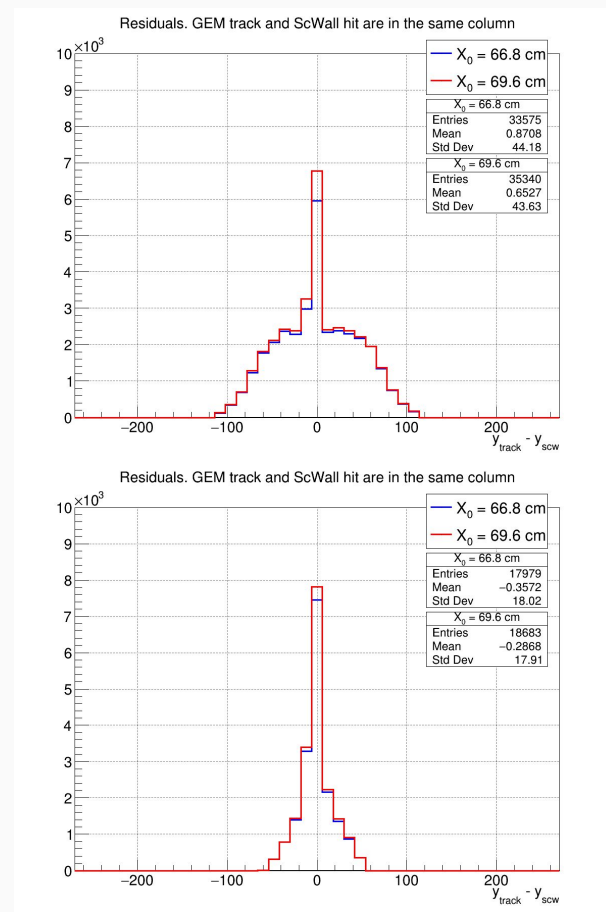
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nvctD	173	172	171	170	169	168	167	166	165	164	163	162	161	160	159	158	nvctD								
156	155	154	153	152	151	150	149	148	147	146	145	144	143	142	141	140	139								
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ScWall residuals

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94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59							
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Number of hits

