ToT saturated events: a preliminary study

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Science
Verification,
Analysis and
Calibrations
A study on the events saturating ToTs

- Question: ToT values in saturation are really high energy deposit?
- Answer: probably yes, but not easy to demonstrate

Strategy to understand this simple situation:

1) define a clean class of event (i.e muons)
2) look to the ToT distribution and compare with the whole distribution
3) event display to verify
We define as **muon** the event with the following characteristics:

- Single track
- 1 Mip deposit in calorimeter (0.6<\text{CALMIP}<1.3)
- Moreover we use almost vertical event (Zdir <-0.95)
What are the keys to select shower?

- Showers should be characterized by many hits or many tracks or bad chi^2 in the reconstruction.

Here shower is defined as TRACK>1 or event with CALMIP>1.3.

Showers are characterized by:
- Many hits out of track (>40-60)
- Or bad chi^2 in the first track
- Or many total hits (>70?)
ToTs

All ToTs in all active layers

Fraction of ToT saturations:
- 0.21 % all events
- 0.05 % muons
- 0.31 % showers
Examples: good muons

Good muons have few hits outside the track
Examples: bad muon

72 total hits, 56 out of track
Shower

205 total hits/172 out of track
• **Muons** have fewer fractions of ToT saturations
• **Showers** (defined looking only hits or CAL) have a larger fraction of ToT saturations

ToT saturations indicates really large energy deposits

Everything ok?
Damn!

What is this tail? (not muons nor showers)
Events with a lot of saturations (>1)

Nothing strange but 11 hits (5 out of track) and 4 arrays in saturation
Examples-2

High energy event? 31 hits 5 arrays ToT-saturated
Example-3

Clean muon but 37 hits 21 out of track and 9 arrays in saturation
A look on these events

Probably too short tracks
Are these events physical? Probably \textbf{yes}: many short tracks or large zenith events (and bad reconstruction)