

# Tracking efforts in TPC/iTPC groups

Tracking Focus Group Meeting



Irakli Chakaberia

Yuri Fisyak

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# Outline

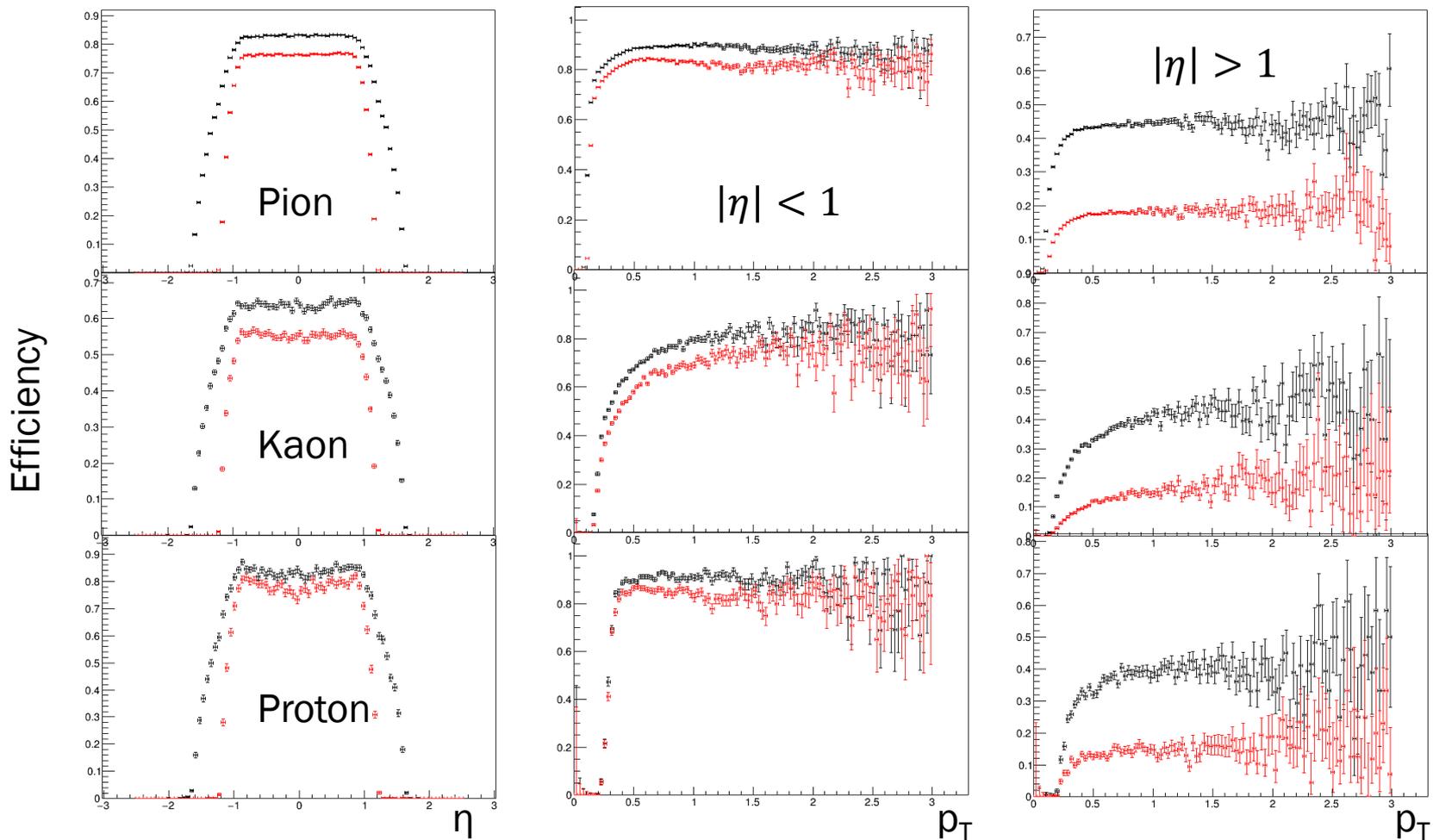
- ☞ Tracking efforts within iTPC upgrade project
- ☞ Tracking effort independent of iTPC
- ☞ New ideas that may prove efficient in the light of the new iTPC

# Tracking with new iTPC

- ✎ The simulation study has been performed for different new geometry designs (devT\*) and compared to old one (y2011/2014).

Geometry	devTA	devTB	devTC	devTD	devTE	devTF	y2011
# of Padwors	32	40	40	32	50	32	13
Pad Size[cm×cm] [width × length]	0.67×2.0	0.67×1.6	0.5×1.6	0.5×2.0	0.335×1.2 8	0.4×2.0	0.335×1.1 5
# of Channels	2162	2572	3496	2762	6494	3456	1750

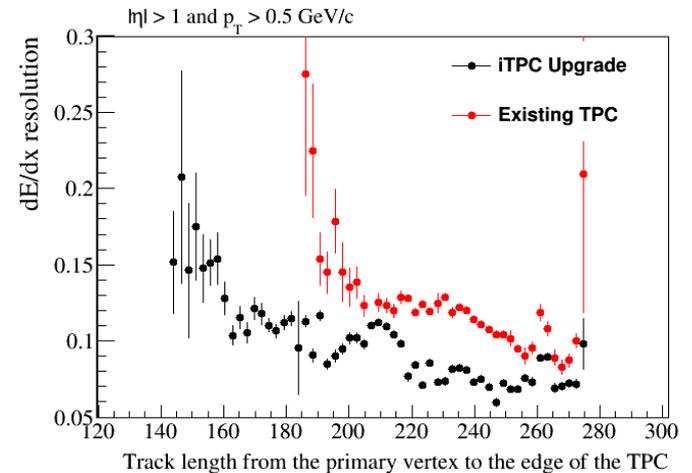
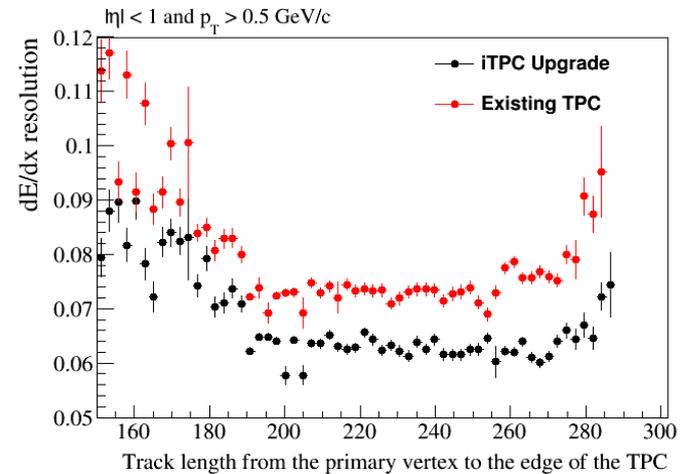
# Efficiency Comparison **current** vs. upgraded



# $\frac{dE}{dx}$ Resolution

∞  $\frac{dE}{dx}$  resolution depends on the number of  $\Delta E/\Delta x$  measurements we make for the track.

∞ Therefore more padrows will naturally yield a better  $\frac{dE}{dx}$  resolution.



# Momentum Resolution

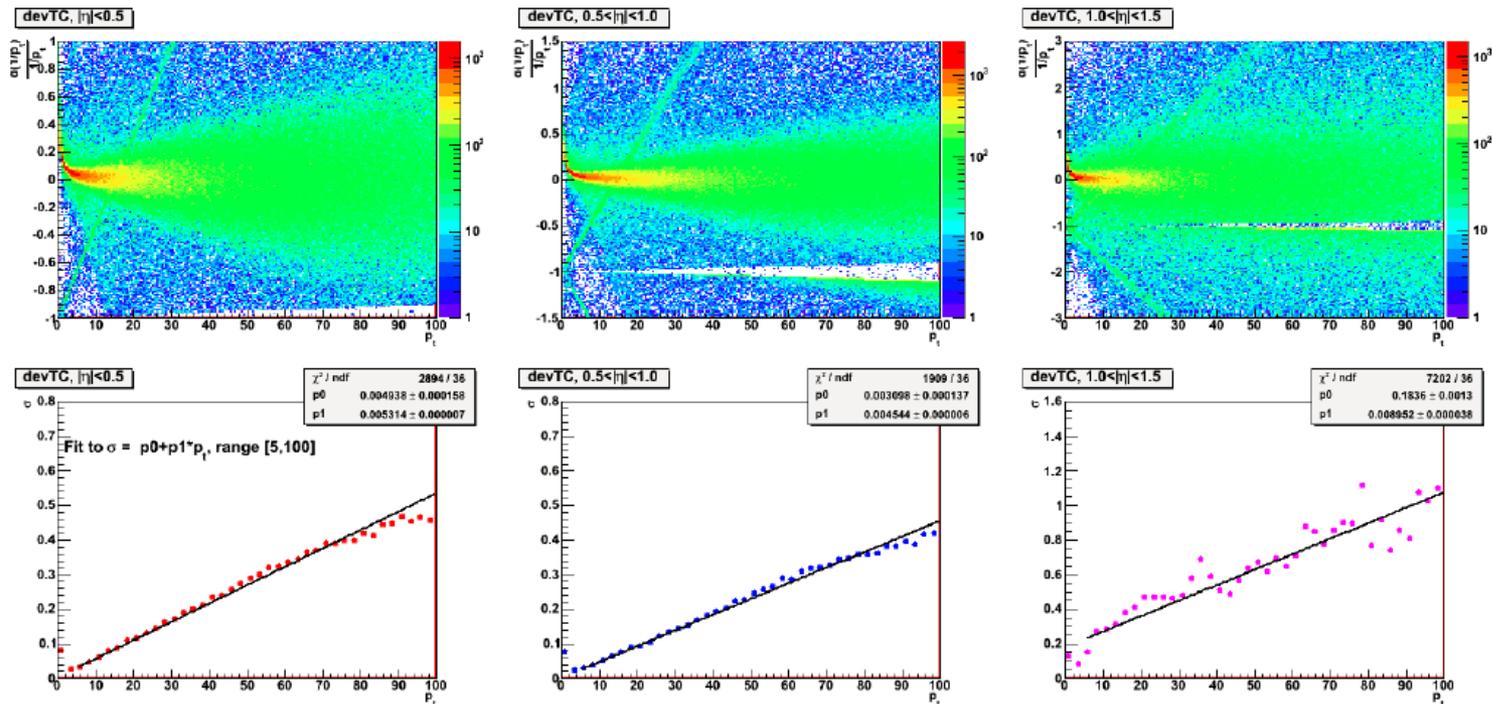
- High  $p_t$  pion sample was generated to study the momentum resolution:

$$\left(\frac{\sigma_{p_T}}{p_T}\right)^2 = (\sigma_{res})^2 + (\sigma_{ms})^2; \sigma_{res} = p_0; \sigma_{ms} = p_1 \times p_T$$

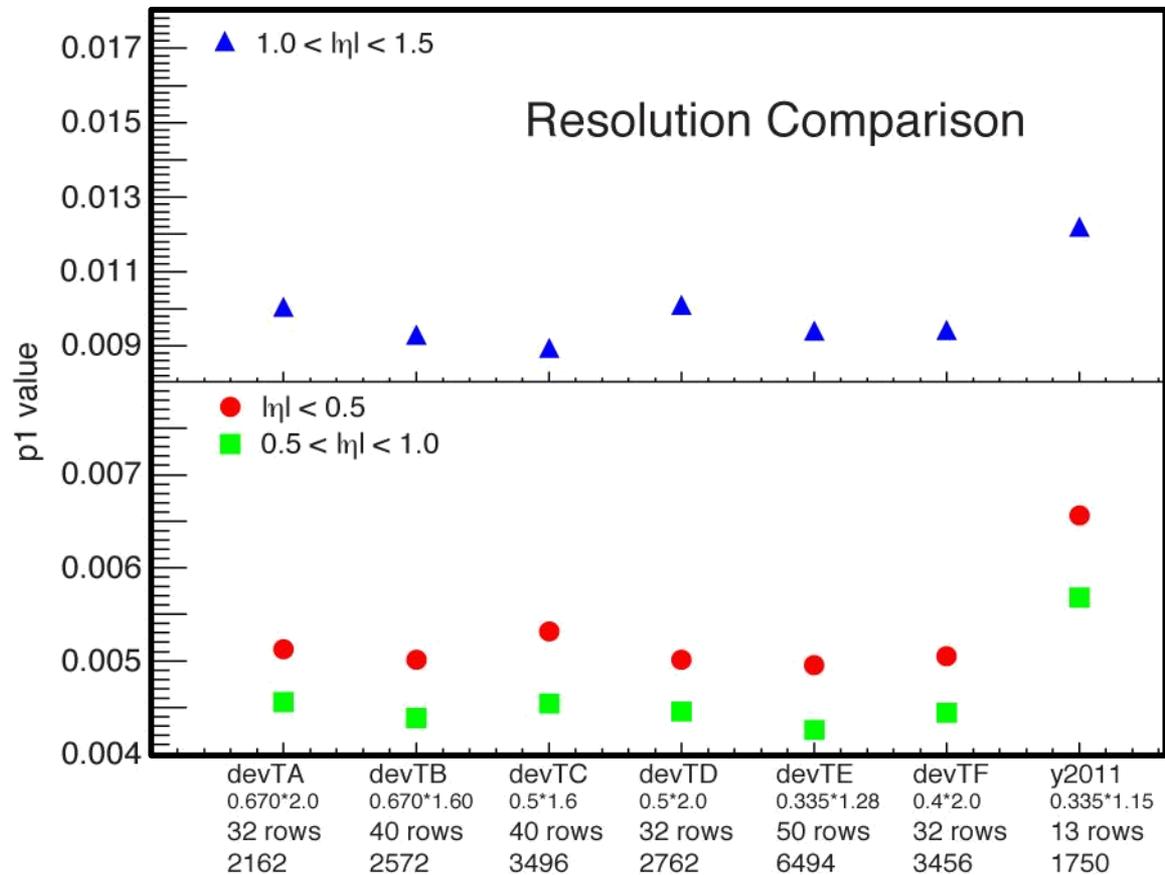
- Histograms below show  $\frac{1/p^{RC} - 1/p^{MC}}{1/p^{MC}}$  vs.  $p_T$ .

- Gaussian sigma for each  $p_T$  bin is fitted to extract  $p_1$  value

- The measure of the momentum resolution is shown as proportionality between the  $p_t$  of the particle and  $p_t$



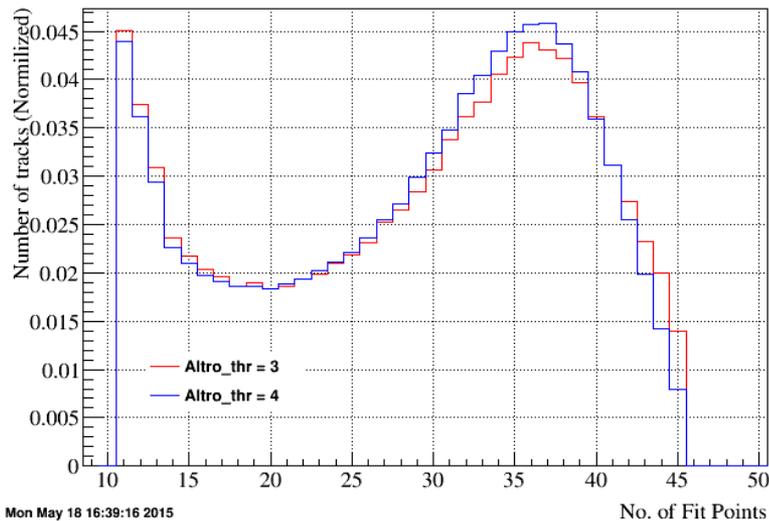
# Momentum Resolution



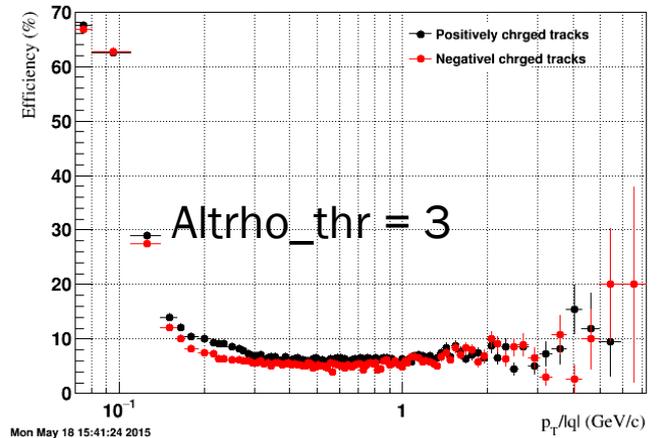
# Altro threshold change effect in SIMULATION

- ☞ Tonko proposed to increase the threshold of the ALTRO readout to use TPC bandwidths more efficiently
- ☞ Deadtime analysis by Tonko showed about 15% less deadtime with higher threshold
- ☞ We looked at the effects of such change in the threshold
- ☞ Simulation shows that no significant difference

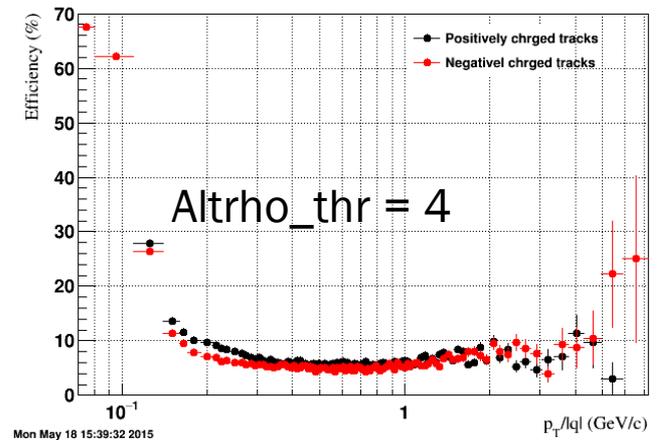
$$\langle N_{\text{trk}}^{\text{thr}=3} \rangle = 28.82, \langle N_{\text{trk}}^{\text{thr}=4} \rangle = 28.77$$



Lost wrt Geom for Global Tracks vs  $p_T/|q|$  (GeV/c) at  $|\eta| \leq 1.0$  at  $p_T > 0.11$

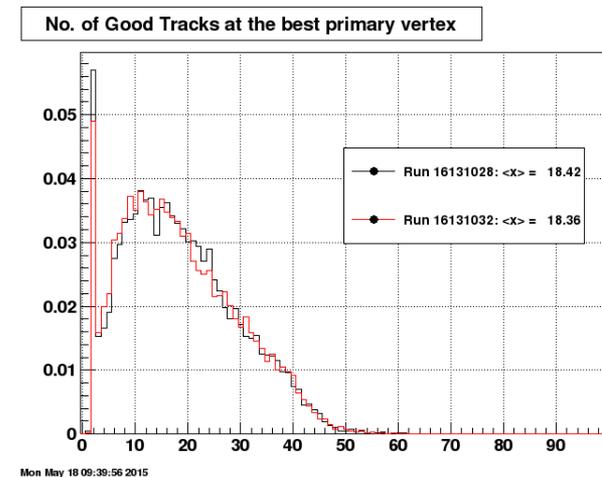
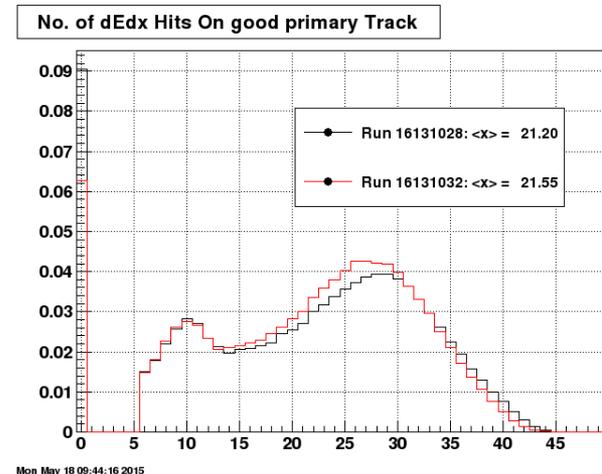
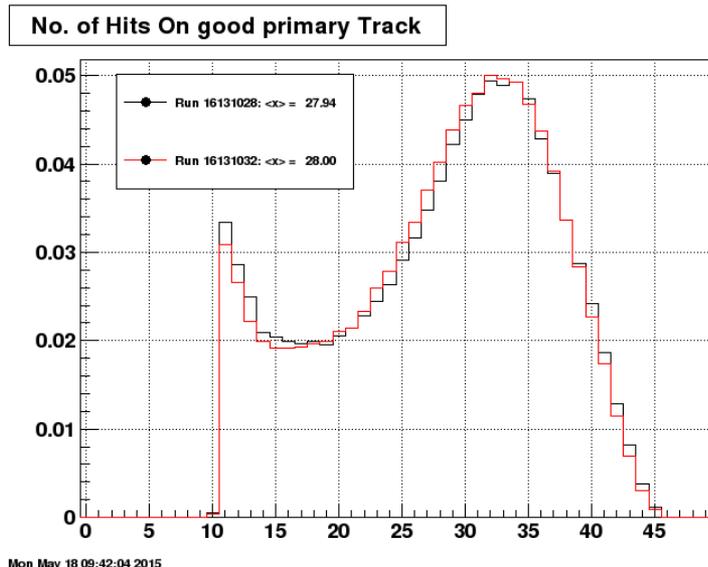


Lost wrt Geom for Global Tracks vs  $p_T/|q|$  (GeV/c) at  $|\eta| \leq 1.0$  at  $p_T > 0.11$



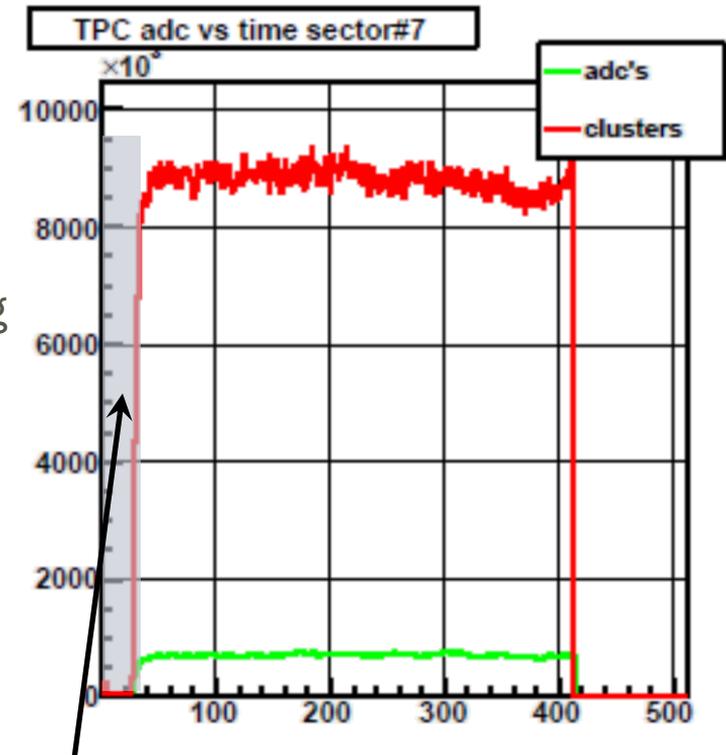
# Altro threshold change effect in DATA

- ☞ We had a test run with p-Au to with increased threshold to see the effect
- ☞ Data shows no significant difference either



# Keeping Gating Grid Open Longer

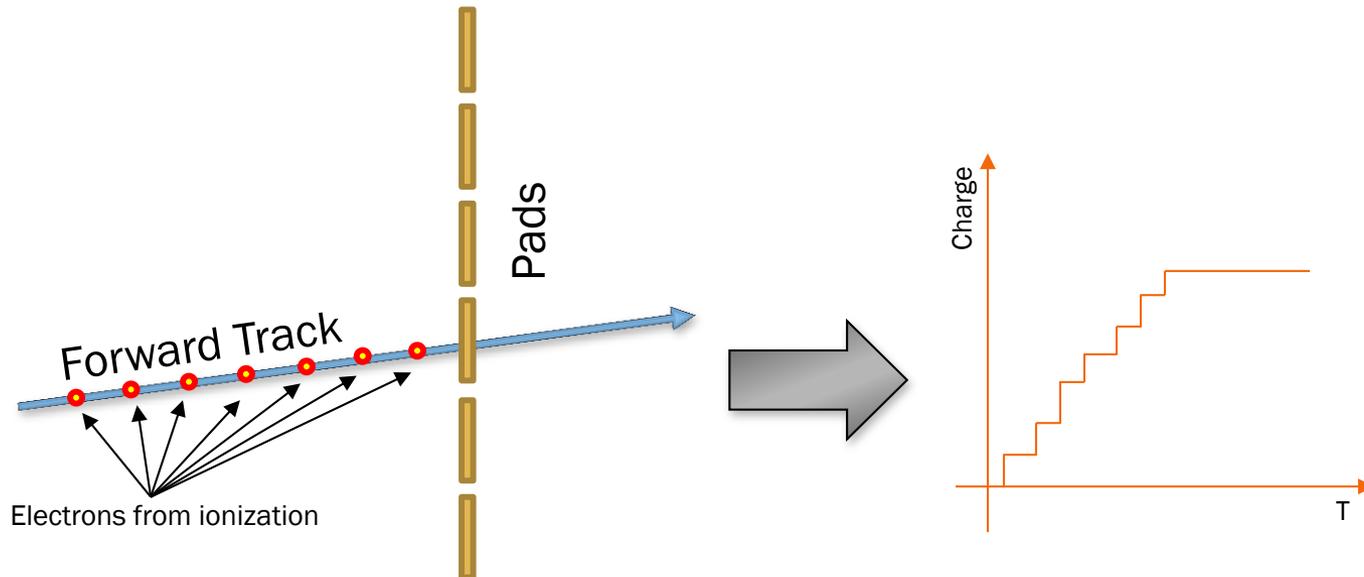
- ∞ Another idea for more efficient TPC use is to keep gating grid open longer.
- ∞ This will eliminate the time needed for the gating grid to open thus effectively increasing the length of TPC by ~10 cm.



Lost time during GG opening

# Use Time Buckets for Track Reconstruction

- ⌘ Upgraded iTPC will have almost no gas between pad thus collecting all the charge going through the sector.
- ⌘ Even though forward tracks will not traverse minimum number of pad rows required of the track quality but there is a possibility of splitting the collected charge into individual time buckets and utilize for track reconstruction.



# Summary

- ☞ iTPC upgrade related changes of tracking studied using simulation;
- ☞ ALTRO threshold increase effects measured on data and simulation;
- ☞ Keeping gating grid open longer to increase efficiency of data collection;
- ☞ Track reconstruction using individual time buckets;
  
- ☞ More ideas...? (reconstructing loopers...?)