Getting Diffusion Coefficient using LAMPS TPC

Jeonghyeok Park

Diffusion Coefficient

ELPH beam summary

Run#	Hbeam (mm,cm)	Efield (V/cm)	VGEM (V)	Gain (fC)	Tdelay	Frequency (MHz)	VGEMs (V)	nevt
P10 gas								
93	554(50.24)	115	320	120	1600	25		1770
94		155						3226
95			330					3977
96			340					1514
97			345					1608
98	554(50.24)	155	345	240	1600	25		8579
101		145						6707
103		135						8211
104		125						8291
105		115						8372
107	404(35.24)	115						9902
108		125						8284
110		135						8116
111		145						1632
112		145						8253
113		155						8180
114	254(20.24)	115					330	6372
115							330	9370
116		125					335	8200
117		135					340	8894
118		145					345	6640
120		145					345	2167
121		155					x	8222
ArCO2 gas								
122	254(20.24)	115	300		1600	25	x	1505
123		115	310					4969
124		155			2600			6705
125		170						15726
126		170					310	6395
127						10	310	1920
128					3600		310	1462
129	254(20.24)	170	310				310	18119
130			320				310	21787
131			330				310	20336
134				1pC			x	12033
135	254(20.24)	170	340					20174
136			345					9916
137				10pC				9968
139	404(35.24)		340	1pC	5600			10153
140	554(50.24)				7000			13304

$$\sigma^2_{track} = D^2 z + \sigma^2_0$$

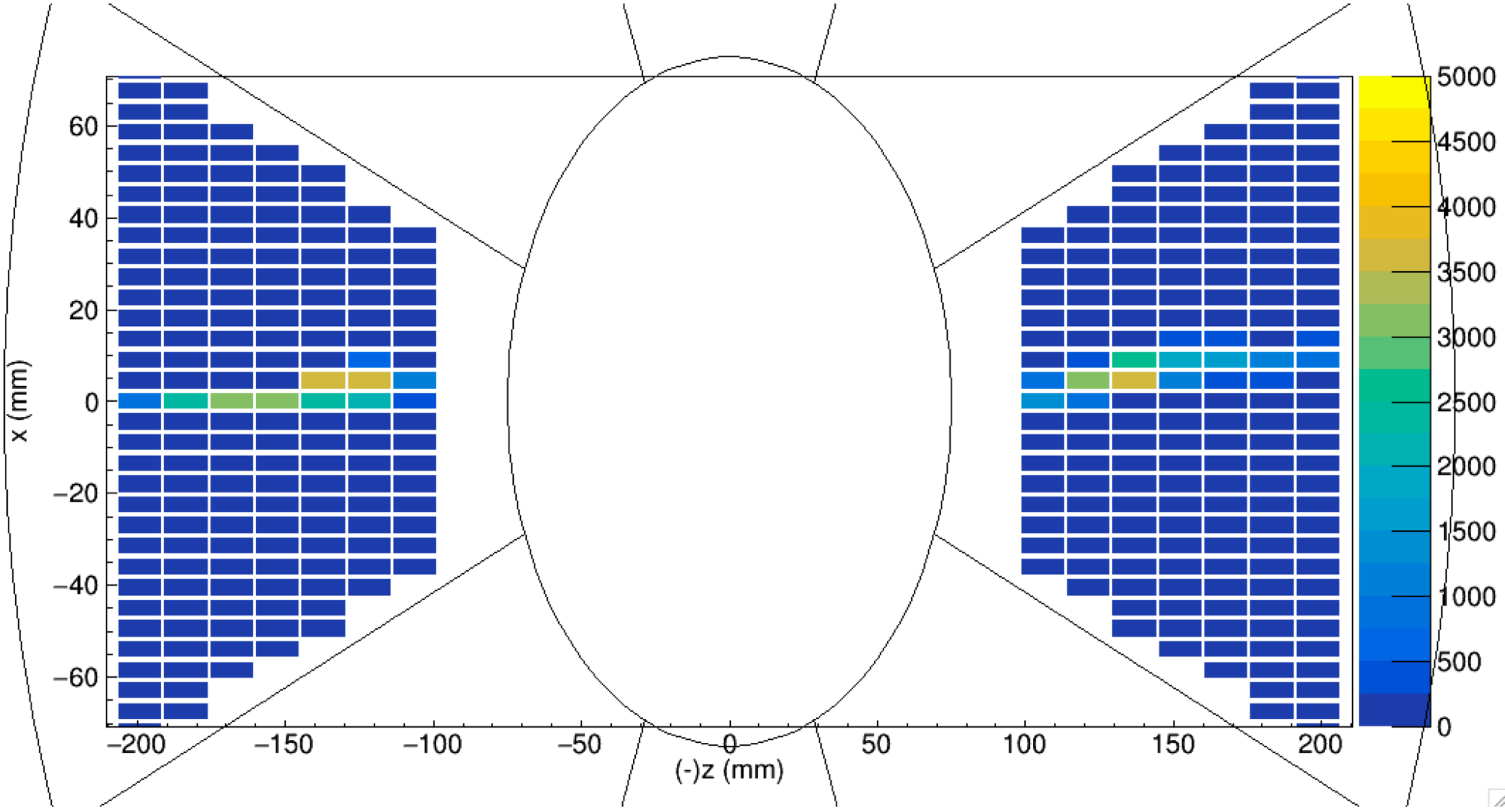
- We can know how electrons diffuse with the Diffusion Coefficient D.

- Run Number 103, 110, 117 are used for the first analysis.

- In the same Efield(135 V/cm), each beam heights are 554, 404, 254 mm.

- Run Number 101, 112, 120 were used first but the event number was not enough to reconstruct.

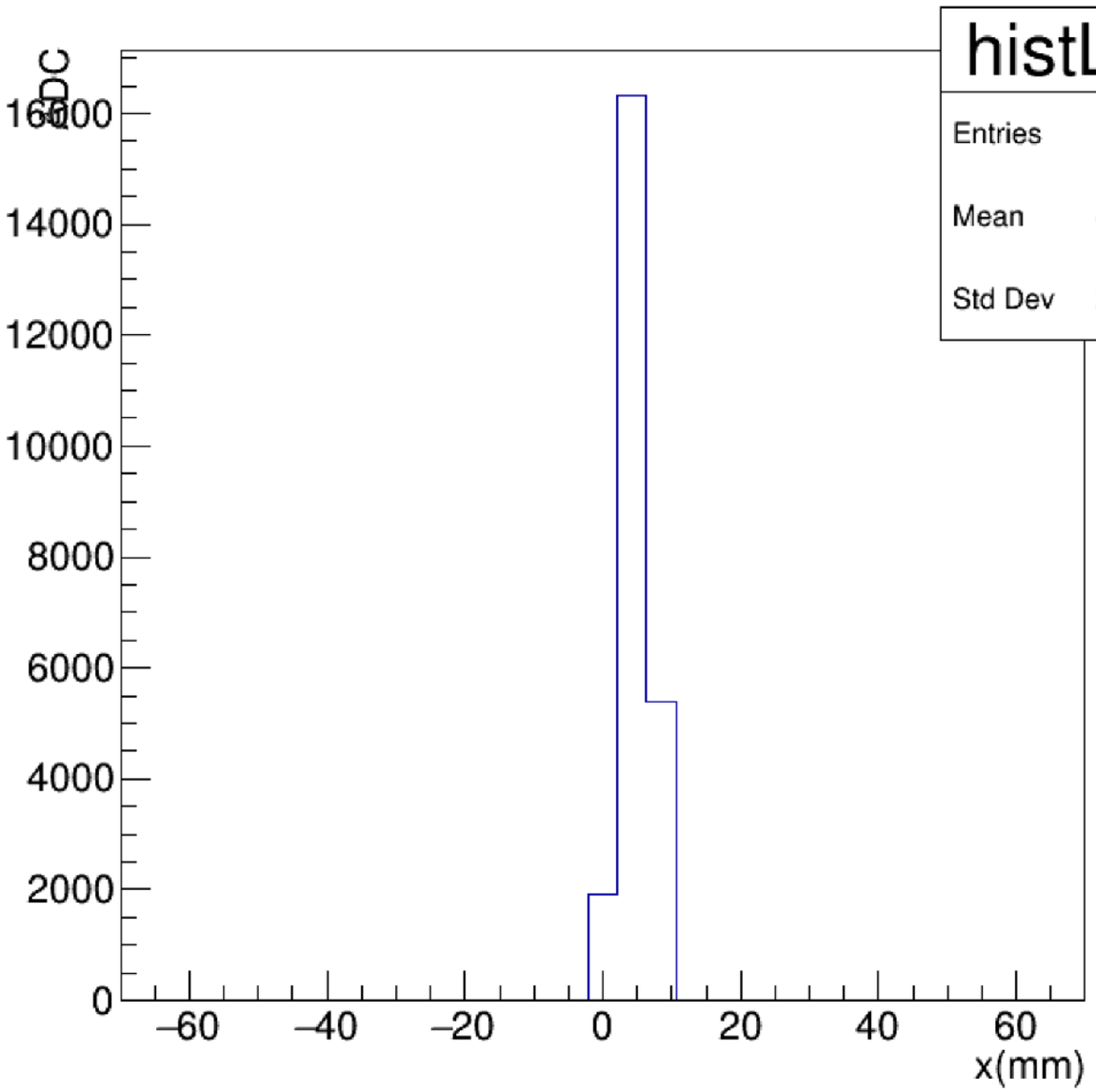
PadPlane

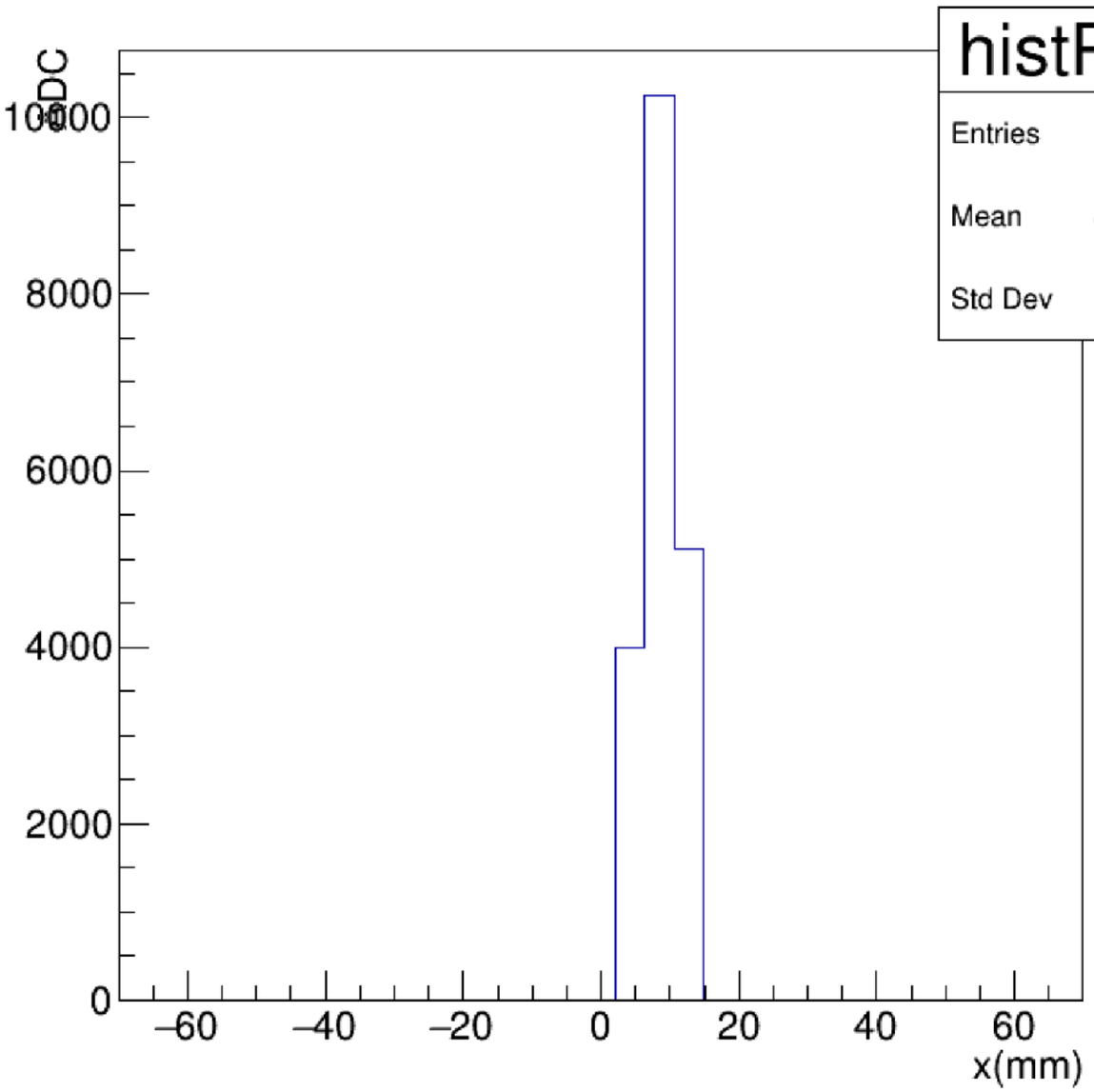


Direction of the beam is z-direction. (heading to right direction)

Charge vs x

RunID = 117 & 11th event.

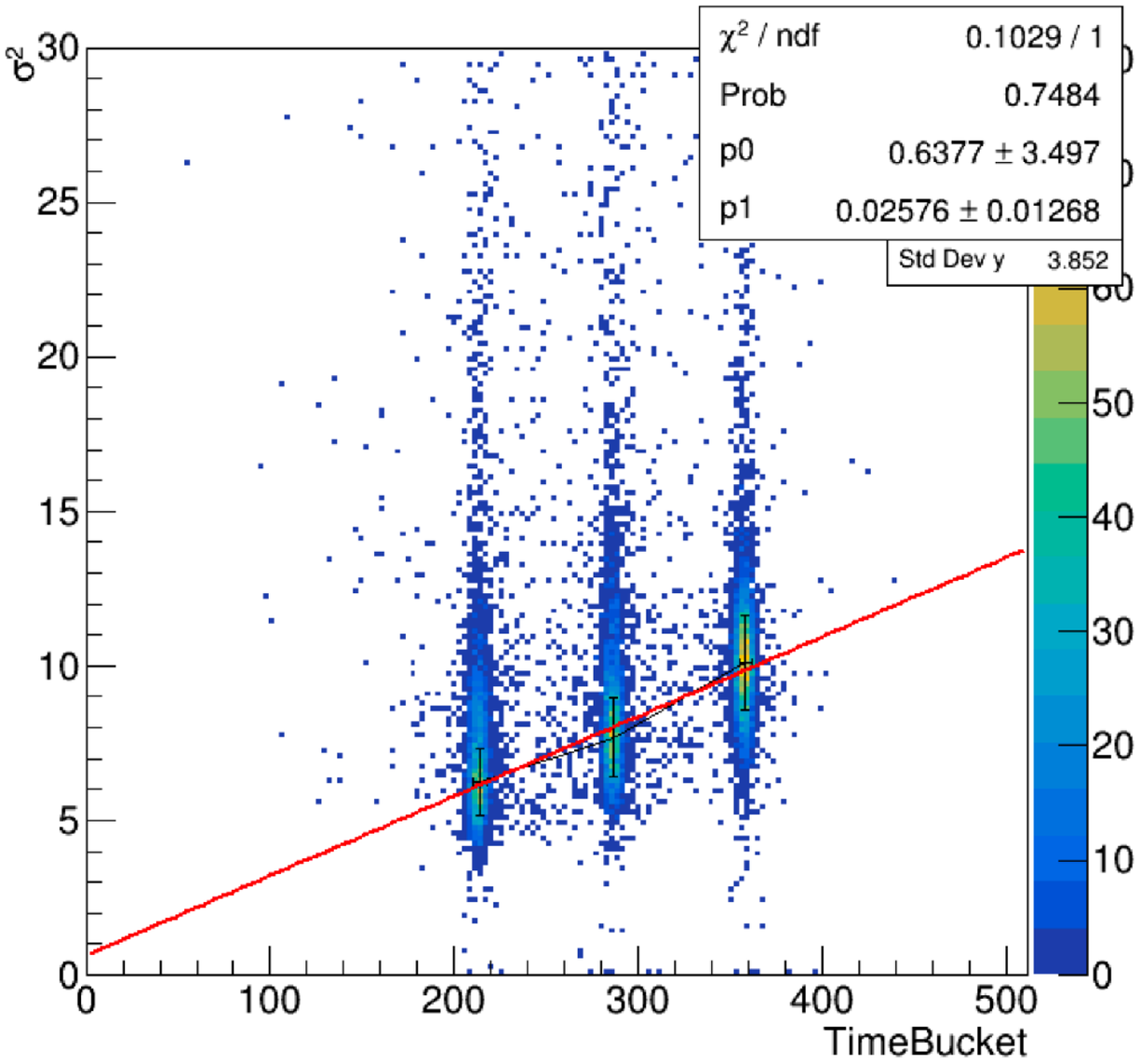


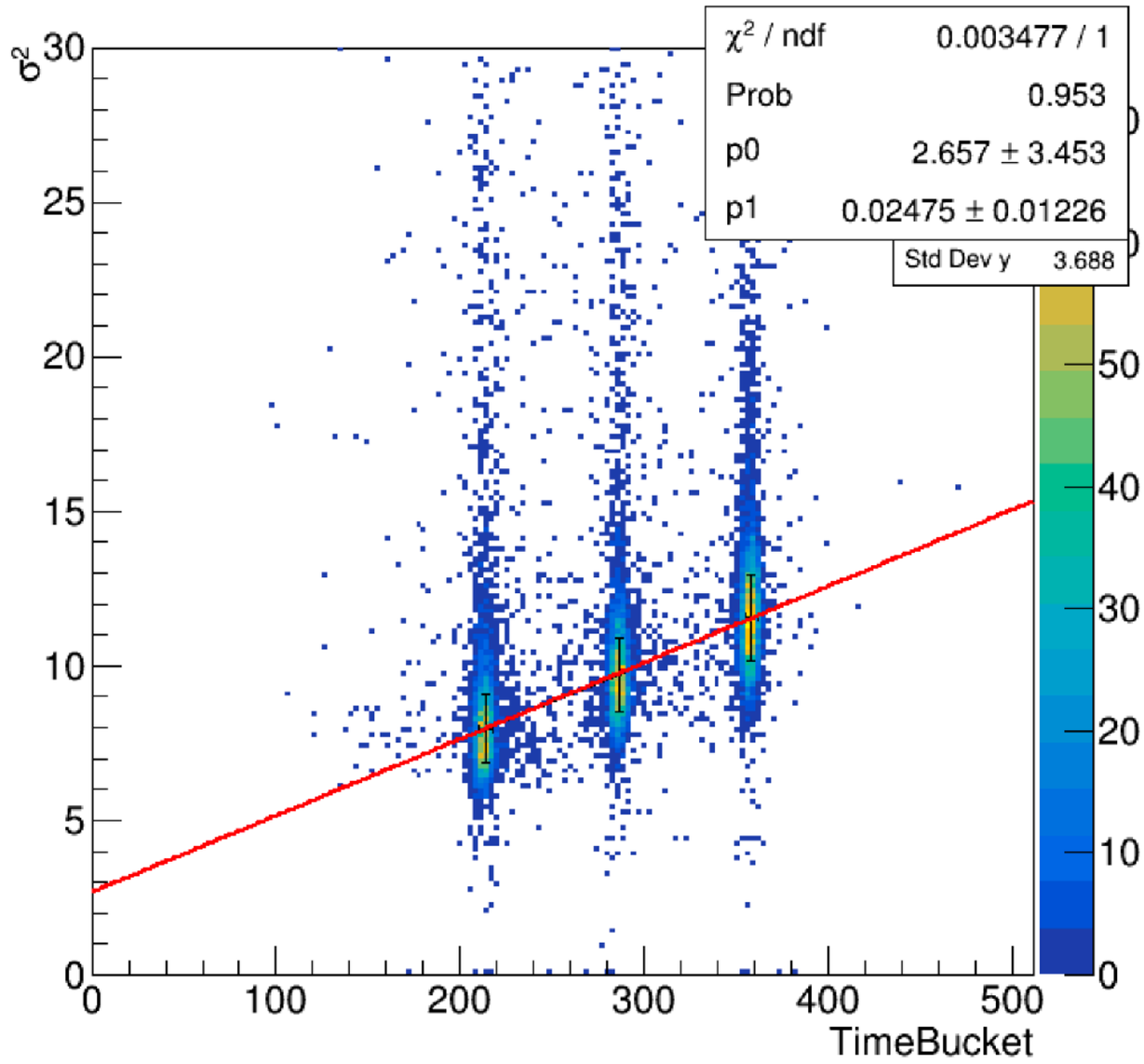


The sigma values of these histograms are used to get the diffusion coefficient D.

σ^2 vs Drift distance

Run IDs are 117, 110, 103 from the left to right





TimeBucket will be changed into the drift distance to get the exact diffusion coefficient.