Gamma-ray Large Area Space Telescope

Study of the redundancy in the TKR readout: 2 towers analysis

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Redudancy in the TKR readout

Outline

Data samples: 2 towers runs

Event Selection

Hit maps per layer

Comparison of

Angular distributions,

Hit multiplicity and ToTs

for runs readout by

LEFT/RIGHT cables only with those read out from both cables

Conclusions
Data samples: 2 towers configuration

Runs analyzed:

• 135002057 (right run);
• 135002103 (left run);
• 135002052 (baseline run – both cables readout)
Hit maps (bottom - Tower 0)
Hit maps (centre - Tower 0)
Hit maps (top - Tower 0)
Event Selection

Events triggered by TKR in Tower0/Tower4
Cut1 = GemTkrVector[0/4] ==1 && GemTkrVector[4/0] ==0
and trigger from 3 consecutive layers:
Cut2 = Cut1 && GemCondWord ==2 \hspace{1cm} (50\% of events selected)

Single muon tracks in the TKR:
Cut3 = Cut1 && TkrNumTracks == 1 \hspace{1cm} (40\% of events selected)

To select MIPs we used the CalMIPRatio variable
Cut4 = Cut2 && (CalMIPRatio < 1.3 && CalMIPRatio > 0.6)
&& CalNumHit[4]==0 \hspace{1cm} (10\% of events selected)

Normal tracks selected
Cut5 = Cut3 && VtxZDir < -0.95 \hspace{1cm} (3\% of events selected)
Arrival directions: events vs $\cos(\theta)$

No significant differences between baseline, left and right cables readout.
Arrival directions: events vs $\varphi$

No significant differences between baseline, left and right cables readout.
Hit Strip Multiplicity

No significant differences between baseline, left and right cables readout.
Hit strip multiplicity vs $\cos(\theta)$

The strip multiplicity is minimum for vertical tracks and increases with track length.
Hit strips multiplicity vs $1/\cos(\theta)$

The hit strips multiplicity increases linearly with $1/\cos\theta$. 

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There is a difference between the hit multiplicity in Tower 0 and Tower 4, but the behavior is the same.
Average ToTs vs $1/\cos(\theta)$

There is a difference between the ToT in Tower 0 and Tower 4, but the behavior is the same of hit strip multiplicity.

The ToT increases linearly with $1/\cos\theta$ as hit strip multiplicity.
Average ToT$\bar{s}$ vs $1/\cos(\theta)$
ToT vs $\varphi$

There is a difference between the $<\text{ToT}>$ in Tower 0 and Tower 4 (baseline run)
There is no difference between the $\langle\text{ToT}\rangle$ in Tower 0 and Tower 4 with TKR readout in different configuration (baseline run left-right run).

There is a difference between the $\langle\text{ToT}\rangle$ in Tower 0 and Tower 4 (baseline run).
There is a difference between the $\langle\text{ToT}\rangle$ in Tower 0 Layer 15 when read out by left or right cables in baseline configuration.

No difference when we use left or right readout, separately (left-right run)
Average ToTs vs layers (3)
Single hit strips per layer

ToT value of the layer assigned to selected hit strips

We made an average ToT map (ToT vs strip) layer by layer
ToT map (central layers)
ToTs from the right side of the layer (strip 768-1535) seem to be lower than the left one.
Conclusions

Angular distributions, hit multiplicity and ToT have been compared for different TKR readouts in the 2 towers configuration.

The results in the 2 tower configuration are the following:

- The Hit multiplicity and ToT depend linearly on $1/\cos\theta$ (track length).
- ToT needs to be calibrated.
- MC comparison: work in progress.