Overall Trigger and Latching Efficiencies of Large Area Telescope

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Plan for the Two Tower Test and the Full LAT Test

Condition:
3. Minimum interference with LAT I&T activity and data taking.
4. Independent (autonomous) monitoring throughout the entire I&T period.
5. Zero cost in M&S.

Objective:
7. Estimate overall “trigger”/“latching” eff. with cosmic ray muons to ~1% level
8. Compare local “trigger”/“latching” eff. with prediction by Gleam to ~1% level
Method No. 1: Test without Muon Telescope

- Local Efficiency Mapping -

The two towers

Cosmic rays

Require "muon-like" track segments

Test region

Require crossing to the exit point
Method No. 1: Taking Data on Towers

Select Tkr-Trig events with one and only one set of XY Tkr hits at the entry point followed by \( N(>2) \) more sets of XY Tkr hits (one and only one in each of N planes).

Least-sqaure fit to a straight line to these N+1 sets of XY coordinates.

Extrapolate the fitted line through the two tower geometry and calculate the number of layers the track will cross. (Definition of the boundary TBD).

See if there is one and only one set of XY Tkr hits at the exit point.

Layer > LayerMin

Store the event in a file and make a list (position and direction) for a new event generation for Gleam.

Abort

Least square < Lstsqmin

Yes

No
Method No.1: Running Monte Carlo

- **Generate muon events** with Gleam at the entry point and in the direction recorded in the list.

- See if the generated event leaves a set of XY hits at the exit point consistent with those in the list.

- **Abort** if the generated event does not match the expected hits.

- **Yes** if the generated event matches the expected hits.

- **Compare trigger primitives and hits** recorded in the real events and the Gleam events.

- Plot "missing" primitives and hits in the real events and the Gleam events.

Follow-up analyses, possible problem-finding and resolution thereof.
Method No. 2: Test with Muon Telescope

- Unbiased Overall Efficiency -

The two towers

Cosmic rays

Large plastic scintillator

Small plastic scintillators

4-fold coincidence

Record time

Large plastic scintillator

Small plastic scintillator

Record time
Method No. 2: Matching Two Time Sequences

**Muon Telescope**
- Select muon crossing events with min. contamination of shower events. Make sure that the telescope geometry guarantees 6 in-a-row crossing in one tower.
- Record time of coincidence in the muon telescope.

**LAT**
- Trigger LAT only by Tkr
- Record GPS times (or the internal clock times) of all triggers

**Compare and find “missing” events in LAT**

**Follow up studies**
Expected Results from the Two Methods

**Method No.1**

3. “Trigger and latching inefficiency distribution” for each layers. (Here “inefficiency” means missing Trigger Primitive or Hit.)
4. Inter-tower latching inefficiency distribution.

**Method No.2**

8. Overall trigger/latching inefficiency.
9. Overall dead time.