

Near Detector Electronics Performance

March 18, 2005

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3/18/05

MINOS Collaboration Meeting

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Overview

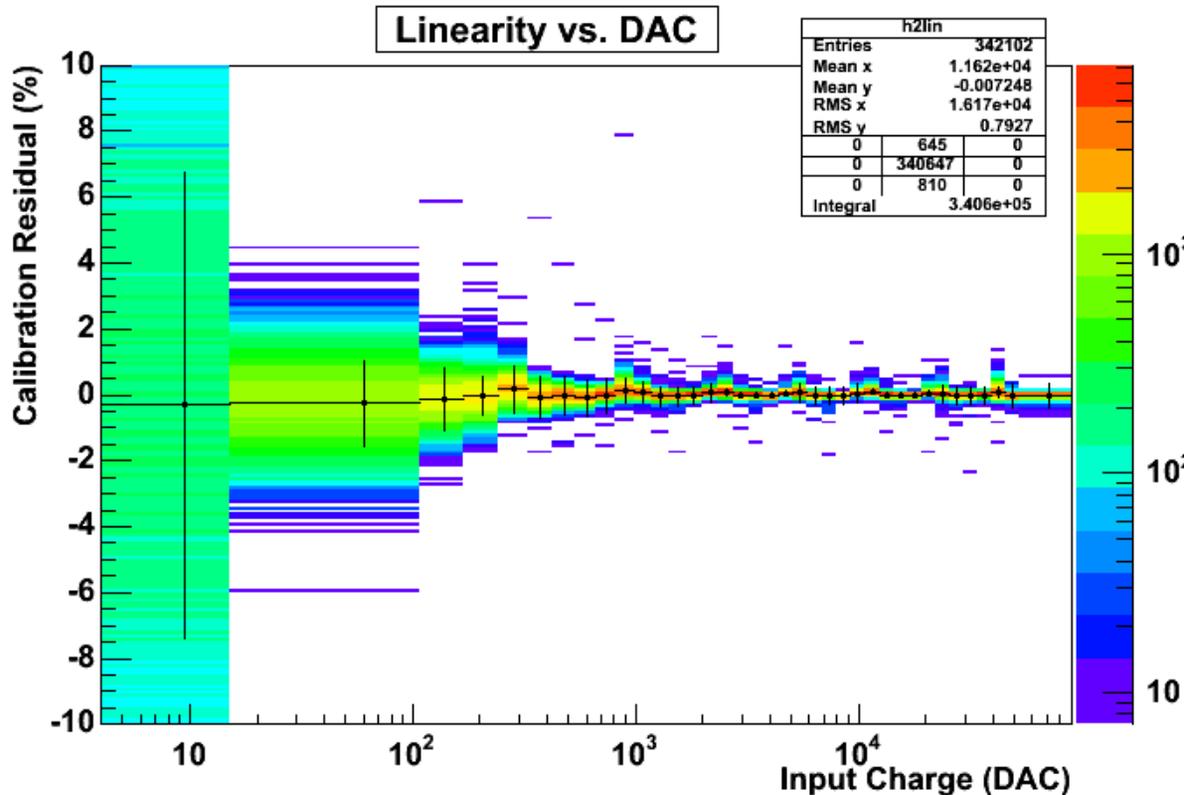
- Problems solved
- FEE Linearity/Calibration
- SGATEs
- Pedestal noise
- MENU failures

Problems Solved

- **SGATE running**
 - 200mF of capacitance on each MASTER crate eliminated problem
- **“Channel 4 problem”**
 - Extra data words on MASTER input channel 4
 - Affected ~30% of all MASTERS at $\sim 10^{-5}$ to 10^{-6} level
 - Capacitance on FPGA clock line
 - Down to 2 problem MASTERS

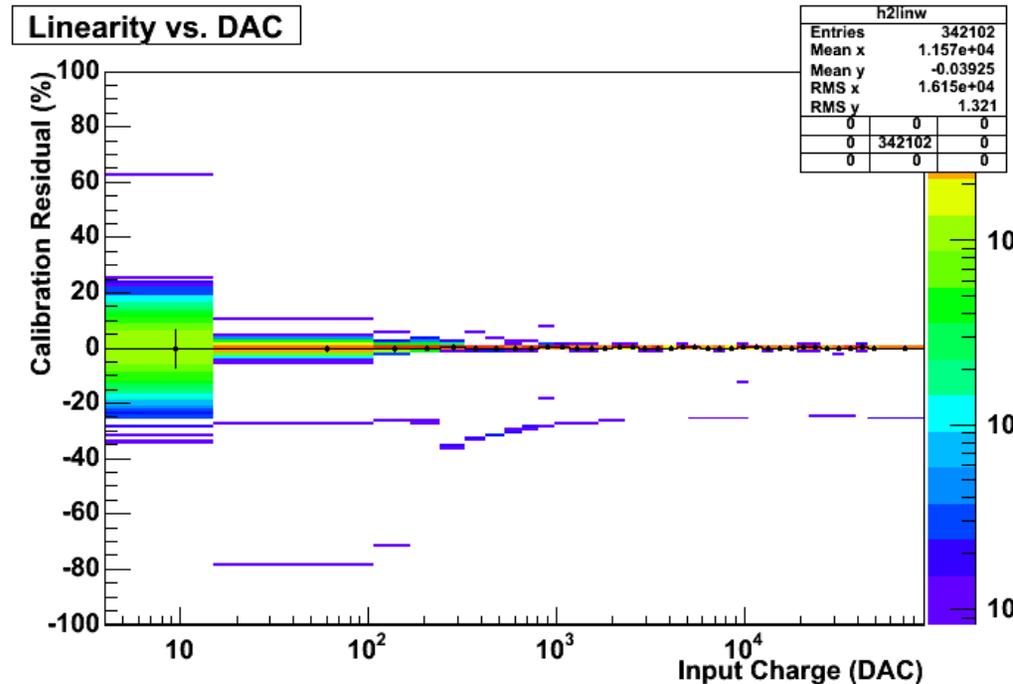
Calibration

- As of 3/16/05 18:00
 - % deviation from linearity in Charge Injection
 - 1 entry/channel/ DAC setting
 - 2 bad channels excluded out of 9240
 - Less than 10 other problems not shown due to y-axis limits



Calibration Issues

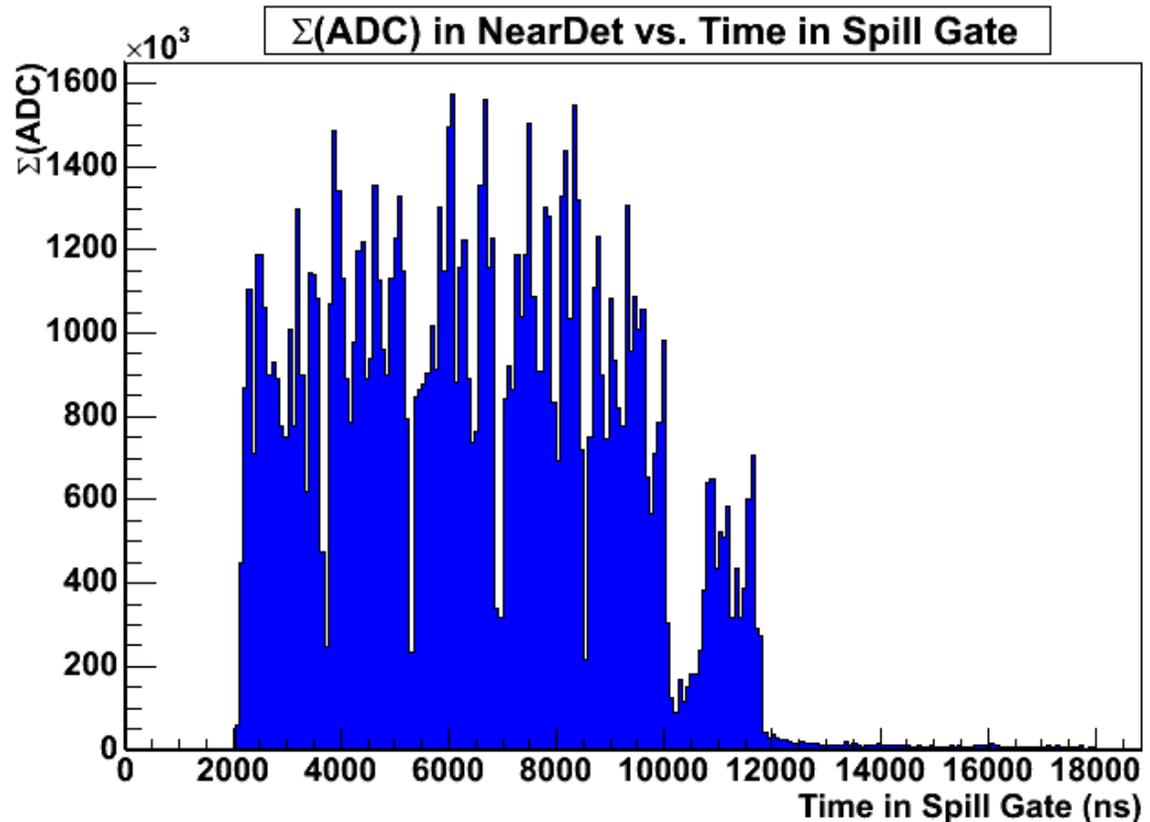
- 6 channels have missing fits for 1 range, 1 capid
 - At least 1 is due to missing bits in FADC – hardware failure we weren't catching
 - 2 are on range 7 – hard to populate with DCI points – not relevant
 - Others not fully understood, but expect new calibration code from Dave R. will eliminate the symptom
- 1-2 other 10% level problems
- ~ten 2-3% level problems



SGATE Running

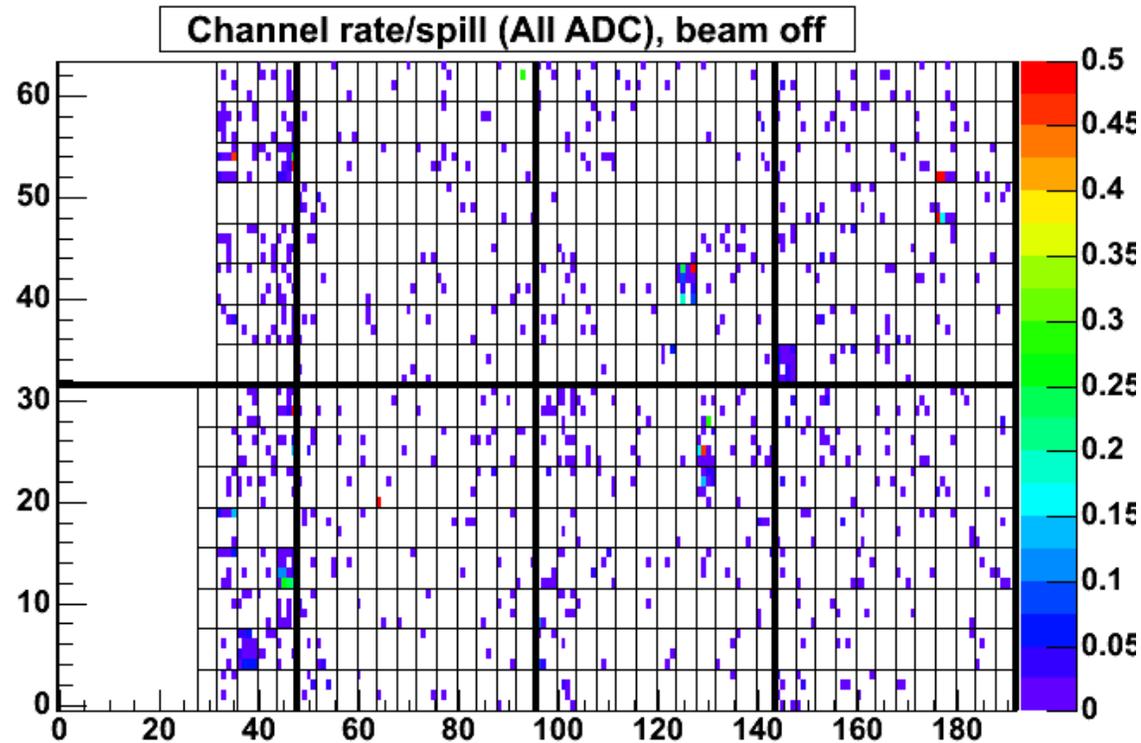
Time Structure:
sum(ADC) vs time in
SGATE

6 batches



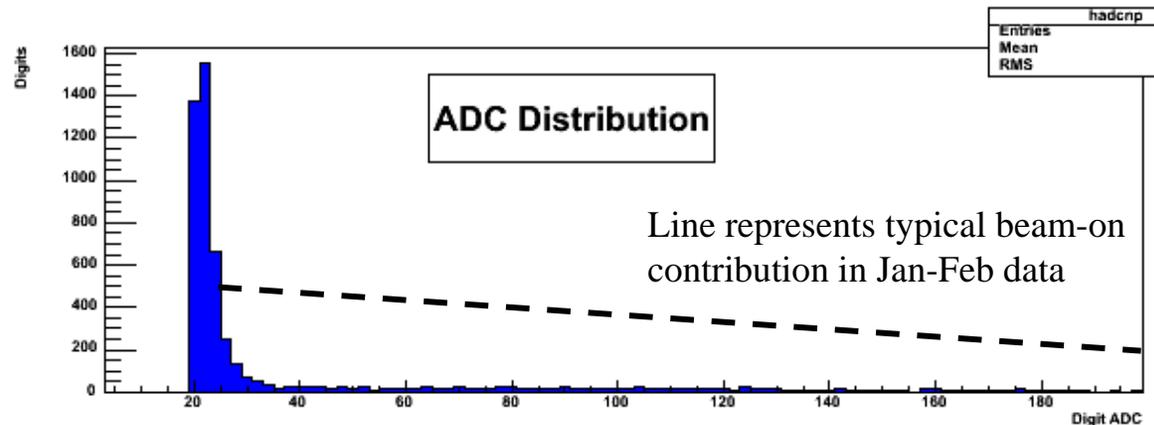
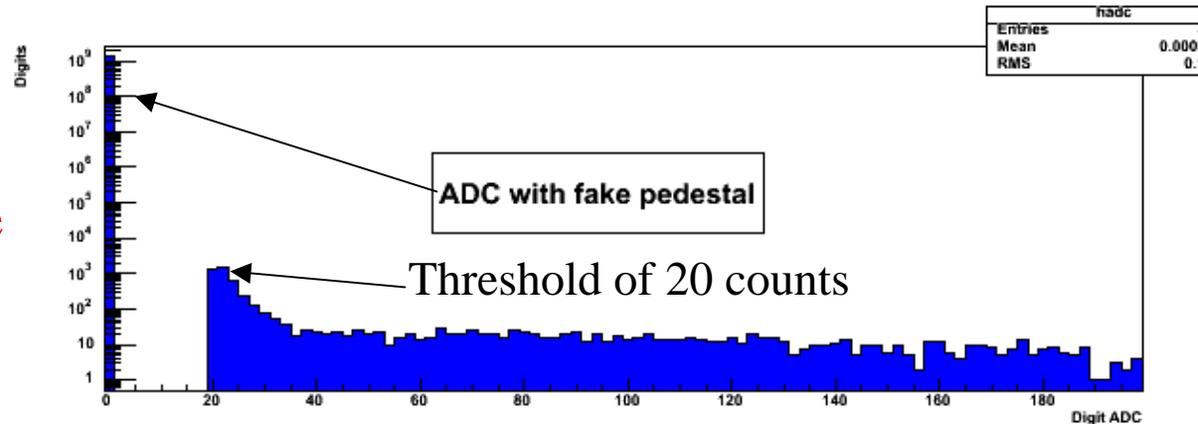
SGATE Rates

- Beam off run 6818
- Channel Map of number of digits/150 spills
- “Dark rate”
 - $\sim 16\text{Hz}/\text{strip}$, or $\sim 2e-4/\text{strip}/\text{spill}$
 - Some channels have much more: worst channel = 5 digits/spill



Beam off: Noise Hits

- Many single digits that appear to be noise just above threshold.
- These don't seem to be calibration problems
- Evidence for local coherent noise in ~4 MINDERS
- Solutions include
 - Hardware investigations
 - Offline strip cut
- See Niki's talk



Hardware Problems

- “Failing MENUs”
 - “We’re losing ~5/month”: P. Shanahan, Jan. meeting
 - That was more like 15/month in January and February
 - Most common symptom is “CapID” error – many possible underlying causes
 - ~3/4 of these have blown +12V fuse, but are otherwise good
 - Had been observed on bench during checkout in ~20 channels
 - not yet understood, but may be “latch up” in QIE?
 - Most others also fixable – not trace failure due to poor cleaning during assembly.
 - Recent 12-day period with no failures – Poisson cruelty?

Conclusions

- **NearDet electronics performance very good**
 - SGATE transient solved, “channel-4” problem reduced 2 orders of magnitude.
 - Drilling down to more rare and more subtle problems
 - “Peeling an onion”
- **Noise in SGATE readout mode**
 - Current problems for reconstruction – shouldn’t be hard to handle
 - Need to investigate cause, as well as possibility of local coherent noise
- **MENU health:**
 - We’ve had 3-4 failures a week, most of which only require new fuse
 - Fuse failure is currently a mystery