Study of the ToT for Triggering and Track Layers: 4 towers analysis

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ToT in Triggering and Track Layers

Summary

✓ Event Selection and Definitions
✓ Data samples: 4 towers runs
✓ Study of the ToT as a function of $\theta$ ($\rightarrow$ track length in the SSD)
✓ Study of the ToT as a function of the ratio between track length and projected track length
  ✓ Comparison between X-view and Y-view Layers
✓ Conclusions
✓ Some questions…
Event Selection and Definitions

**Event Selection:**

- **Trigger from 3 consecutive layers:** $\text{GemConditionWord} = 2$
- **Single tower events:** $\text{GemTkrVector}[\text{tower}] \neq 0$ for only one tower
- **Single muon tracks in the TKR:** $\text{TkrNumTracks}=1$

*Triggering Layers* = Layers in both views from $\text{GltLayer}$ (First Triggering Layer) to $\text{GltLayer}+2$ (Last Triggering Layer)

*Track Layers* = Layers in both views from $\text{Tkr1FirstLayer}$ (First layer in the track) to $\text{Tkr1LastLayer}$ (Last layer in the track)

$$
\text{ToT} = \begin{cases} 
0 & \text{if both left and right ToT} = 0 \text{ or NA} \\
\text{left ToT} & \text{if right ToT} = 0 \text{ or NA} \\
\text{right ToT} & \text{if left ToT} = 0 \text{ or NA} \\
\text{left and right ToTs} & \text{if both left and right ToTs} > 0 
\end{cases}
$$
Data samples

**Runs analyzed:**

- 135002498; 135002499; 135002500; 135002501

**Events:**

- TWR0: 91076 tracks
- TWR1: 86827 tracks
- TWR4: 94814 tracks
- TWR5: 85635 tracks
40% of events are triggering the 3 top layers (17,16,15)

In TWR0 there is a deficit of events in layers 4,3,2 → problems in layer 4
The ToT is minimum for vertical tracks and increases with track length.

The dependence on \( \cos \theta \) is the same for all towers.
The ToT increases linearly with $1/\cos \theta$ (track length)
The ToT depends almost linearly on the ratio $l/l'$.

The ToT increases with the same rate as the ratio $l/l'$. 

**ToT vs $l/l'$**
The ToT dependence on $l/l'$ is the same for X-view and Y-view layers
Conclusions

- The dependence of the ToT on the track parameters has been investigated in the 4 towers configuration.
- The proper n-tuple variables have been taken into account.
- The same results as in the 2 tower configuration have been obtained.
  - The ToT depends linearly on $1/\cos \theta$.
  - The ToT depends linearly on the ratio $l/l'$.
- The dependence of the ToT on the ratio $l/l'$ is the same for X-view and Y-view layers.
Some questions…

- **Question 1:**
  - Which are the IDs of the three layers in a row issuing the trigger?
  - Actually we are assuming that these layers are the ones from GltLayer to GltLayer+2. Is this assumption correct?

- **Question 2:**
  - To which tower do Tkr1FirstLayer and Tkr1LastLayer belong?
  - This information is necessary to select data samples of single tracks fully contained in a single tower.
  - For instance, is it possible an event with GemTkrVector ≠ 0 only for Tower 0, TkrNumTracks = 1, but with Tkr1FirstLayer belonging to Tower 1?

- **Question 3:**
  - Is it possible to add in the n-tuples the information about the x-y (or x-z) coordinates of the hit strips?