SuperB DCH weekly meeting
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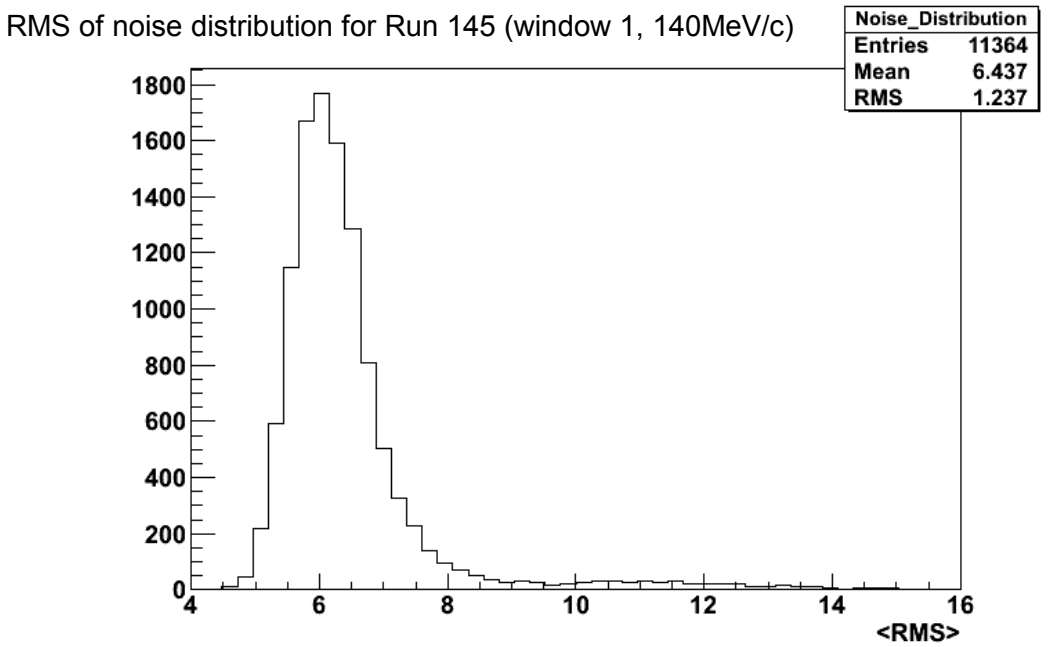
TRIUMF testbeam data

- Using TRIUMF single wire test chamber in electron/muon/pion M11 beam, we suspect that the muon/pion resolving power is limited by S/N
- Data at different HV settings was not taken, but data was taken at various Z values, which have different signal sizes.
- Use that data to see if Nov testbeam is S/N limited

Noise Study

Looked at empty events.

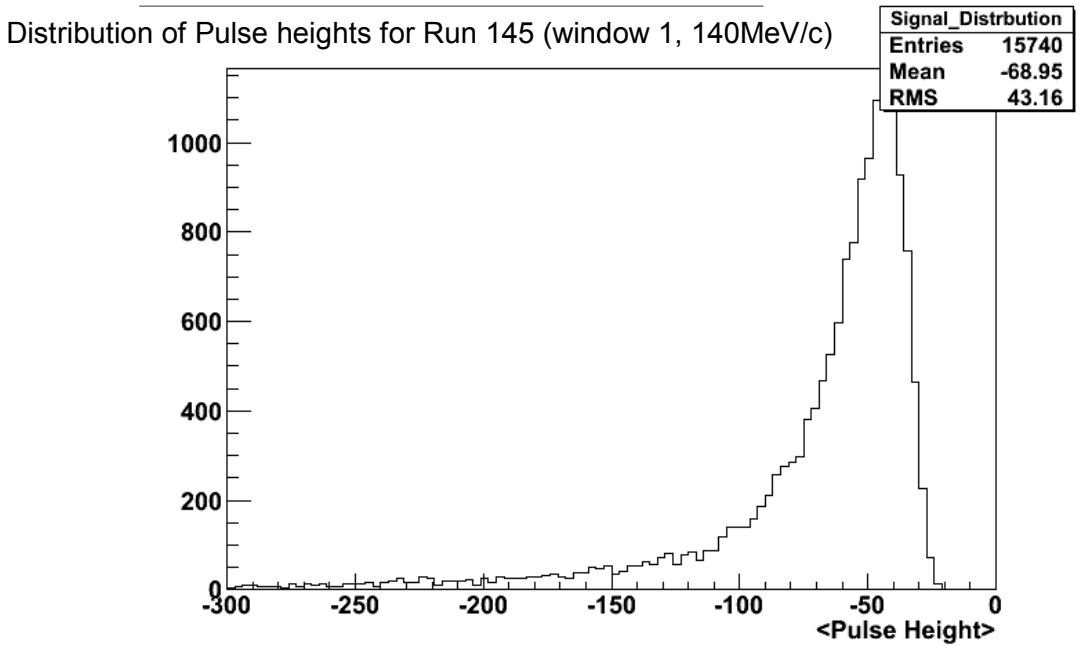
- Created histogram of the pulse heights of each bin in an event
- RMS recorded for each event, added to histogram for run



Signal Study

Removed empty events

- Created histogram of the pulse heights above 2xRMS of each bin in an event
- Mean recorded for each event, added to histogram for run



Signal and Noise

Determined signal and noise for several runs:

140MeV/c, Terminated, 90He 10Isobutane

run	Window	<RMS> (noise)	<PH>	<PH>/<RMS>
153	-2	6.41	-43.24	-6.75
151	-1	7.33	-49.11	-6.7
169	0	5.33	-43.24	-8.11
145	1	6.44	-68.95	-10.71

140MeV/c, NOT Terminated, 90He 10Isobutane

run	Window	<RMS> (noise)	<PH>	<PH>/<RMS>
171	-2	6.61	-66.5	-10.06
170	0	6.17	-60.66	-9.83

Notice poor S/N

Chamber Schematic

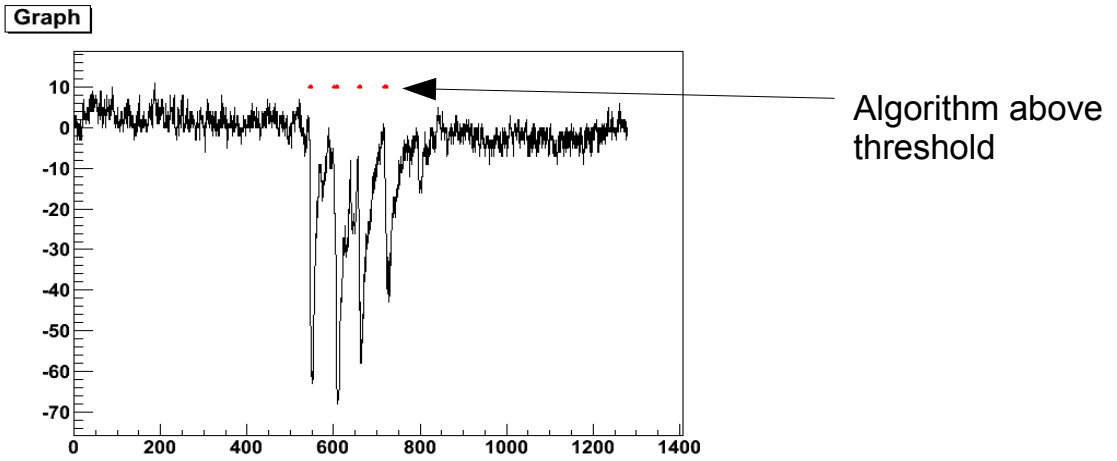
Preamp	Window 2	Window 1	Window 0	Window -1	Window -2	High Voltage

Cluster counting Algorithm

Algorithm takes the difference between a bin and the average of previous n bins

$$a_i = v_i - \frac{\sum_{j=1}^{n} v_{i-j}}{n}$$

If a_i is above a certain threshold, a cluster is detected, as long as a_{i-1} is below threshold



Cluster Counting

Cluster distributions were computed for muons and pions at various thresholds and n

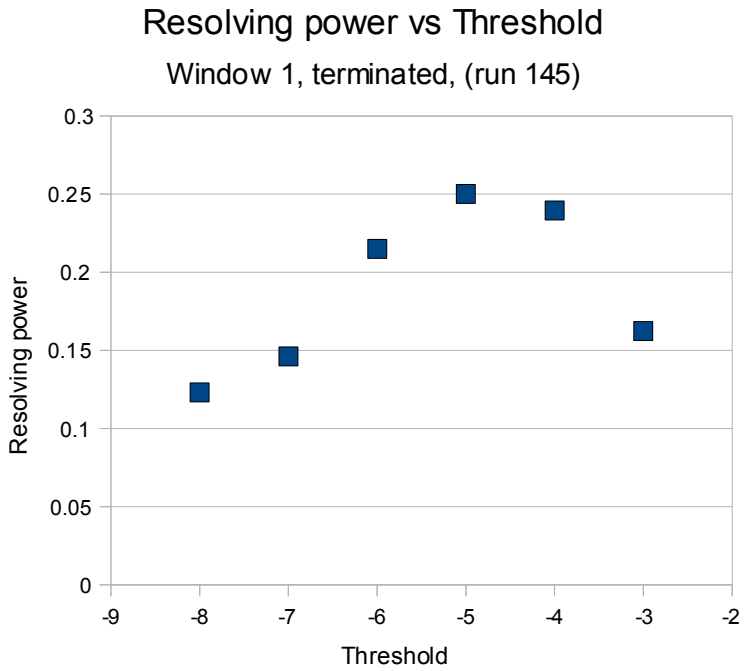
Resolving power computed:

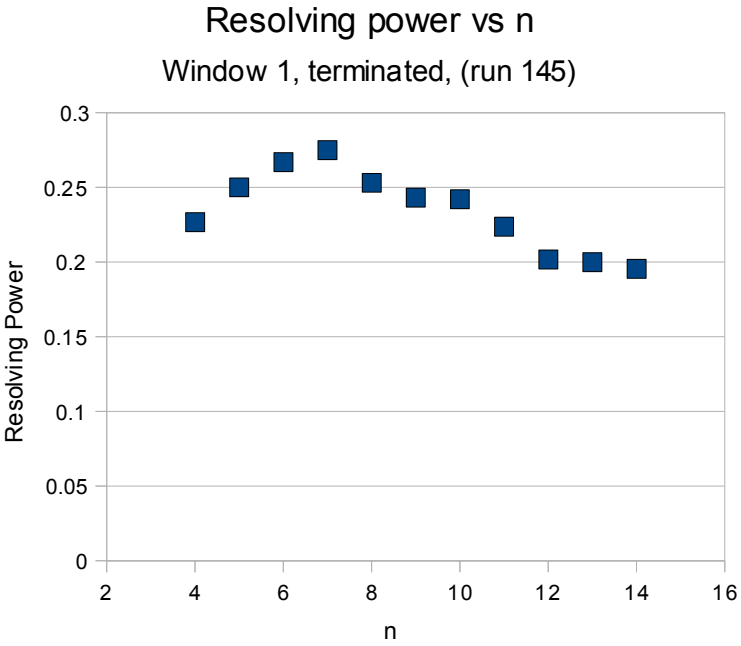
$$\text{Resolving power} = \frac{(\pi_{mean} - \mu_{mean})}{\sqrt{\pi^2_{RMS} + \mu^2_{RMS}}}$$

Cluster Counting

Threshold was varied while n was held at 5 and a peak in the resolving power was found at -5

n was then varied while the threshold was held at -5





Summary

Terminated, 140 MeV/c

Preamp Window	2	1	0	-1	-2
Resolving Power		0.28	0.15		0.04
<PH>/<RMS>		-10.71	-8.11		-6.75

NOT terminated, 140 MeV

Preamp Window	2	1	0	-1	-2
Resolving Power			0.17		0.19
<PH>/<RMS>			-9.83		-10.06

S/N too low for cluster counting?

Conclusion

- Clear correlation between S/N and resolving power – resolving power is limited by S/N
  - Increase gas gain to improve S/N
  - Terminating wires does not improve S/N and resolving power much
- Next steps:
  - Compare S/N of electrons in TRIUMF chamber at M11 with S/N of electrons in Proto2 from LNF testbeam
  - Expect to see higher S/N in LNF testbeam
  - Determine what gas gain is needed