Status of track reconstruction in central tracker for the SRC experiment

Sergei Merts

on behalf of reconstruction group

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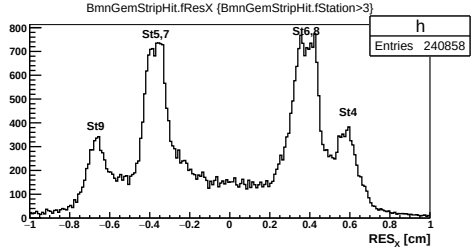
- Reconstruct SRC events w/o target
- Estimate Lorentz shifts for different fields and compare with Garfield++
- Estimate Momentum resolution

Run	2322	2325	2327	2332	2335
Current [A]	900	1200	1500	1800	2100

- **Digits: After converter (Vasilisa → Pavel)**
- **Tracking: Cellular Automaton**
- **Beam: Carbon,** $T = 3.17 AGeV \rightarrow P_n = 4.00 GeV/c \rightarrow P/Q = 8.00 GeV/c$

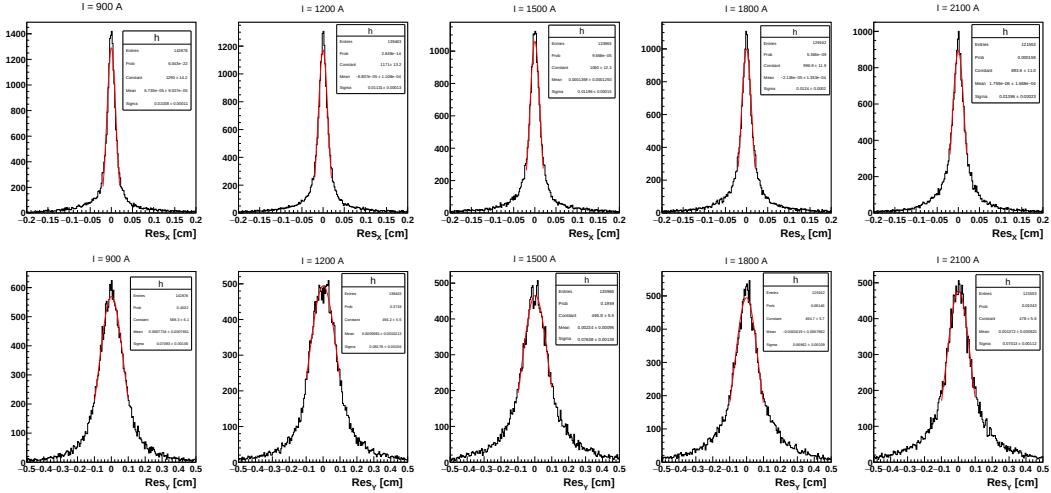
Algorithm

- Main idea: Iteratively moving of all hits on stations to shift peaks of residuals to zero
- Firstly implement this approach to run 2320 (no magnetic field) for alignment
- Implement this approach to other runs scanning by magnetic field



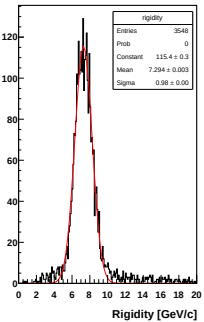
Station	4	5	6	7	8	9
dX [cm]	+0.158	-0.065	-0.039	-0.037	+0.008	+0.080
dY [cm]	+0.013	-0.063	+0.083	+0.011	+0.034	-0.097

Residuals after Lorentz shifts extraction

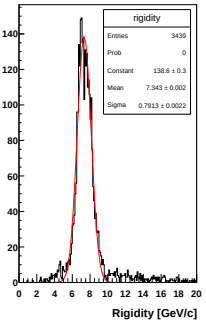


Momentum distribution

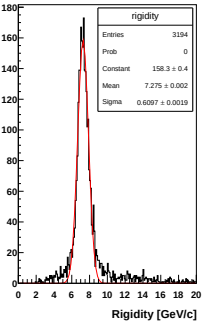
I = 900 A



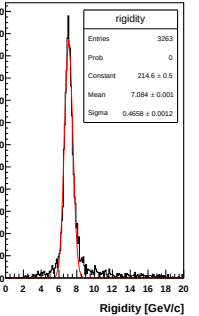
I = 1200 A



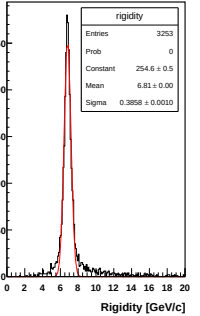
I = 1500 A



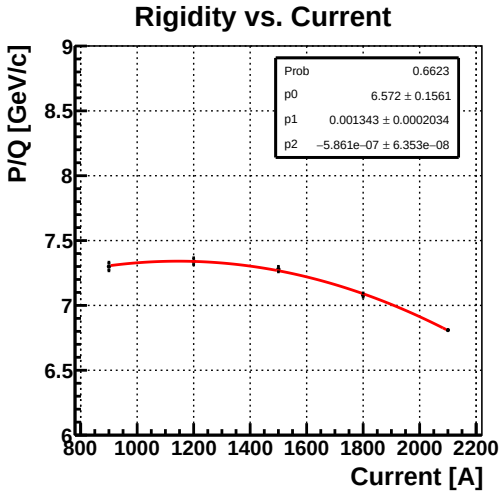
I = 1800 A

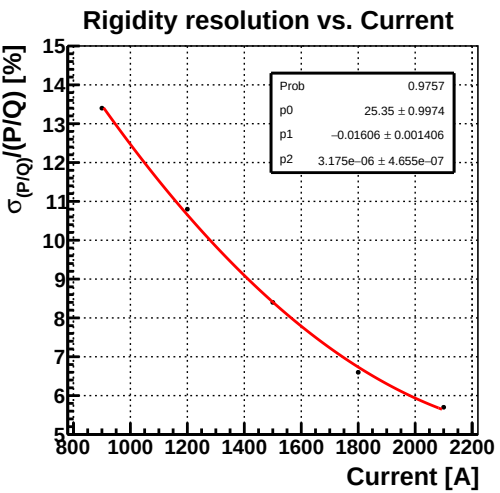


I = 2100 A



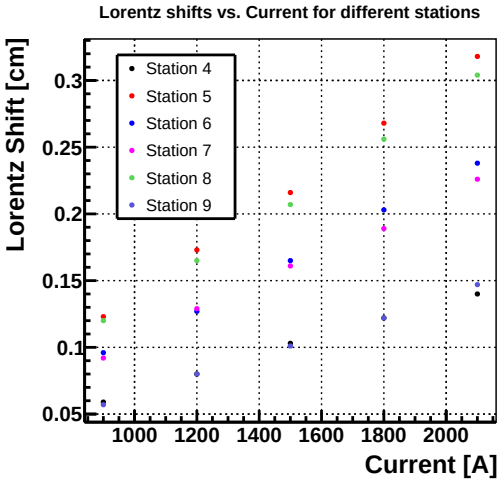
Momentum distribution. All together

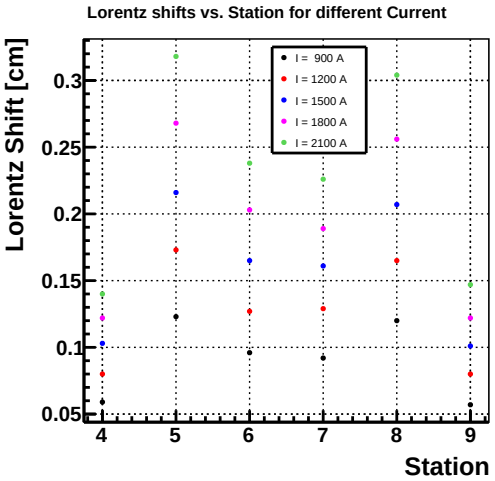




- Beam momentum is shifted down
- Residuals looks well enough ($\sigma_x \approx 100\mu m$, $\sigma_y \approx 700\mu m$)
- Momentum resolution for working current (**I = 1800 A**) is around **7%**

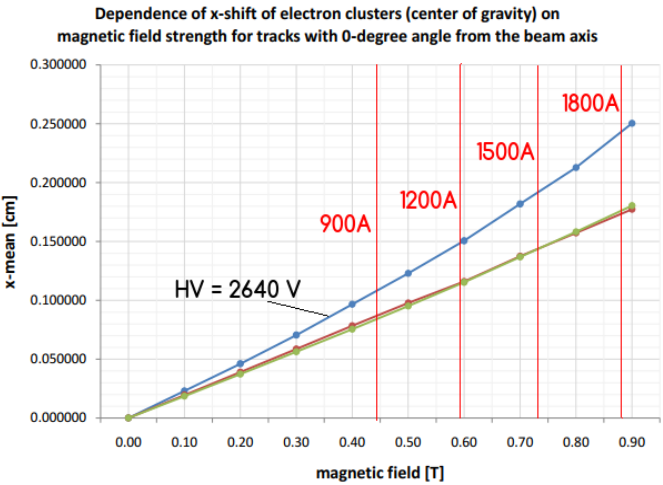
Extracted Lorentz shifts



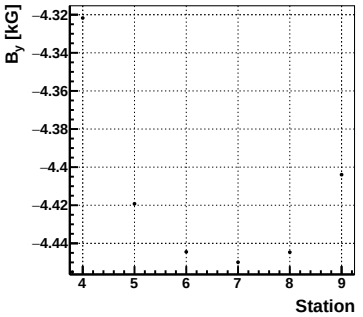


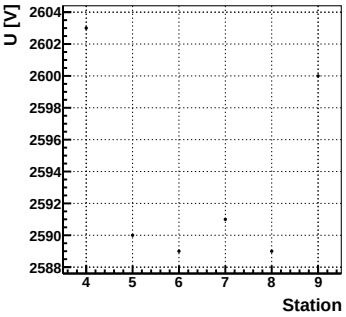
Modeling Lorentz shifts

B-field [T]	average shift of cluster center [cm]		
	ArC_4H_{10}(90/10) E=880:..V/cm	$ArCO_2$(70/30) E=1000:..V/cm	ArC_4H_{10}(80/20) E=1720:..V/cm
0.00	0.000000	0.000000	0.000000
0.10	0.022990	0.019550	0.018530
0.20	0.046100	0.038920	0.037280
0.30	0.070500	0.058570	0.056330
0.40	0.096680	0.078300	0.075500
0.50	0.122900	0.097740	0.095060
0.60	0.150600	0.115900	0.115300
0.70	0.181900	0.137400	0.136800
0.80	0.212800	0.157200	0.158200
0.90	0.250400	0.177300	0.180400



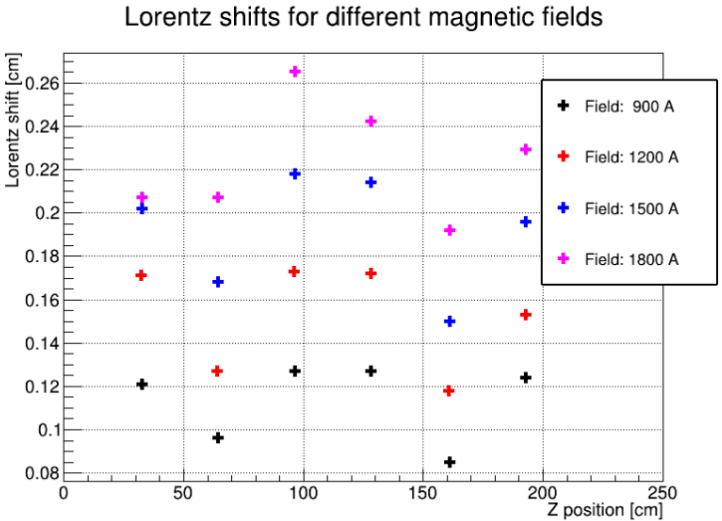
Magnetic field and high voltage on stations



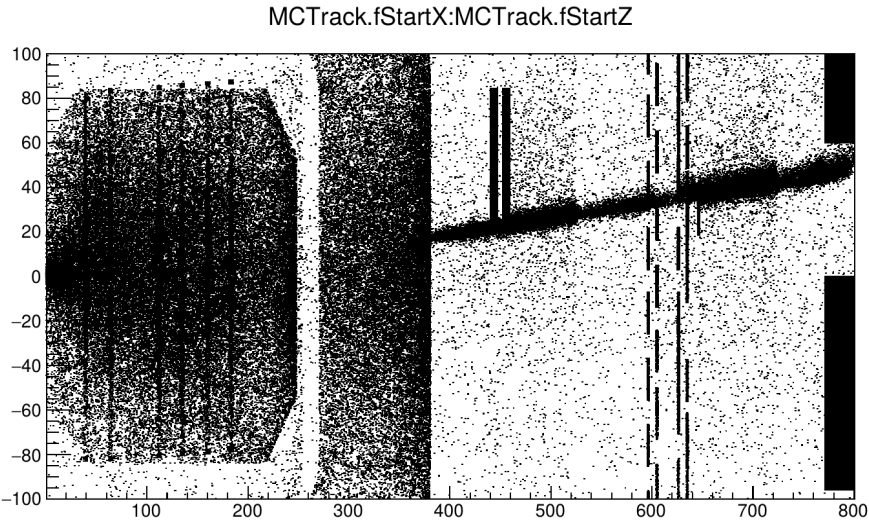


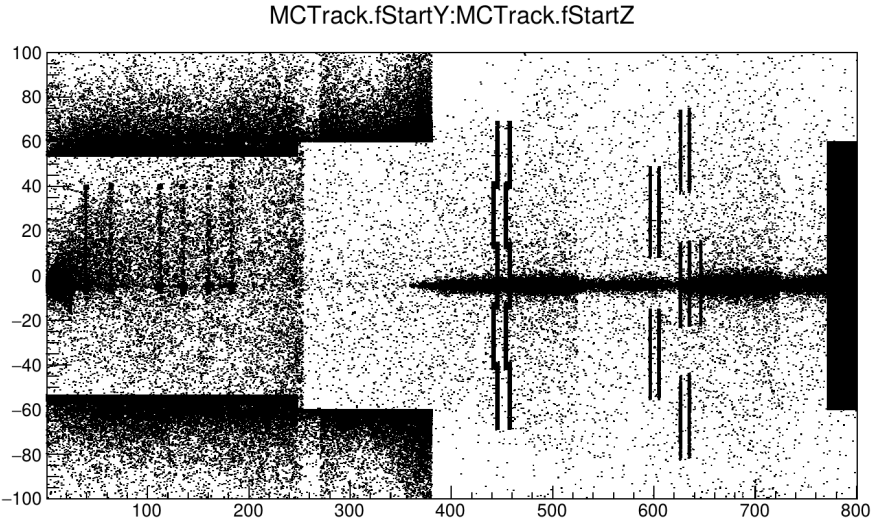
Current	900 A	1200 A	1500 A	1800 A
LS garfield [cm]	0.110	0.150	0.190	0.240
LS exp [cm]	0.120	0.170	0.220	0.270

Extracted Lorentz shifts for run6 (2017)



- Lorentz shifts looks strange
- Effect of HV should be investigated more careful
- Structure of LS looks similar for Run-6 and Run-7


MCTrack.fStartX:MCTrack.fStartZ
100
80
60
40
20
0
−20
−40
−60
−80
−100
100
200
300
400
500
600
700
800


MCTrack.fStartY:MCTrack.fStartZ
100
80
60
40
20
0
−20
−40
−60
−80
−100
100
200
300
400
500
600
700
800