



Results of Long Term Testing from Recent UCSB production

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Module Test Status



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- **150 Modules assembled and bonded during two week production run at UCSB**
- **150 Modules tested with ARCS system**
- **Modules with CMN problem were not long term tested because they were being studied extensively with ARCS system**
- **128 Modules put through at least one thermal cycle with full testing in long term test system**



Preliminary Results



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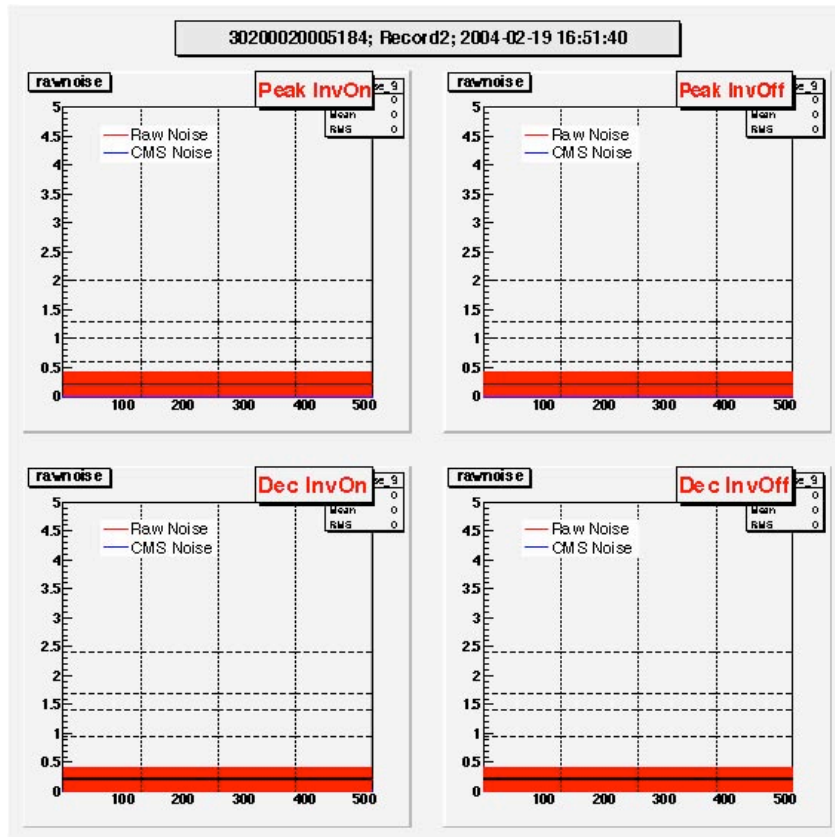
- **29 modules had all channels marked bad by macro**
 - Classified error based on what histograms were written to root file
 - 18 modules had DAQ errors
 - 10 modules had I2C errors
 - 1 module lost bias in the cold



DAQ Error



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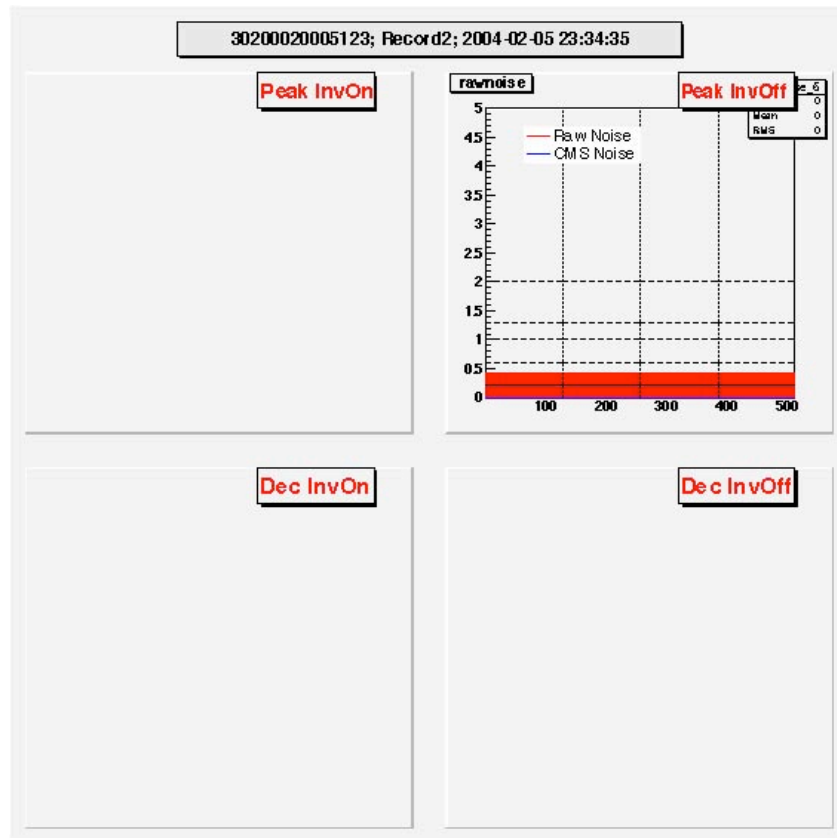
- Histograms written to all 4 modes
- Empty histograms in some modes
- No I2C problem
- Switched to all 4 modes
- Removed from readout because of DAQ problems



I2C Error



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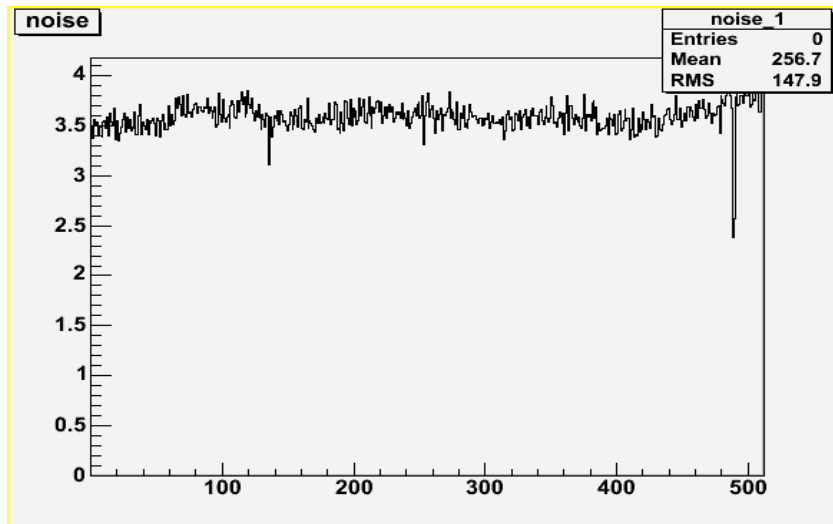
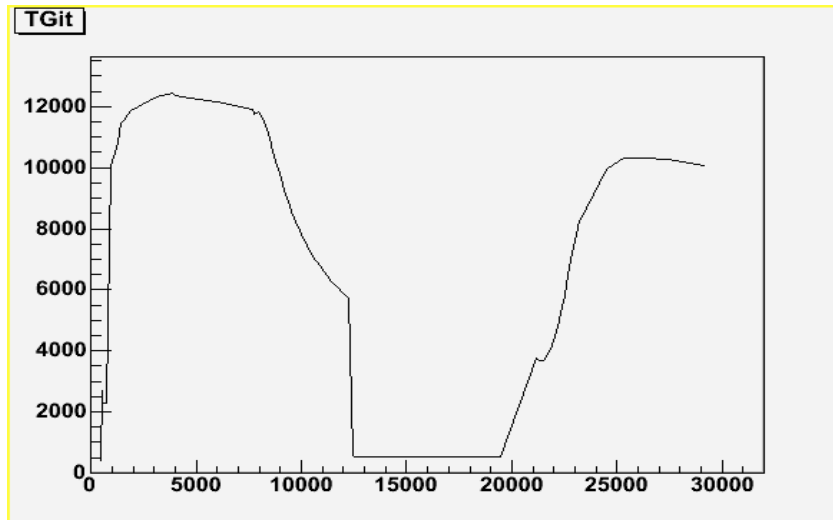
- All histograms missing from some mode subdirectories
- Multiple copies of histograms in one mode subdirectory
- I2C problem because could not switch mode



No bias in cold



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- Module 30200020005069
- Bias current drops to zero in cold
- Noise is consistent with no bias
- Bias current returns on warmup
- Occasionally blows fuses in HV crowbar



“Rippling” DAQ error bug



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- **First retest of modules in load with new modules**
- **2 new modules developed DAQ error!**
- **Directly observed that module that would not read out in cold caused next two modules to be marked bad**
 - **Try 100 times to read bad module**
 - **If next module cannot be acquired immediately it is marked bad**
 - **Can happen twice**
 - **Wim found and fixed bug based on error messages I supplied**



Retesting of Modules



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- **Results confused by rippling DAQ error**
- **Tested one module at a time at -20C**
 - **Cooled box to -20C**
 - **Initialized and tested one module at a time to avoid rippling DAQ error bug**
- **Most DAQ errors went away**
- **Some DAQ errors were real**
 - **Caused by I2C error?**
- **I2C errors were confirmed**



Cause of I2C error ?



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- **Great concern that problem was caused by bonding problems on hybrid**
- **Problem seemed to depend on how long the module was held in the cold**
 - Sometimes I2C errors did not appear until ~1 hour into testing as modules cooled to critical temperature
 - If the module was held in the cold overnight the I2C error problems appeared immediately
- **Thanks to Marco and TIB community for diagnosing the problem and finding the fix!!!**
 - I2C error caused by CCU6 not the hybrid
 - No problem with CCU25 used on substructures



Results



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- **All modules with DAQ errors passed retest with bug fix in place**
- **All modules with I2C errors passed retested with CCU hardware fix in place**
- **One module with real problem in the cold**
 - **One module still losses bias in cold**
- **Visual comparison of Lt histograms to ARCS bad channel list shows good agreement**



Practical experience



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- **UCSB technician loaded/unloaded modules and I monitored Lt remotely in VNC session**
- **Goal was to run two loads per day to match production rate**
 - Typical thermal cycle with testing 8-12 hours depending on number of modules in load and the amount of testing
 - Required split shift to get two loads
- **Box would not get cold on several occasions**
 - Two separate trips from UCR to UCSB (3 hours drive)
 - Loose connector on cable between TRHX and peltier power supply
 - Cable to top peltier pulled loose of connector when new dry air line was installed
 - Peltier power supply does not switch polarity 50% of the time.
 - Replacement peltier power supplied are on order



Reanalysis macro work



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- **Default algorithm for rise time does not work well with shifted pulse peaks**
- **Quick Gaussian fit works better but only smooths results of default algorithm**
- **Bug in ARCS like fit causes Gaussian fit for both Peak and Dec modes**
- **Work on refitting pulse shapes with ARCS like algorithm**
- **Effects of using less than full pulse shape on resolution**
- **Once rise time calculation is correct, rise time can be used for confirming bad channel flags**



Output of refitting



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