

Onboard Filter Status

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12 January 2004

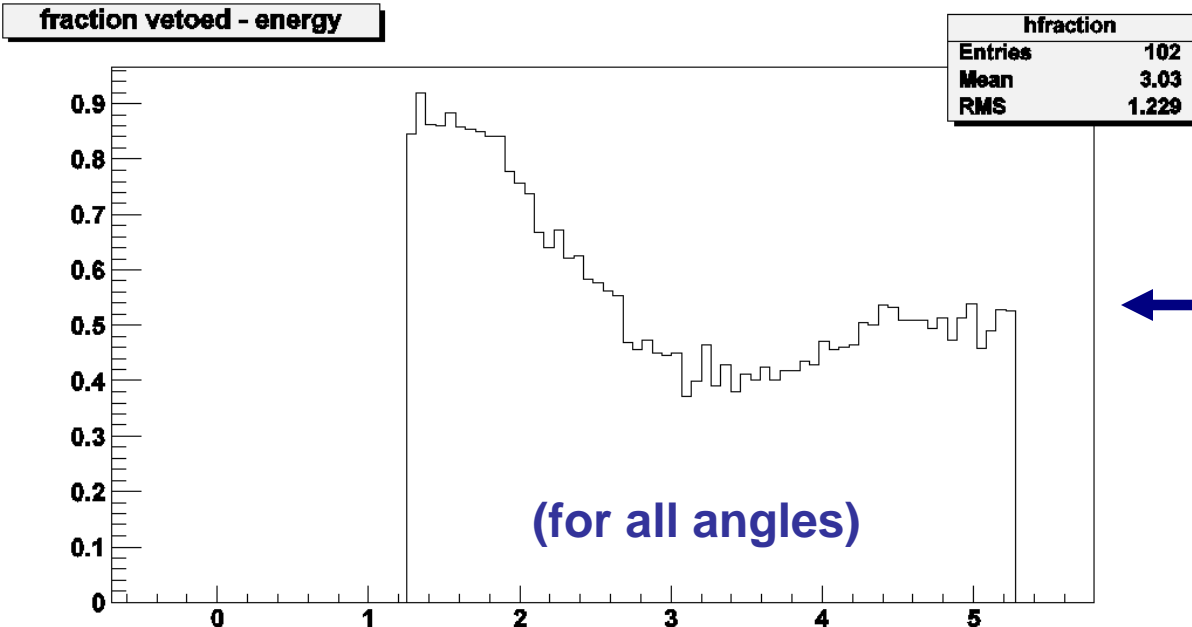
Status

- OnboardFilter is stable, but the gamma veto rate was high, especially at low energy
- Have looked at each veto cut in detail
 - Vetoes based on track finding were inefficient
 - Can be improved somewhat by relaxing track finding “tolerance”
 - Gammas vetoed vs. Energy distributions show where each veto does its damage
 - Looked at these for backgndavgpdr and all_gamma sources (to 180 GeV)
 - GLAST Mission providing LAT with a factor 4 increase in downlink data volume

The solution: let in 5% more background (factor ~2 in rate), and make some minor changes to the filter’s logic

Result: Dramatic improvements

Fraction of Gammas Vetoed vs. log10(McEnergy)

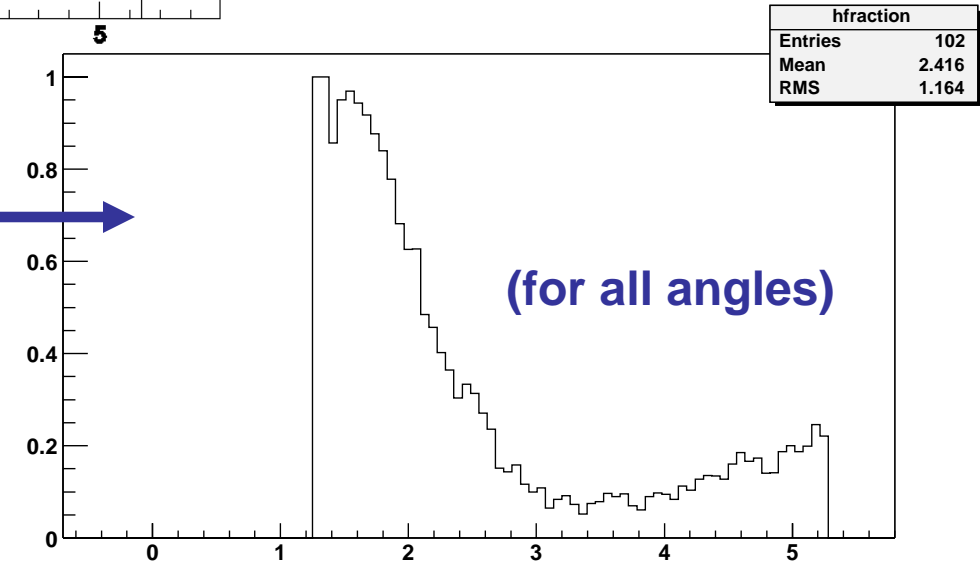


**TKR
triggered
events**

**Before any
changes to
the filter**

**“goodEvents” –Rome
cuts***

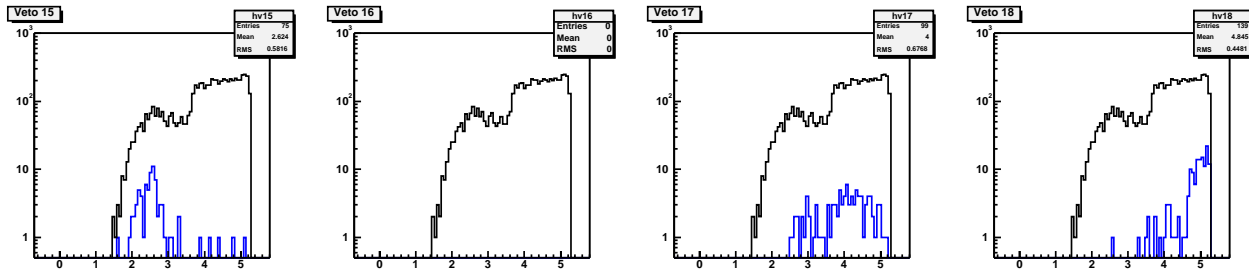
**Before any changes to
the filter**



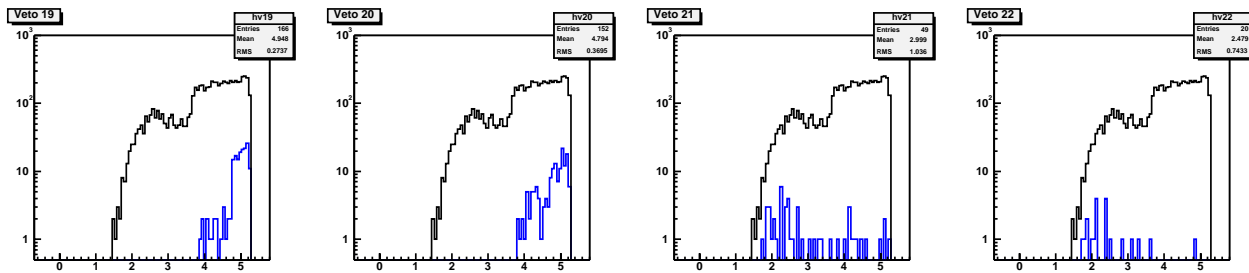
*does not include background cuts, just: goodCal && goodPSF && zdir_recon.
(CalTotRLn>2.0&&CalEnergySum>5.0)&&(IMgoodCalProb>0.2)&&(IMcoreProb>0.2)&&(IMpsfEr
rPred<3.0)&&(Tkr1ZDir<-0.2)

Same plot but for goodEvents only

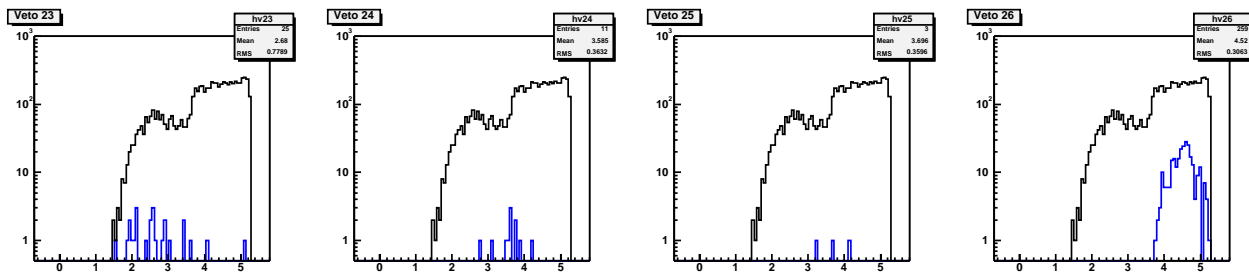
Black: goodEvents
Blue: VETOED



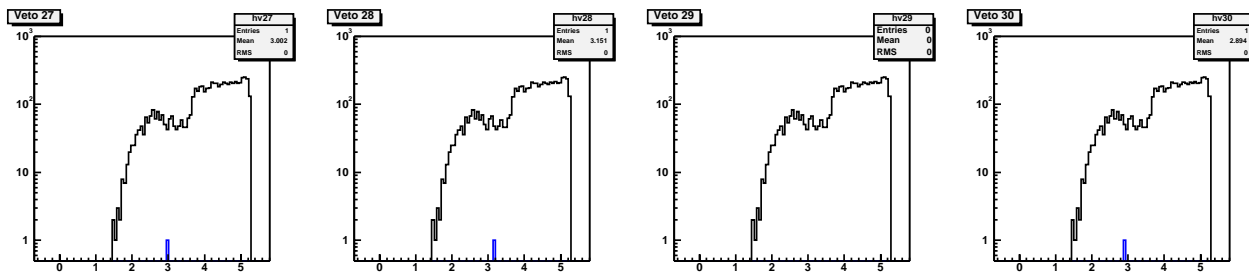
Veto 15 –18



Veto 19 - 22



Veto 23 - 26



Veto 27 - 30

Log10(McEnergy)

The worst offenders? (for any TKR triggered event)

- At low energy
 - Veto 15: no 2 track evidence below 350 MeV
 - Veto 16: track into the skirt region
 - Veto 17: no track found
 - Veto 21: no tracks into CAL with energy
 - Veto 22: CAL E layer 0/ETOT > 0.90
 - Veto 23: CAL E layer 0/ETOT < 0.01
 - Veto 28: Event has 0 energy + tile hit

- At high energy
 - Veto 18: Track - ACD Row 2 match
 - Veto 19: Track - ACD Row 0 or 1 match
 - Veto 20: Track – ACD Top match
 - Veto 26: Event has a splash veto
 - Veto 28: Event 0 energy + tile hit

Changing the filter logic

- Did several trials with different alterations of the filter
 - Removed some vetoes
 - Put energy cuts on a few others
 - Watched the backgndavgpdr rate as vetoes were removed

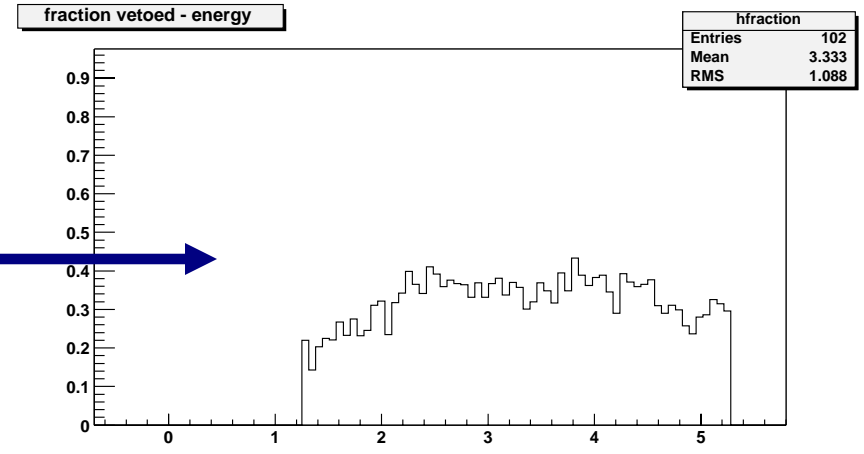
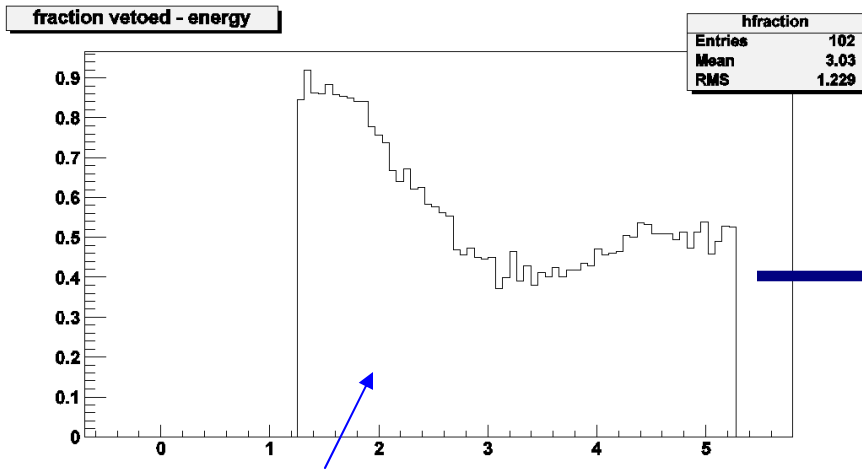
Changes:

- Veto 15 removed
- Veto 17 only executed when Energy > 250 MeV
- Veto 18 only executed when Energy < 30000 MeV
- Veto 19 only executed when Energy < 10000 MeV
- Veto 20 only executed when Energy < 30000 MeV
- Veto 21 only executed when Energy > 100 MeV
- Veto 22 removed
- Veto 23 removed
- Veto 26 removed
- **Track finding tolerance is relaxed**: go from ± 32 strips to ± 192 strips

Note: “Energy” corresponds to the raw cal energy that the filter sees, not McEnergy

This number is being evaluated

Fraction of gammas vetoed after filter changes



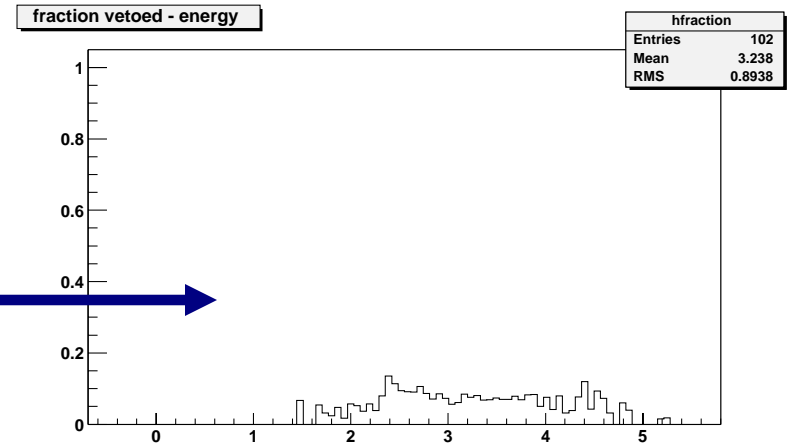
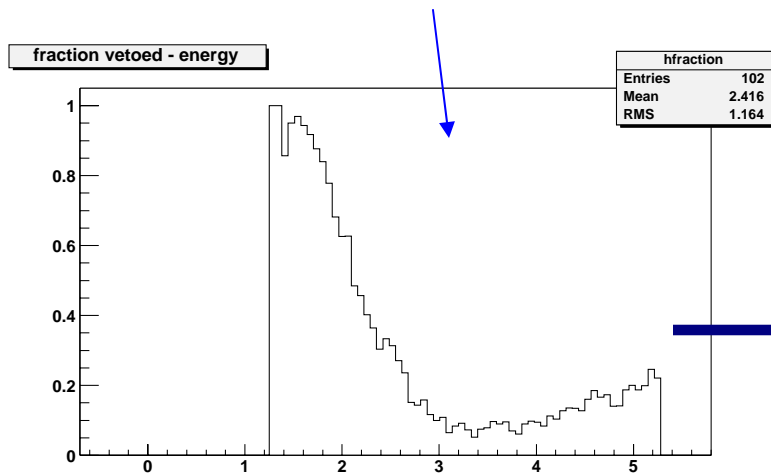
TKR triggered – before filter changes

And after changes

Big drop in fraction vetoed!

Recall...

“goodEvents” – Rome cuts*



*without background cuts

Impact on gamma and background rates

- Most improvement is at very low and very high energy
- The overall “goodEvent” fraction vetoed is between ~3-8%, but most of these will be likely be removed by background cuts (Bk_Veto)
 - An event display examination of the vetoed goodEvents supports this assertion
 - If necessary, may also make minor alterations to Vetoes 17 and 18 that would further reduce gamma vetoes
- With the altered filter, the backgndavgpdr veto rate dropped from ~95% to ~90%, increasing the event rate to ~340 Hz
 - **This would be okay, as we can handle 400 Hz to the ground**
- Just before this talk, added in the new albedo_gamma_upwards source into the background mix
 - This causes the background rate to rise to 470 Hz.
 - Now working on reducing rates again. The albedo gammas have little or no CAL deposition.

Summary

- Simple changes in the filter logic significantly lower the gamma veto rate, while doubling the amount of background that gets through
 - The logic can be altered by removing some vetoes, putting energy cuts on others, and relaxing the track finding tolerance
- The filter has a small impact on the events remaining after the Atwood cuts
 - Most of these will likely be removed anyway by background rejection cuts (not yet applied!). Update next meeting.
- Some additional changes are being tested
 - These are designed to improve the goodEvent efficiency, and the albedo_gamma_upwards rejection rate