ACD “coherent noise” study

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collaborators

- **Eric Charles**
- **Bob Hartman**
- **Alex Moiseev**
- **Eric Siskind (unofficial)**
- **Dave Thompson**

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Overview of talk

1. Data selection
2. “coherent noise effect”
3. Effect on science data

Runs analyzed

1. SVAC B-2
   - 23 x 15 minute runs (phase 0 LAT tests)
   - Triggers are TKR, CAL, CNO, periodic
2. E2E 4-3
   - 19 x 15 minute runs (NCR 829 work)
   - Triggers are the same as for B-2, plus 10kHz of random external triggers (prescaled to 10Hz); i.e. simulated on-orbit rate
3. ACD Triggered Ops
   - 2 hr runs (ACD CPT)
   - Trigger on top/side, side/side coincidence of ACD

Data selection for ACD noise studies

Basic requirements:

- Need to take unbiased “snapshots” of the ACD
- need to eliminate cosmic rays

Data selection:

- Use periodic triggers
- No hits in the tracker

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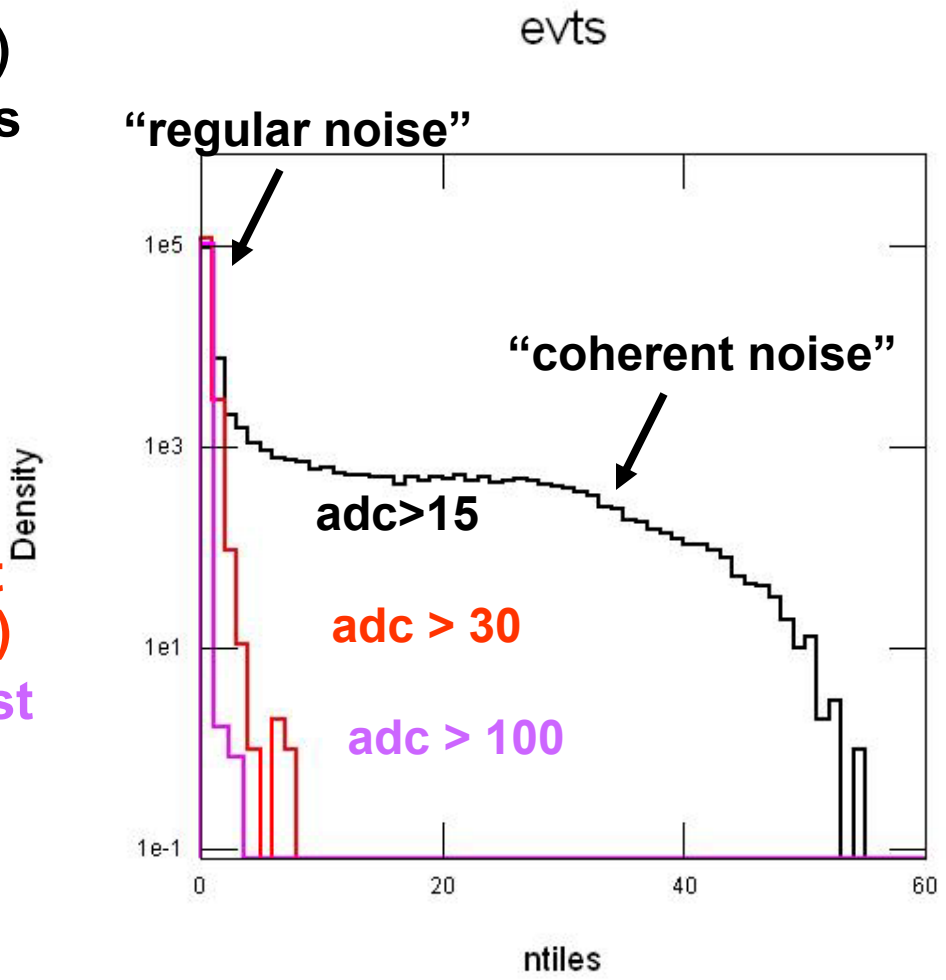
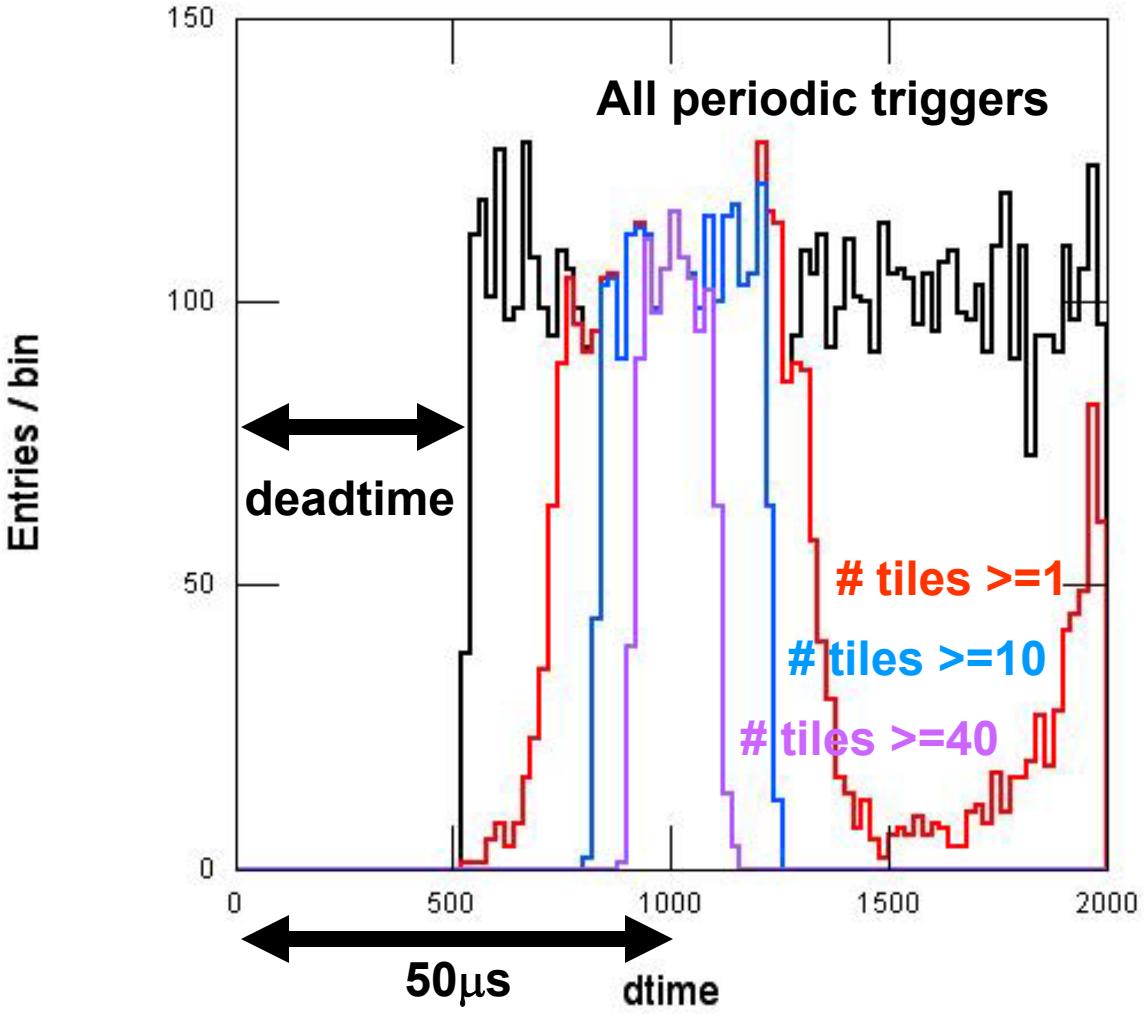
tile hits due to noise vs threshold

- **e2e 4-3 (~10kHz trigger rate)**
- **Periodic trigger, no TKR hits**
- **ADC<30 for "other" PMT on the tile**

- **23% of events have at least one tile with ADC>15 (~0.05MIP)**
- **2.5% of events have at least 1 tile with ADC>30 (~0.1MIP)**
- **0.12% of events have at least 1 tile with ADC>100 (~0.3MIP)**

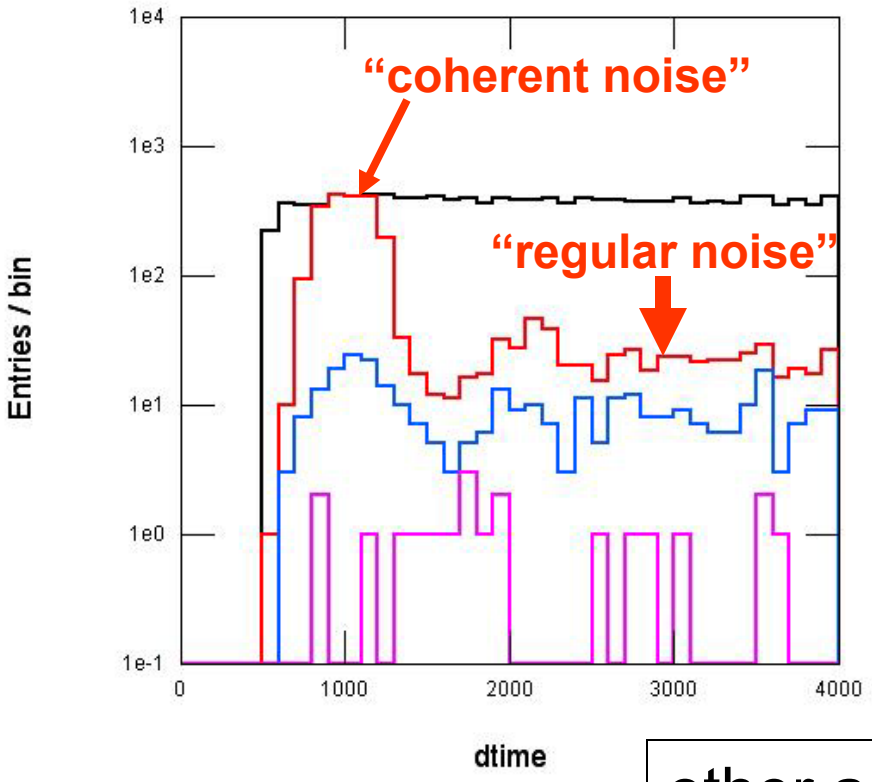


GEM delta event time distributions

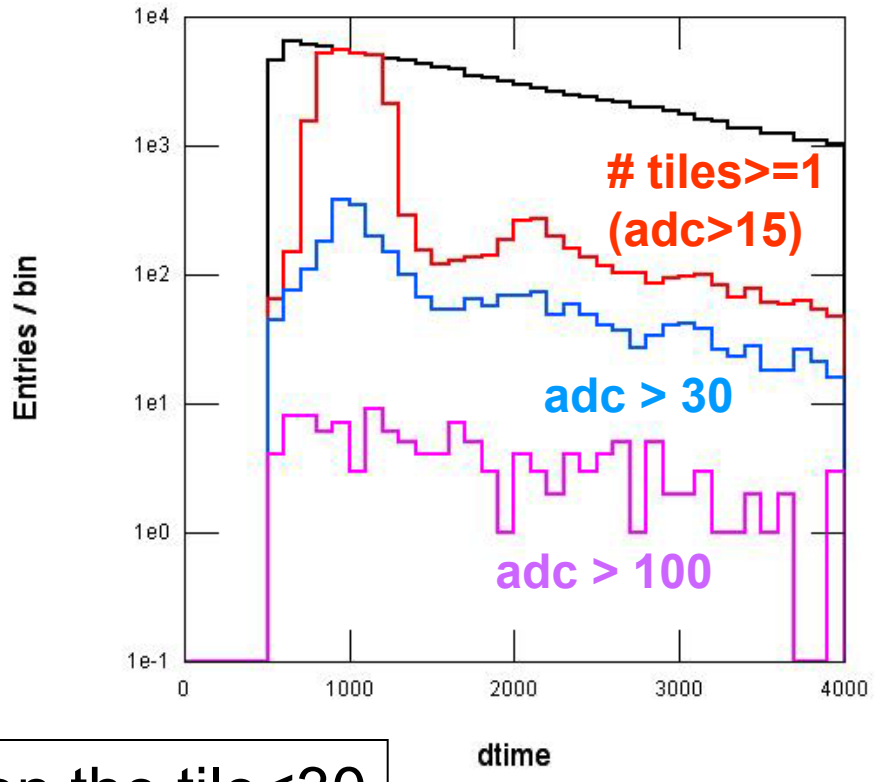


Ground vs in-orbit trigger rates

B-2 periodic, no TKR hits (19 x 15 minutes)

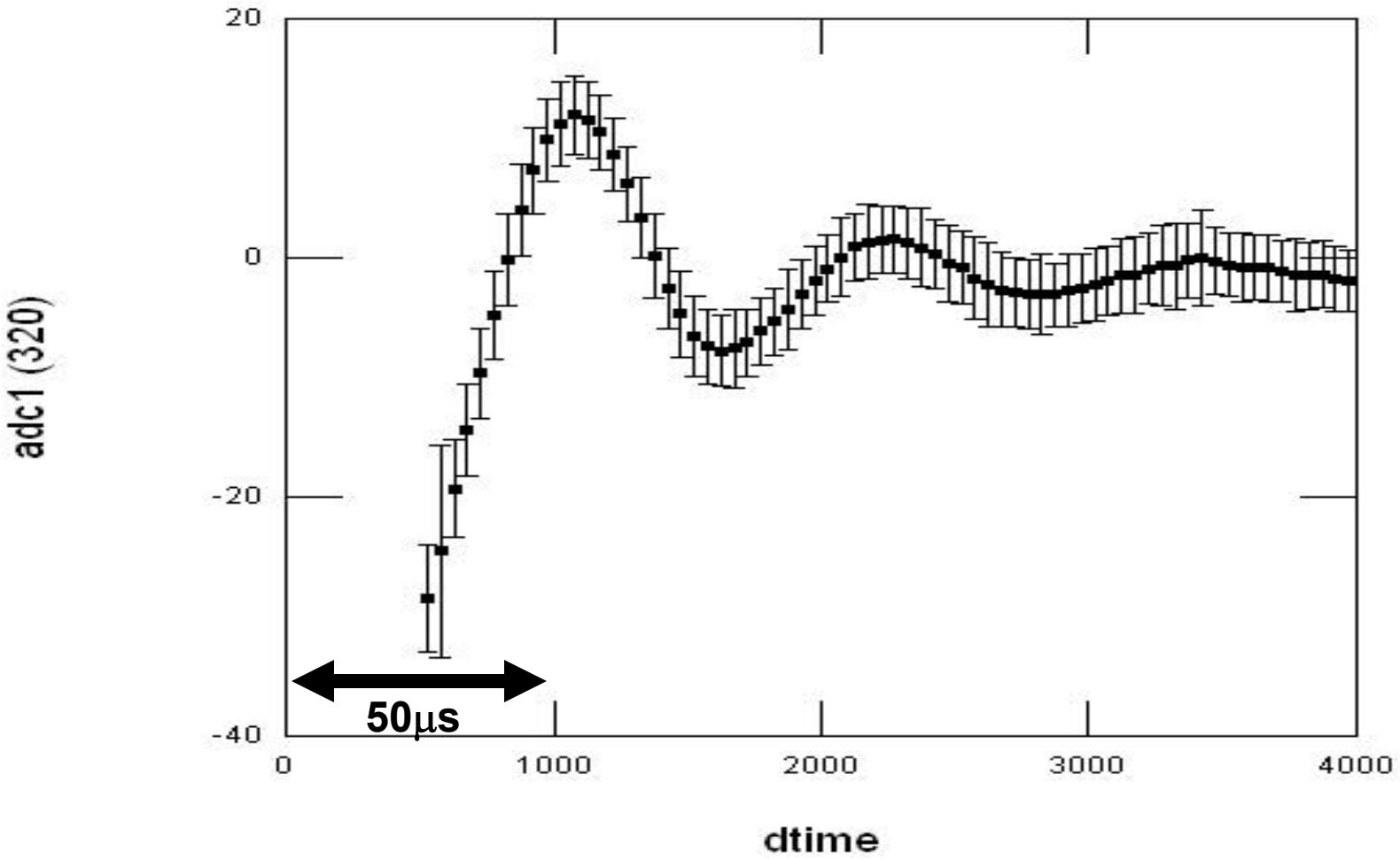


4-3 periodic, no TKR hits (19 x 15 minutes)



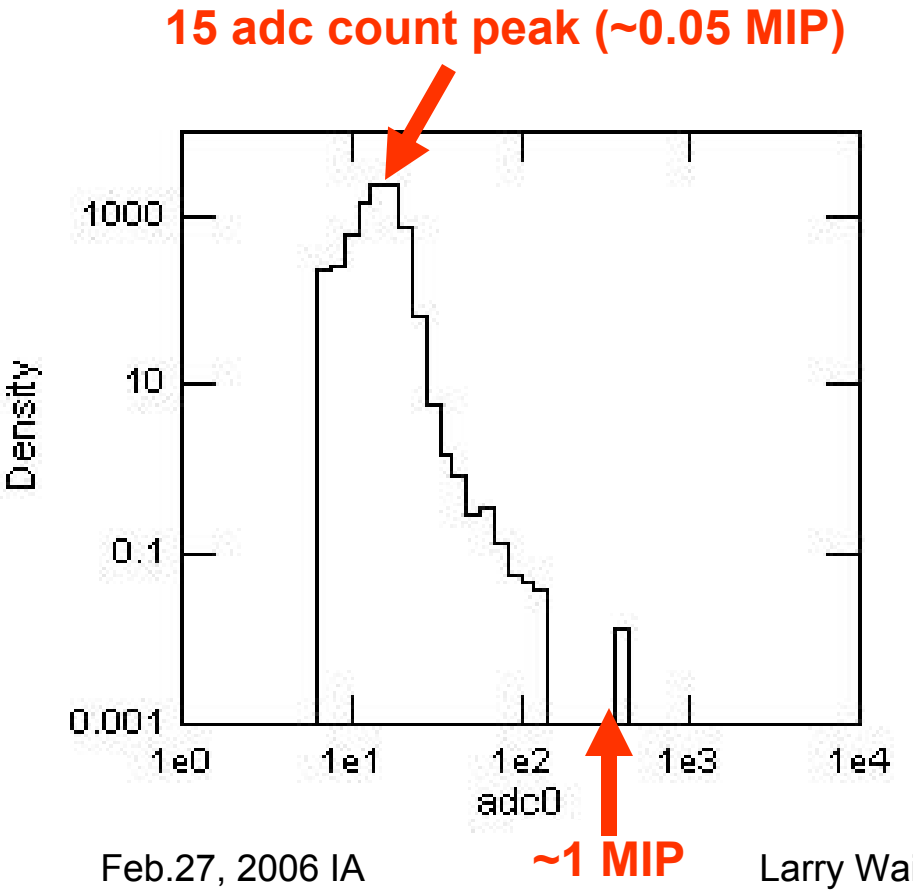
other adc on the tile<30

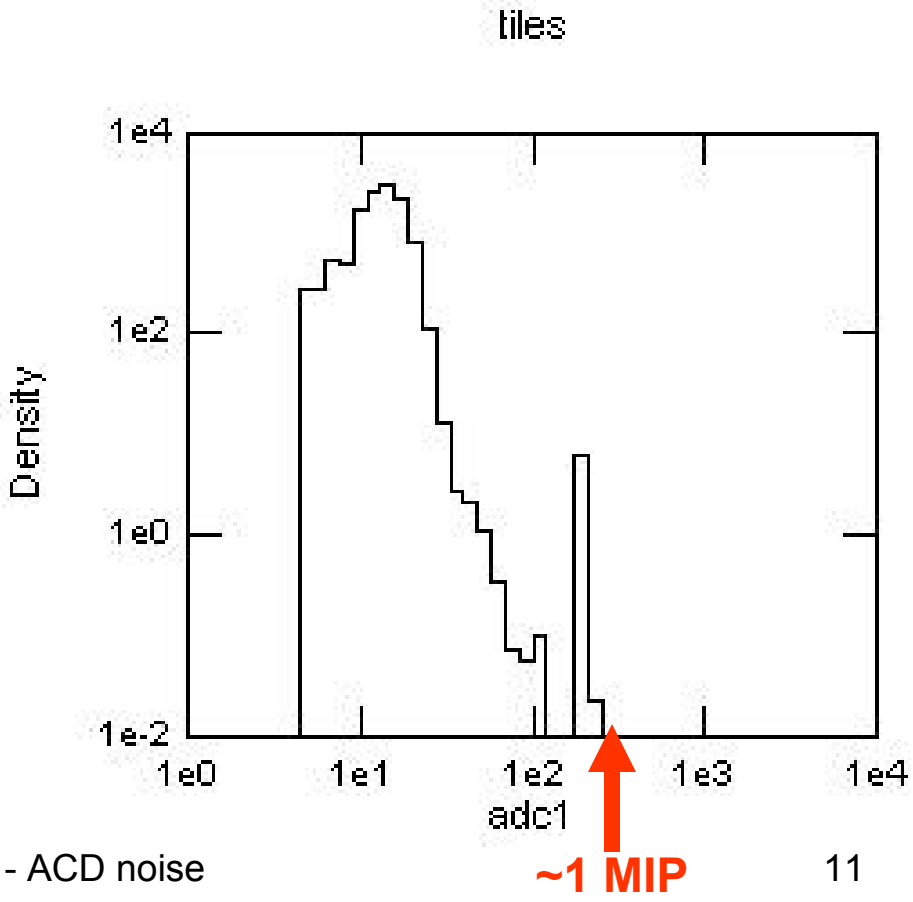
Pedestal vs GEM delta event time



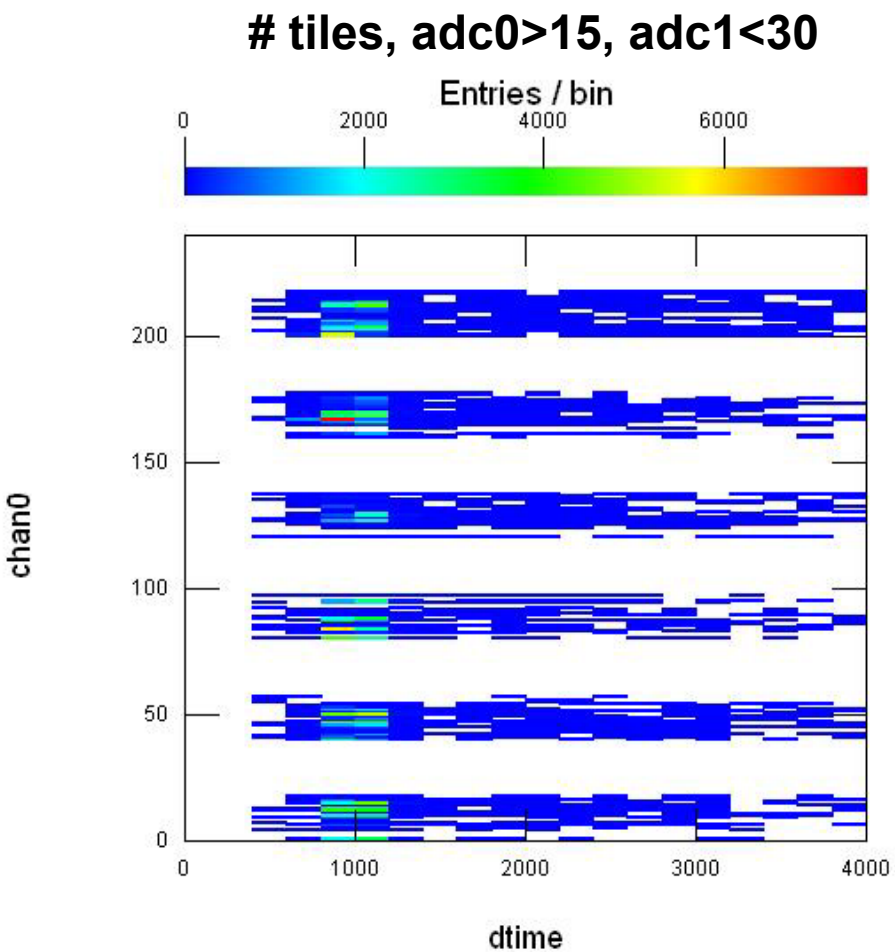
coherent noise ADC distributions

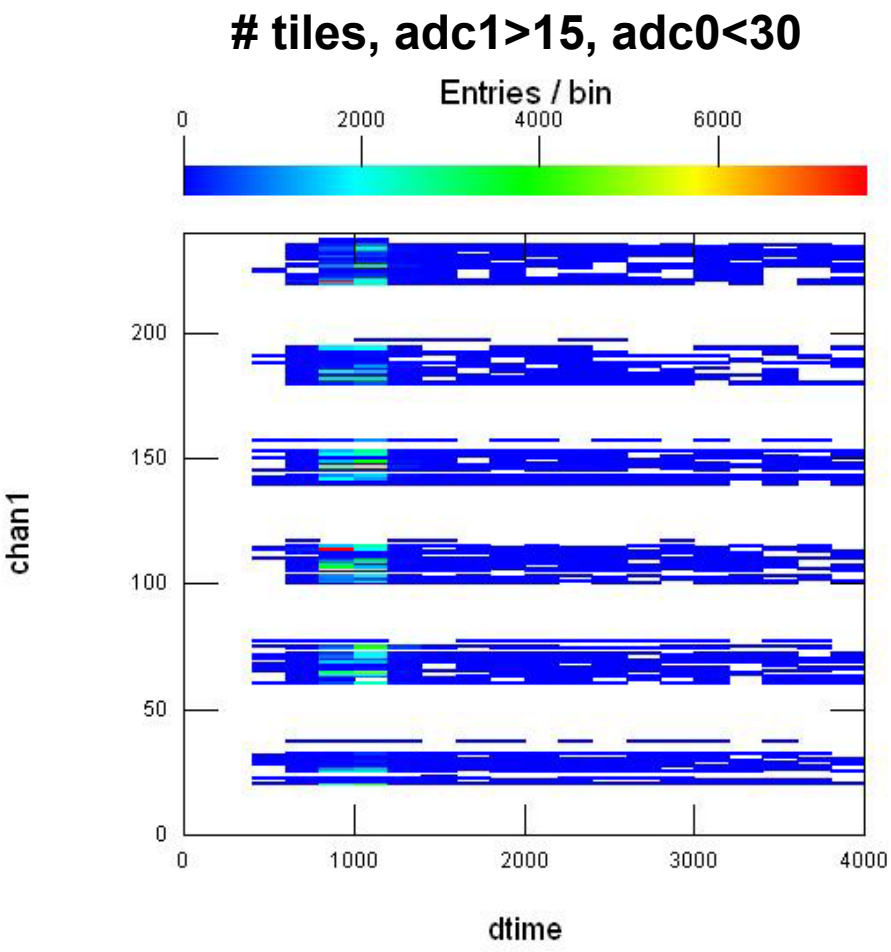
GEM delta event time < 1500, other ADC on the tile=0





Channel dependence

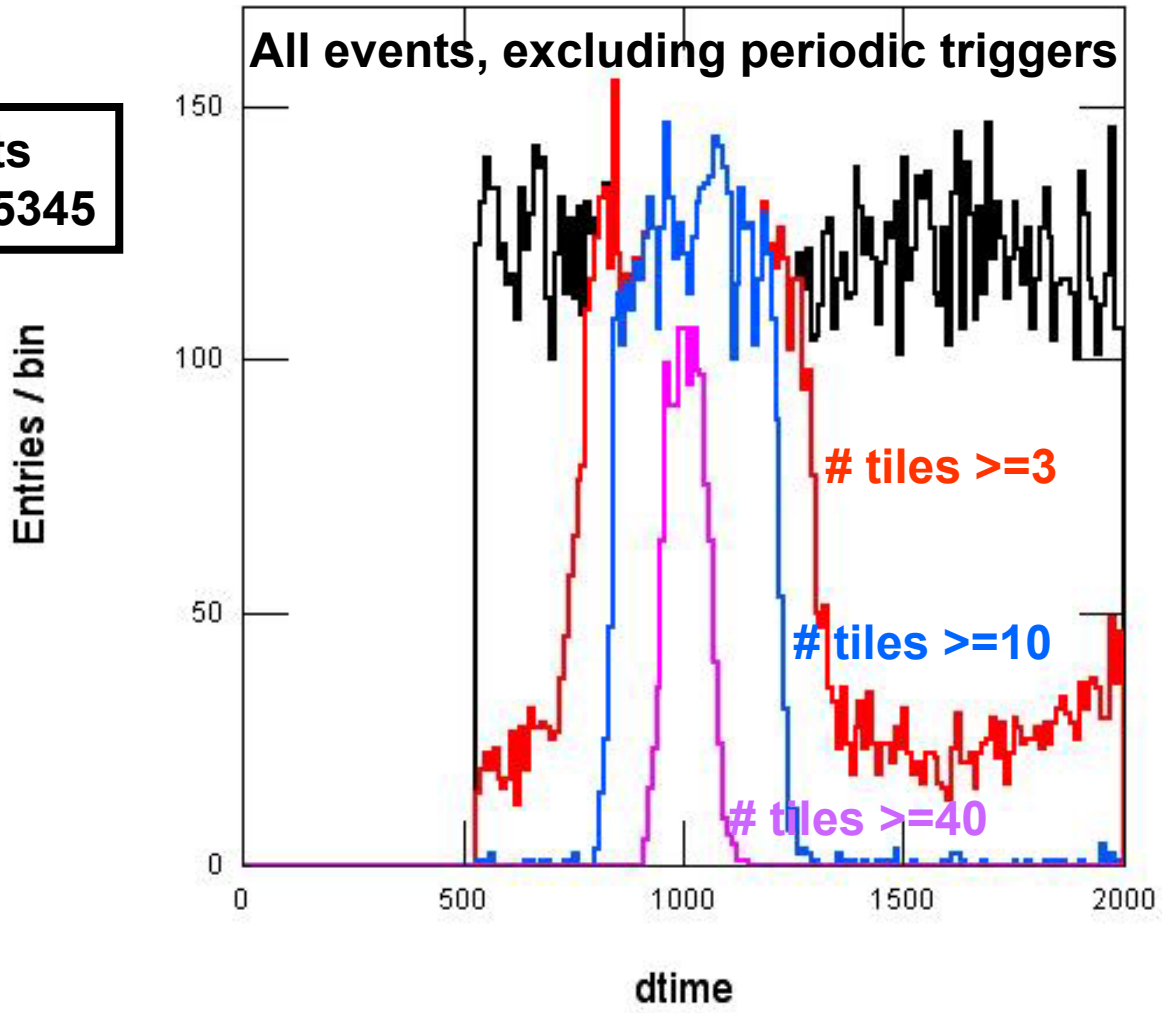




(10kHz, periodic triggers, no tracker hits)

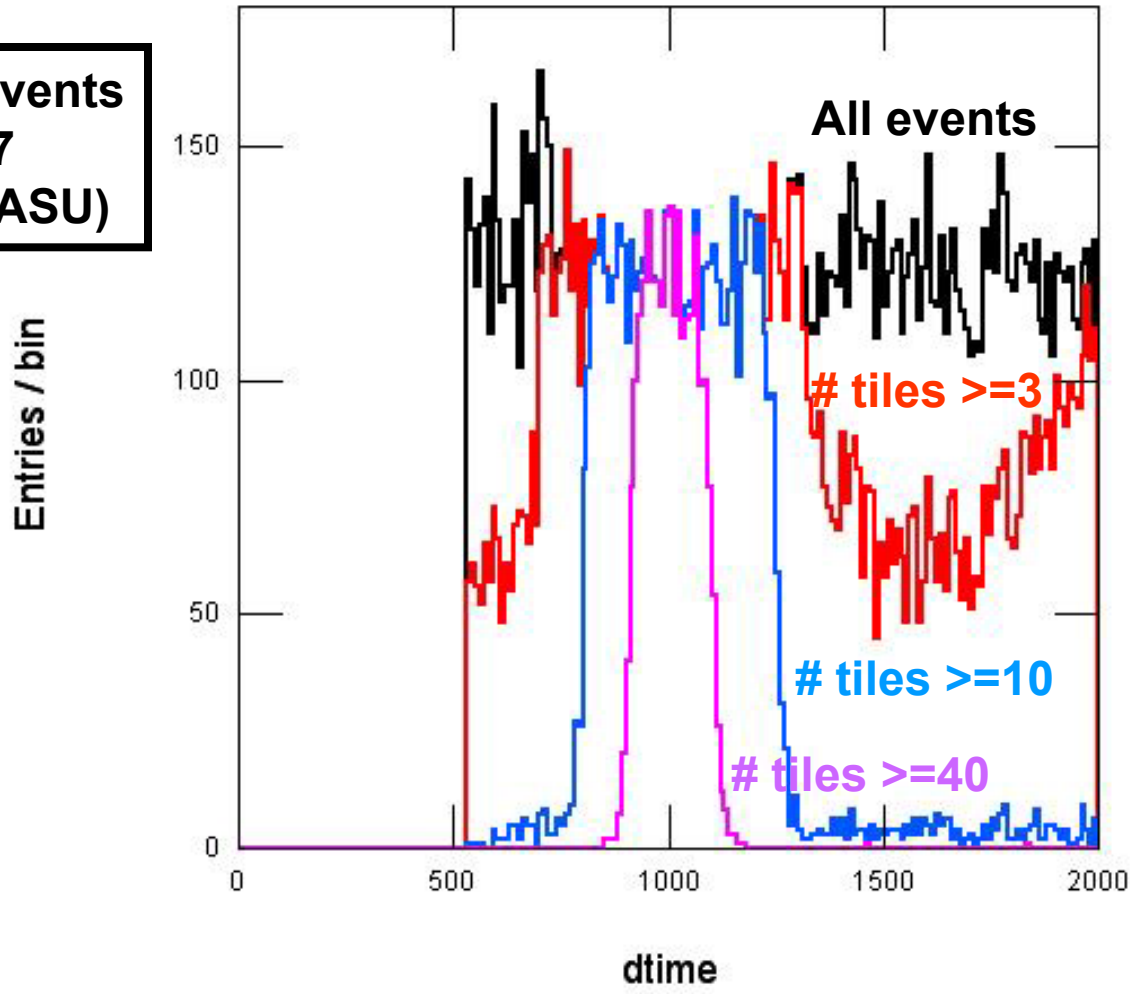
TKR, CAL, CNO triggers

B-2 events
run # 135005345



ACD top/side, side/side triggers

ACD triggered ops events
run # 135005097
(integrated, flight GASU)



Summary of observations

- **2 classes of ACD noise, “regular” and “coherent”**
- **Coherent noise is due to time evolution (damped oscillation) of pedestals w/ main observable peak ~50μs after the previous event**
- **Coherent noise occurs after all triggers**

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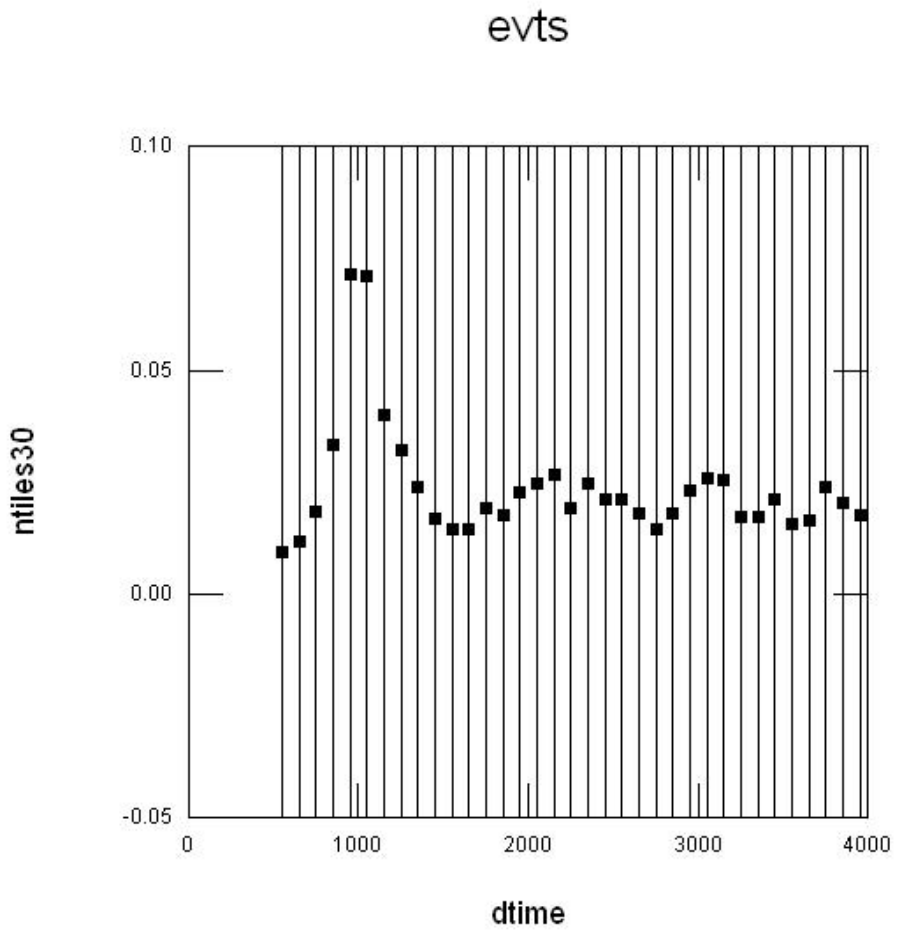
tiles > 0.1MIP vs GEM delta event time



Summary of talk

- **~5% of events between 800-1200 ticks after an event will have a tile above ~0.1MIP due to coherent noise**
- **At in-orbit trigger rates this corresponds to ~few % of events**

- **Question 1: how does this effect contribute to the first level trigger false veto rate (ACD level 3 requirement is <1%)? We checked the ADC value, but we still need to check the veto discriminator outputs.**

- **Question 2: at in-orbit temperature (i.e. during TVAC test), does this effect remain at the same level? Without an external random trigger, we should do a scan w/ high rate periodic triggers over frequency**