What's the Question?

- Spending fewer clock cycles to readout only 7 bits of data from the SVX3D is faster than spending more clock cycles for 8 bits. How much? Ask Gino.

- Going from an 8-bit measurement of the charge to 7-bits effectively cuts your dynamic range in half

- What effect does this have on the quality/efficiency of the data?

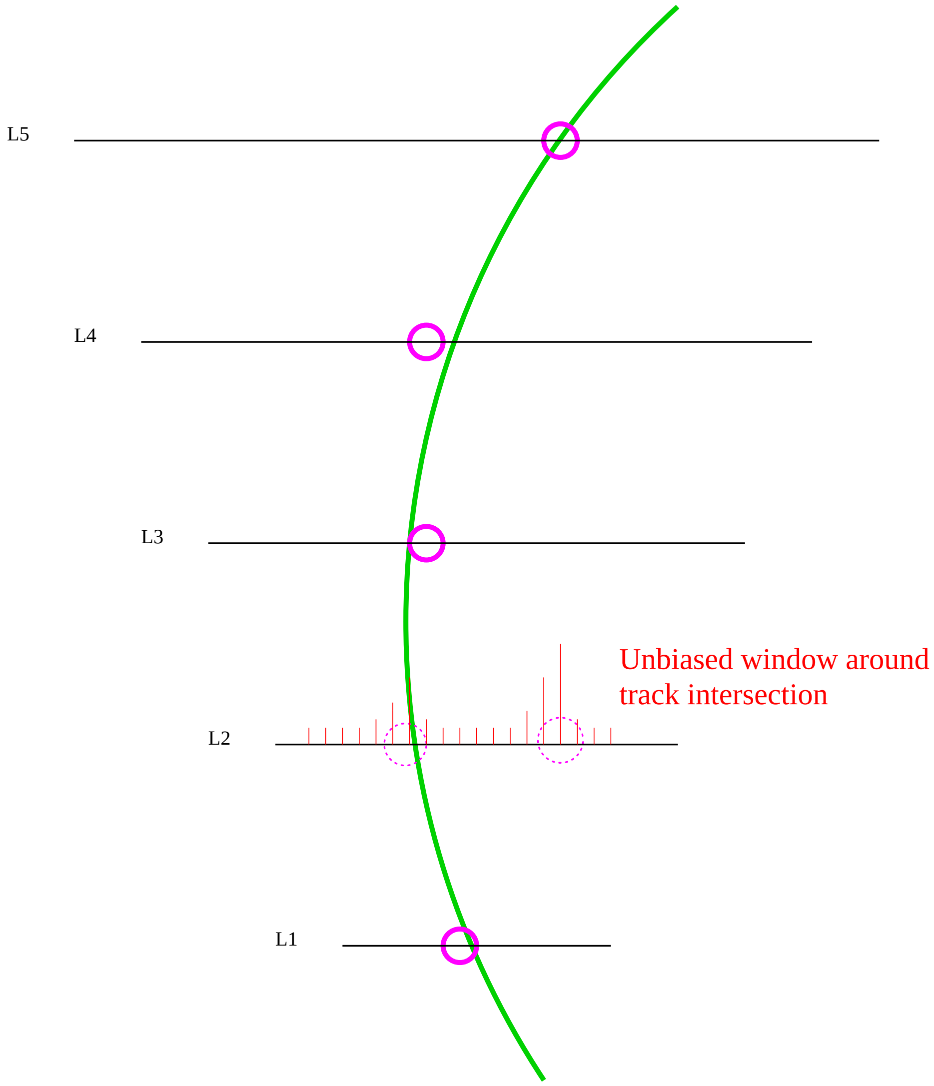
What's the Question?

- What is the effect on the cluster efficiency?
- How often do we saturate?
- Where does this happen (eg, η)?
- How does it affect resolution? (Needs more study)

Clustering Efficiency

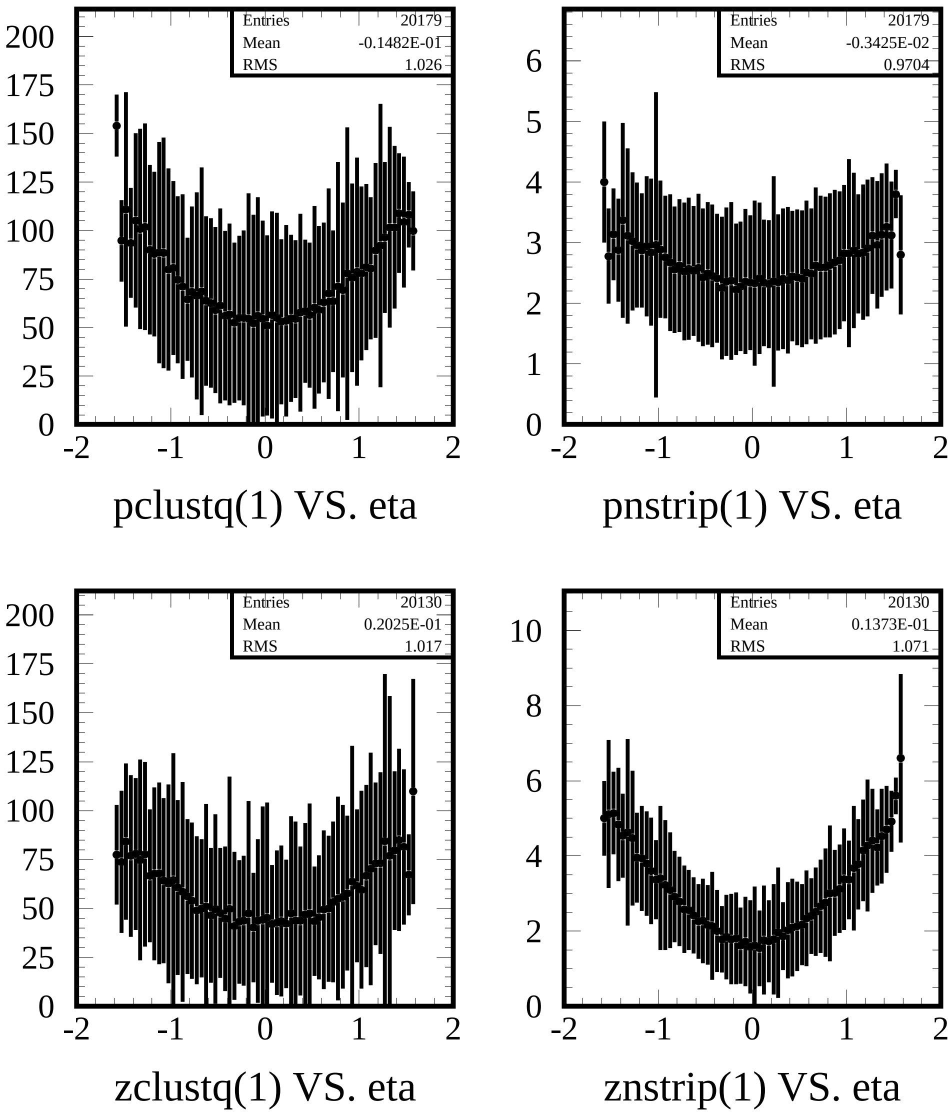
- Currently, saturated strips are marked as “bad” in the offline code, but they are nevertheless still readout by the DAQ!
- It’s a trivial change to not kill these strips in clusters, so there is no problem of “efficiency” to make clusters
- The problem lies elsewhere...

Tool Used to Study These Questions



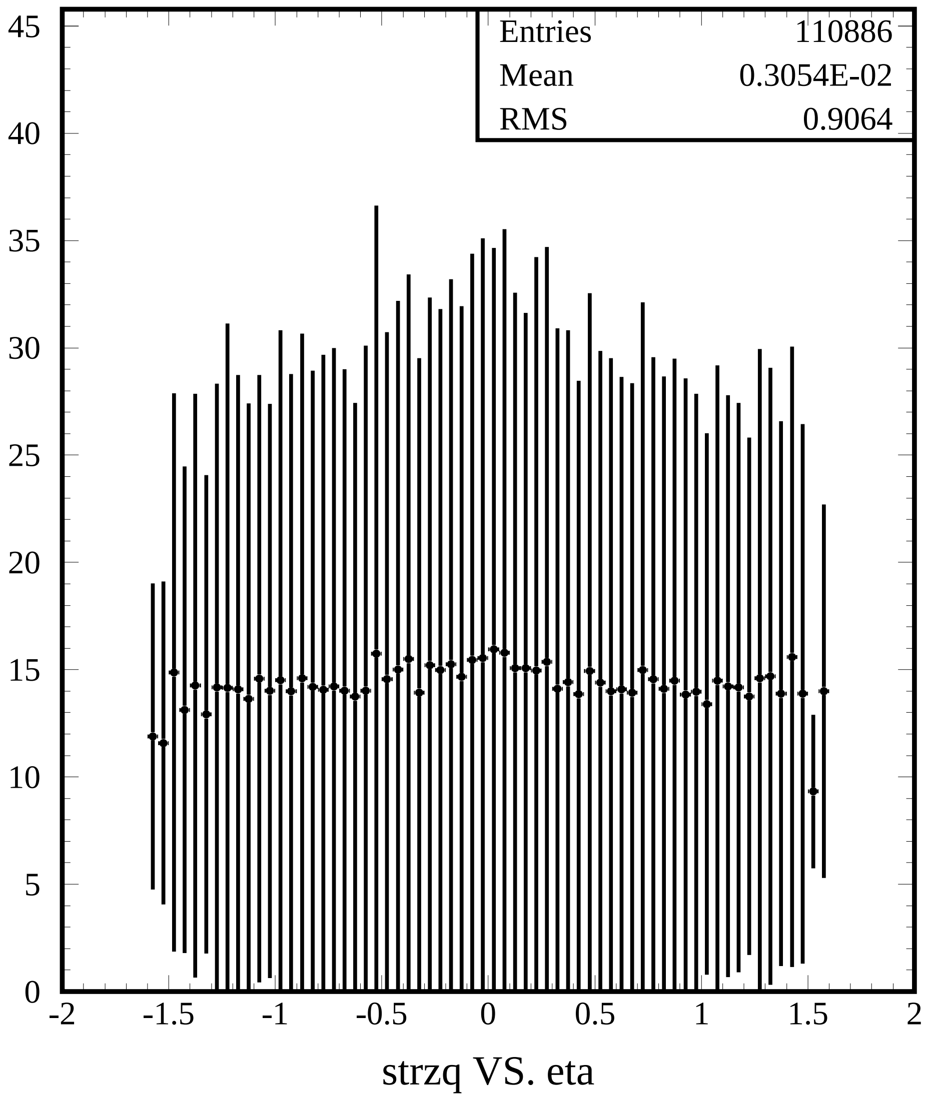
Use SiStudiesGroup ntuple which makes ntuple of all strips and clusters around a window of each track intersection. This layer is left out of pattern rec and reconstruction.

How Often Do We Saturate a Strip?



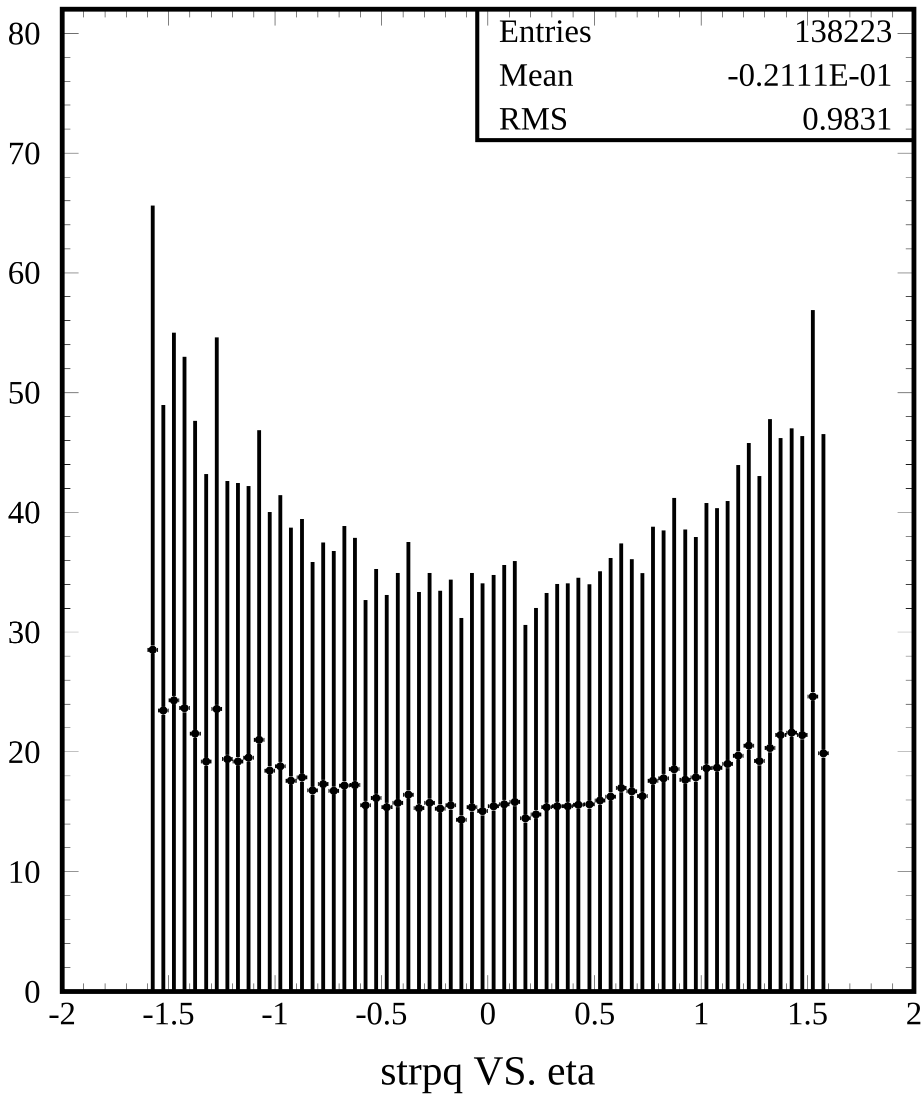
Ped subtracted $Q_{\rm clus}$ is function of angle & δ-rays

How Often Do We Saturate a Strip?



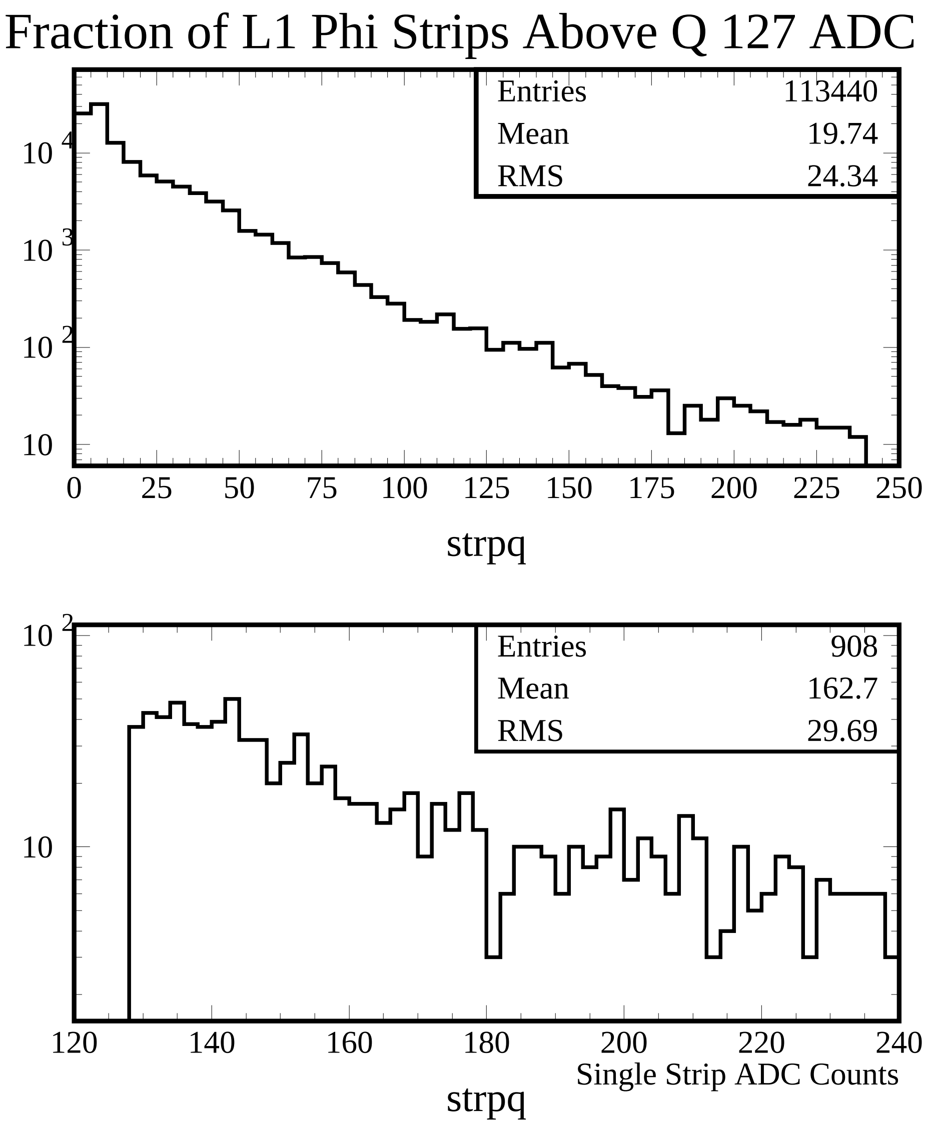
RAW Q_{strip} NOT strong function of η for 90°-strips

How Often Do We Saturate a Strip?



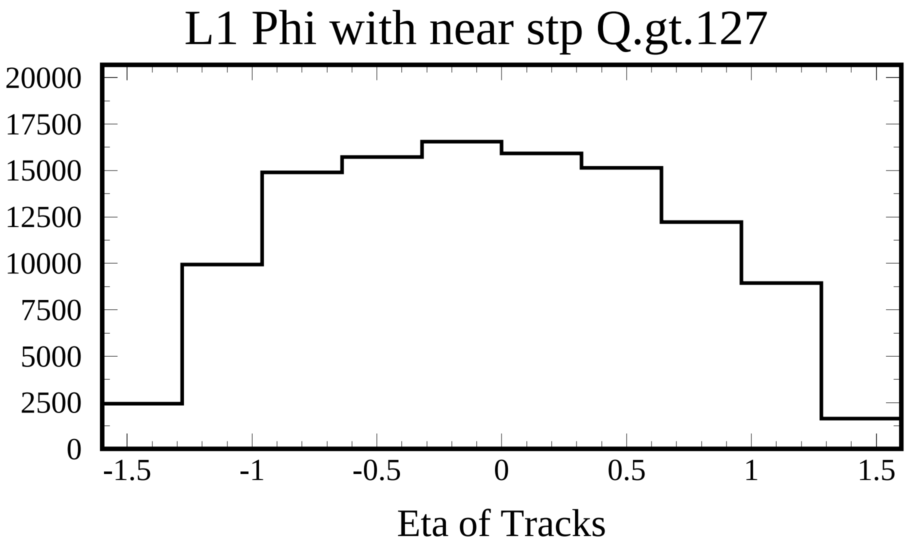
RAW Q_{strip} IS function of η for phi-strips

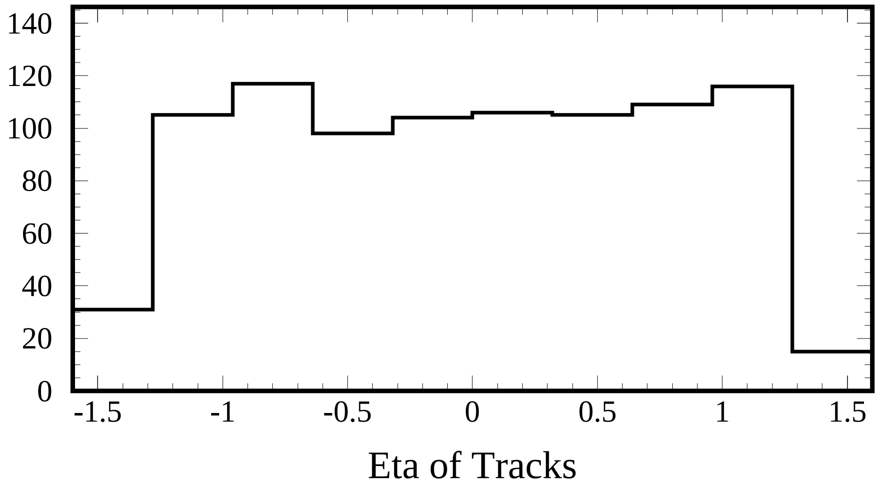
How Often Do We Saturate a Strip?



0.8% of all "physics" ϕ-strips in L1 above 127 ADC counts

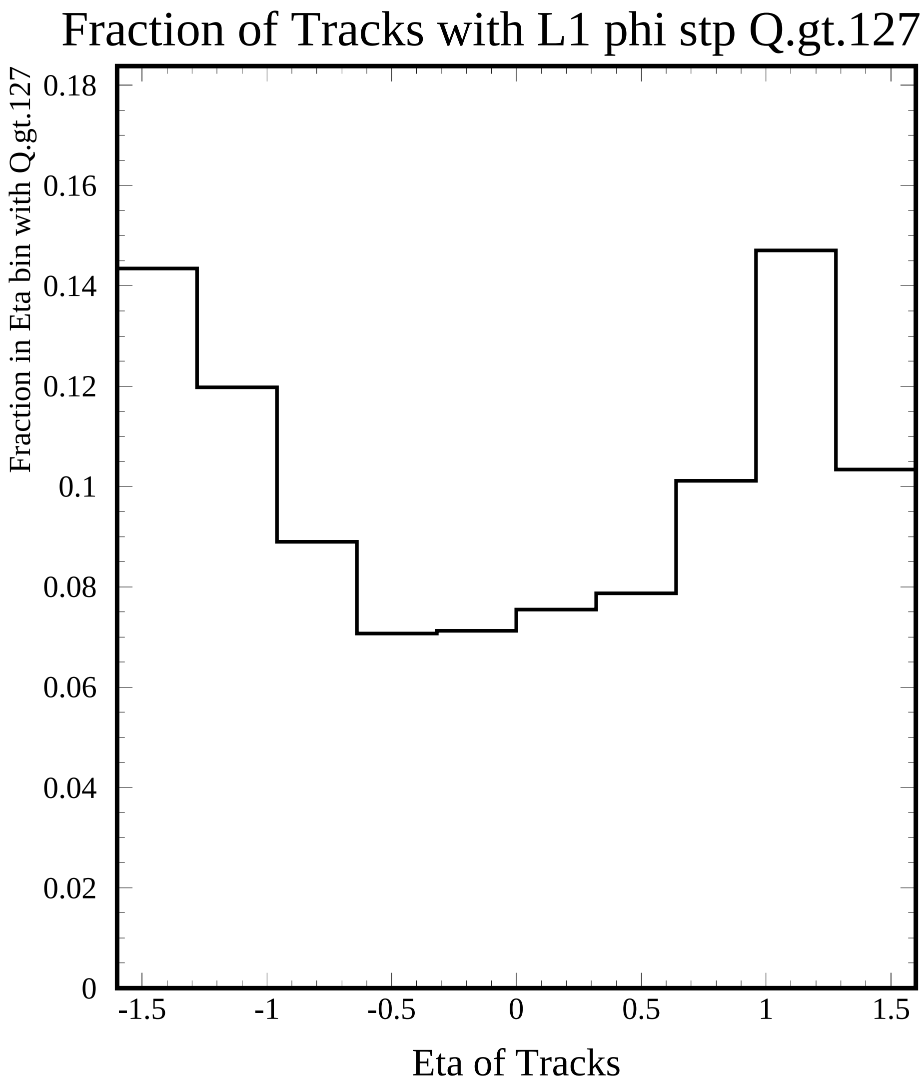
Where Does This Happen?





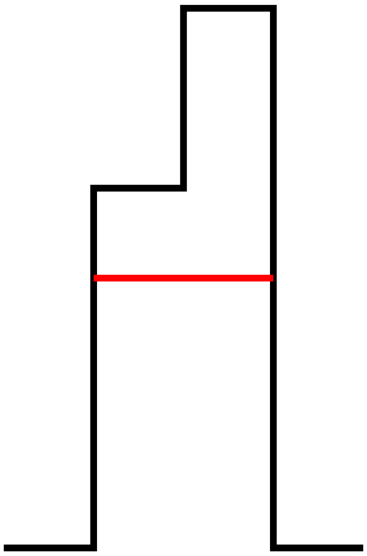
- η of all tracks in L1 sample
- η of tracks with ϕ-strip above 127 ADC

Where Does This Happen?



- Ratio of tracks with ϕ-strip above 127 ADC to all tracks
- Central due to δ-rays, wings due to angle$+\delta$

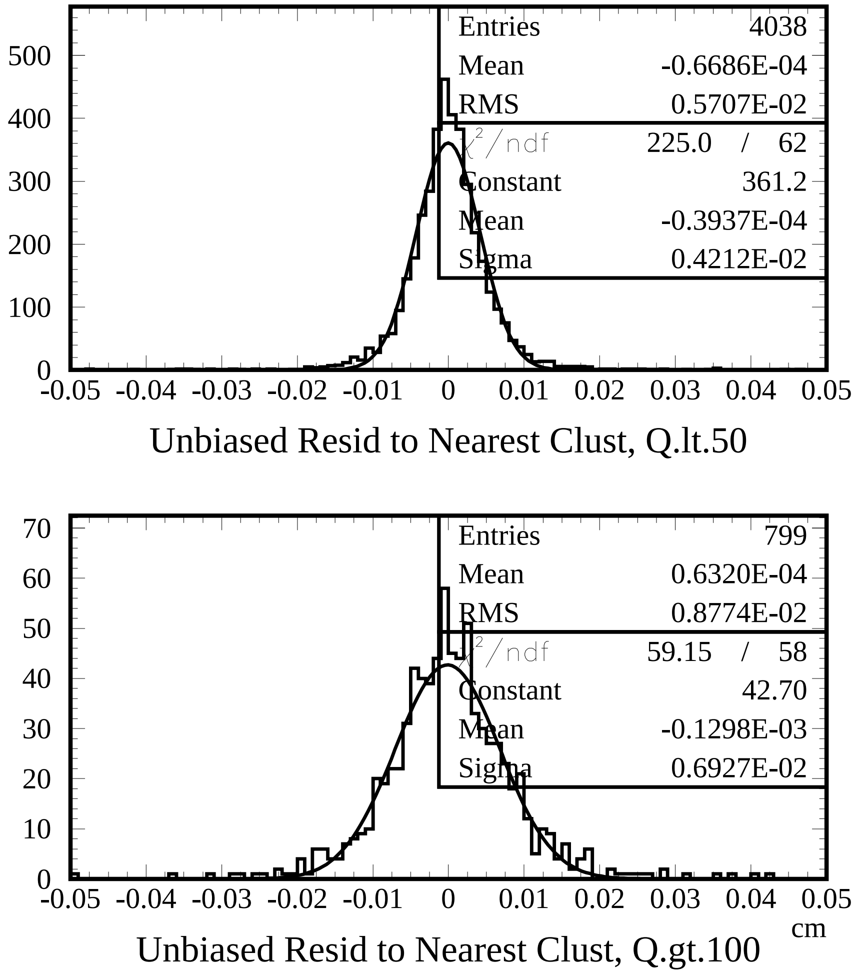
How Does It Affect Resolution?



- Worst-case is when 2-strip cluster gets both strips clipped
- Go from $\sim 9.5\mu\mathrm{m}$ to $\sim \frac{2\times 60\mu\mathrm{m}}{\sqrt{12}} \approx 35\mu\mathrm{m}$ intrinsic resolution for axial SVX

δ-rays Are Worse!

Unbiased Resid at L1 for Hi,Lo Chg Clusters



- Diff in unbiased resid at L1 for clusters with big/small Q for $|\eta| < 0.5$ with current clustering and 8-bit ADC

- δ-rays adding something like $\sim 45\mu\mathrm{m}$ in quad

Conclusions

- Real study of resolution loss should be done (by someone else)
- Chance to have good “physics” strip above 127 ADC counts quite low, $< 1\%$ for L1 ϕ-side (for tracks $|\eta| < 1.5$)
- Probably doesn't hurt SVX much to go to 7-bit mode
- If you can shave the time off something else, would be better SINCE 7-BIT MODE IS LOSSY