Throttle Studies

David Wren

Analysis Group Meeting

22 March 2004

Throttles

- Two Types
  - "Throttle 1" active if a triggered tower is shadowed by an ACD tile that's over threshold
    - Only consider tiles in the front and upper two rows of ACD
      - Core towers are shadowed by 4 tiles
      - Side (middle) towers shadowed by 8 tiles
      - Corner towers shadowed by 12 tiles
  - "Throttle 2" active if any ACD tile in the front or upper two rows is over veto AND there is NO Cal Lo trigger

Throttle 1 Implementation

- Implemented in Gleam Trigger code

Trigger v3r6p1

  - Separate class: ThrottleAlg
    - Not a Gaudi Algorithm, just a class
  - A call to ThrottleAlg::Calculate(…) executes the throttle code, and returns "32" if it should be activated (zero otherwise)
    - TriggerAlg appends a "throttle bit" to GltWord (2^5=32), so GltWord now contains 6 bits
    - Has no effect on other GltWord bits
      - They are calculated before the throttle code executes

Throttle Results

- Did short runs at 100 MeV, 1 GeV, 10 GeV, 100 GeV of uniformly thrown gammas
- Calculated Rates and Effective Area for Throttle 1 
  - Started working on this for Throttle 2, but found that there is not enough info in the ntuple right now, so I'm adding something to my local copy (no "AcdNoTop")

Throttle 1 Rate Reduction

- Looked at uniformly thrown gammas at 4 energies, and also at backgndmaxpdr and backgndavgpdr
- Also looked to see what happens if we disengage the throttle if there is a Cal-Lo or Cal-Hi

	Throttle 1	**Disengaged if Cal-Lo**	**Disengaged if Cal-Hi**
100 MeV gammas	Reduced by 14%	Reduced by 14%	Reduced by 14%
1 GeV gammas	22%	19%	22%
10 GeV gammas	38%	20%	23%
100 GeV gammas	69%	16%	18%
Backgndmaxpdr 10700 Hz	80% (2180 Hz)	65% (3730 Hz)	79% (2240 Hz)
- with albedo_upwards 11000 Hz	79% (2270 Hz)	65% (3860 Hz)	79% (2310 Hz)
Backgndavgpdr 3415 Hz	79% (720 hz)	62% (1290 Hz)	76% (820 Hz)
- with albedo_upwards 3509 Hz	76% (850 Hz)	64% (1280 Hz)	74% (910 Hz)

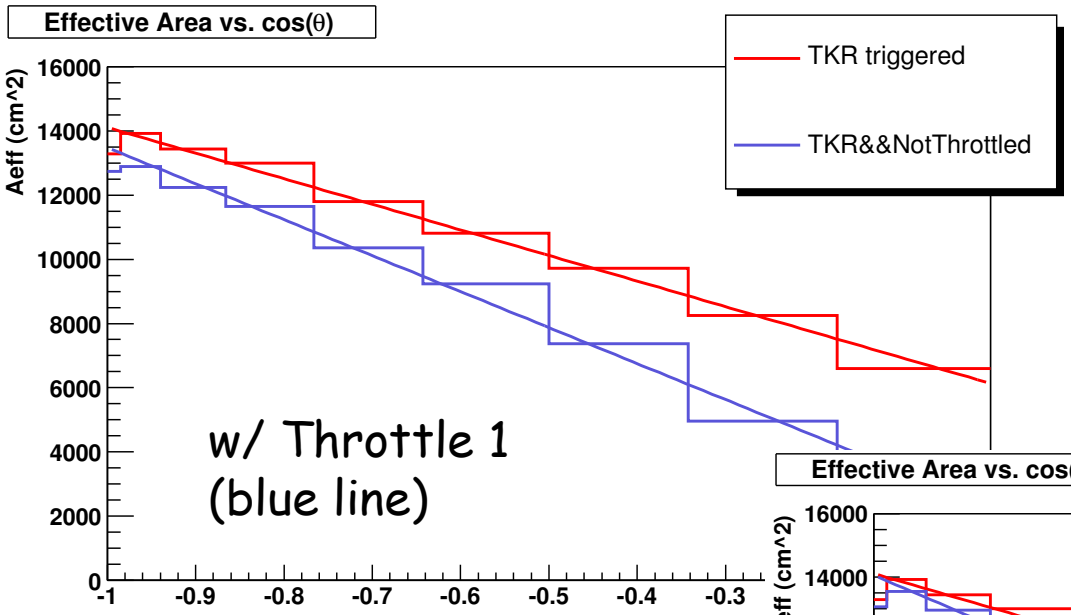
Effective Area and FOV

- Effective area at normal incidence
- Field of View

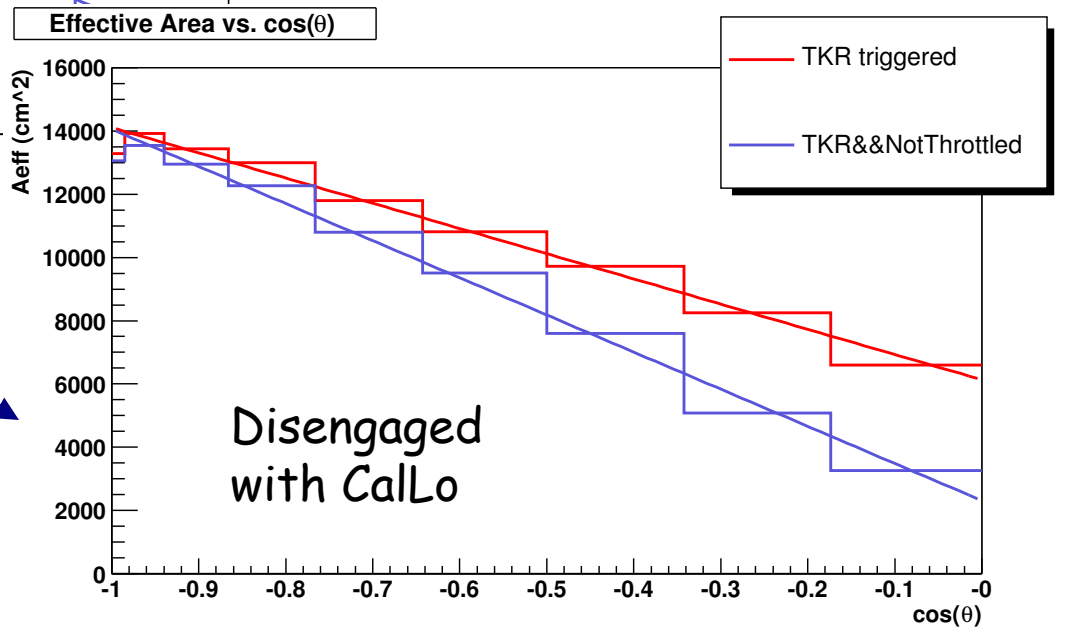
	TKR Triggered (no throttle)		Throttle 1		Disengaged if Cal-Lo		Disengaged if Cal-Hi	
	Aeff	**FOV**	**Aeff**	**FOV**	**Aeff**	**FOV**	**Aeff**	**FOV**
100 MeV gammas	**12250**	**4.05**	11370	3.78	11370	3.78	11370	3.78
1 GeV gammas	**14100**	**4.54**	13480	3.72	14050	3.71	13480	3.72
10 GeV gammas	**14680**	**4.72**	13160	3.26	15180*	3.69*	14560*	3.69*
100 GeV gammas	**14960**	**5.54**	8750	2.98	15440*	4.50*	15550*	4.38*

*Statistics are very low. See plots on following pages.

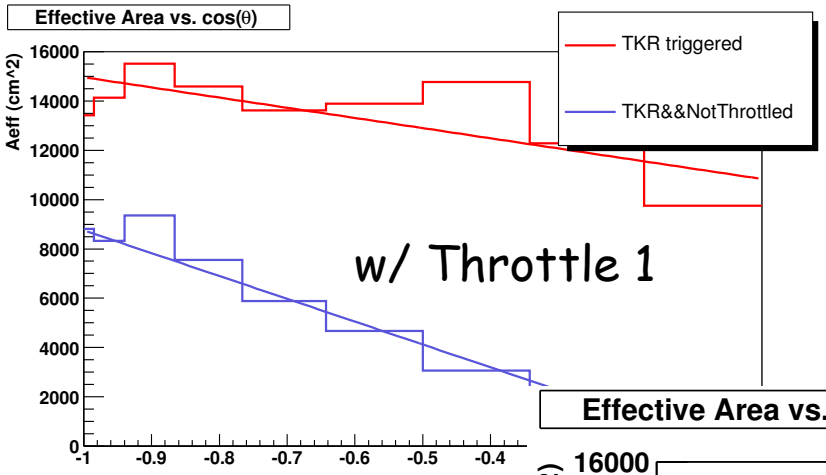
Aeff Plots – 1 GeV

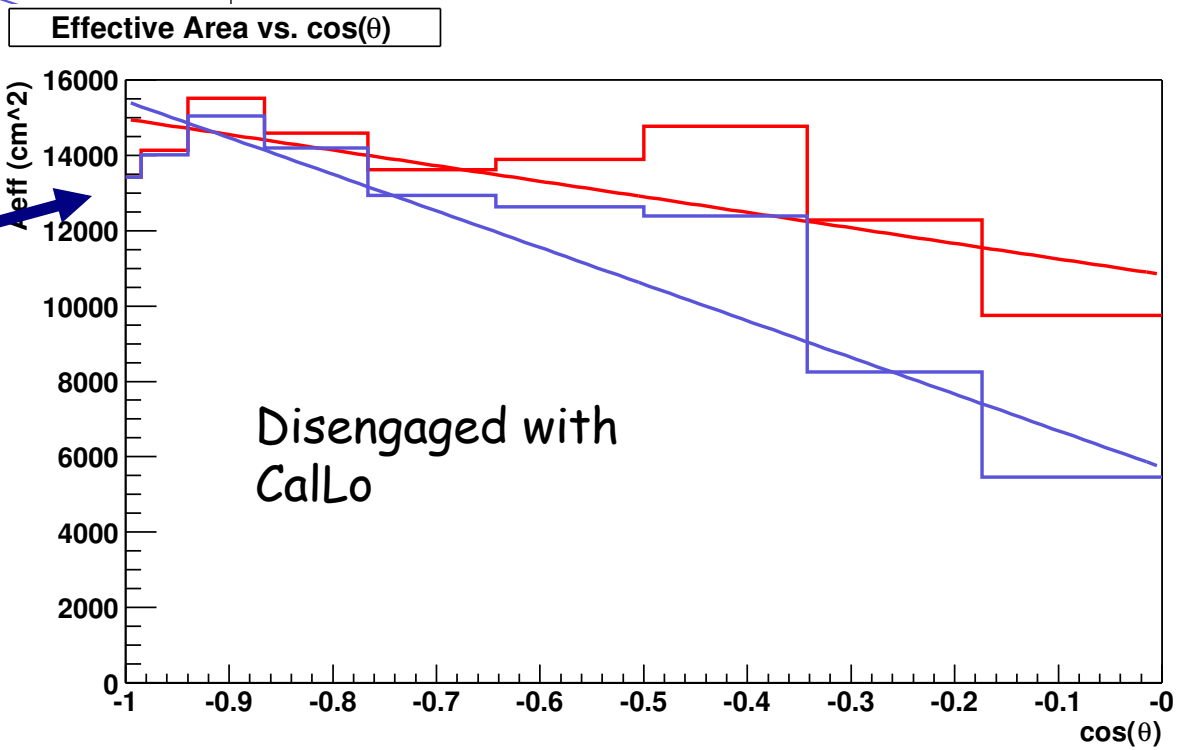


Note improvement



Aeff Plots – 100 GeV





Uncertainty in fit due to low statistics, but can still see the improvement.

Summary

- Looking at 2 possible throttles
  - The method of throttling when a triggered tower is shadowed by a hit tile is effective, but kills too many gammas unless it is disengaged with the cal.
    - Using Cal-Lo disengagement keeps more gammas, but Cal-Hi eliminates more background
    - As energy goes up, throttle disproportionately kills more off-axis gammas
- Next time will report on the method of throttling whenever a tile is hit and there is no Cal-Lo