TOB Report

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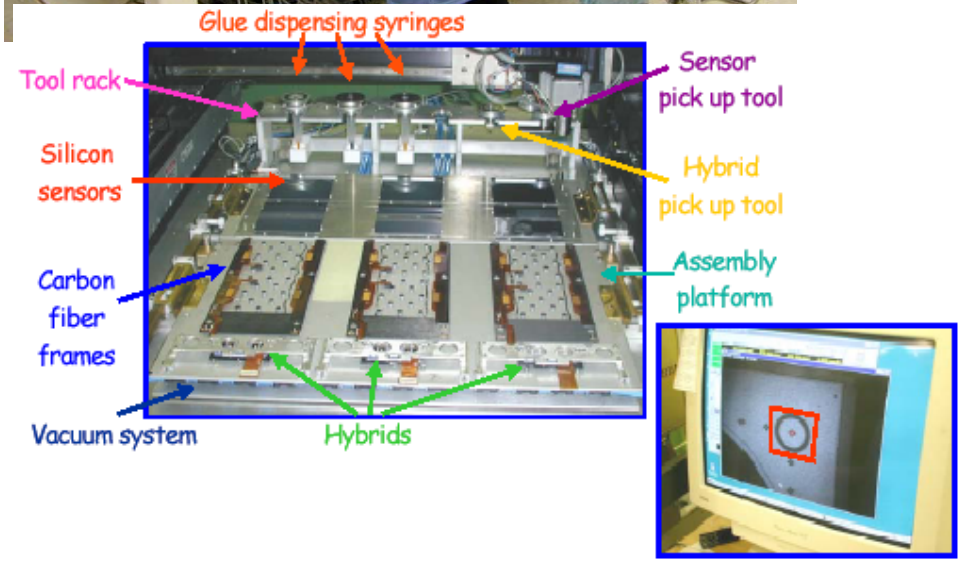
Fermilab

CMS Week

Thanks to Lenny, Kenan, Tim, Wim for information and many slides

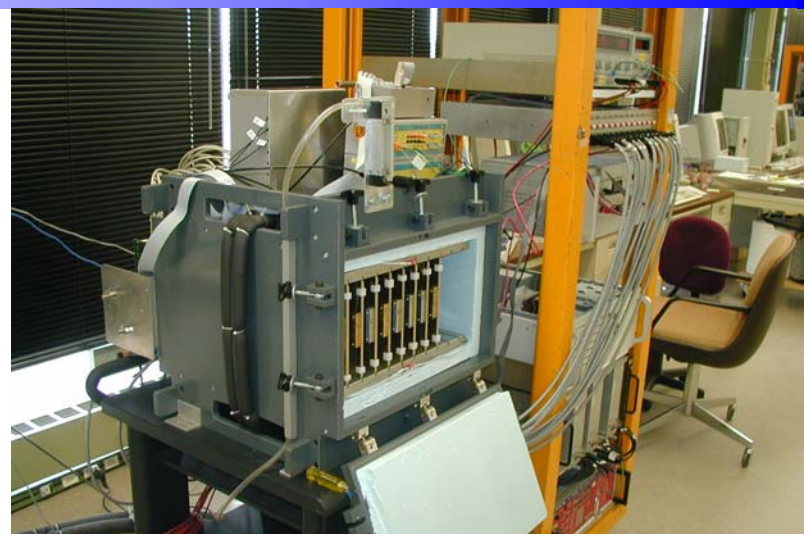
Module Production

- US production lines underwent upgrades to significantly increase production capacity to recover lost schedule time.
  - New and better methods
  - More and better tooling and hardware
  - Better software and Quality Control
- Both FNAL and UCSB production lines have demonstrated stable, high quality module production at high rates
- 15 modules/day/site

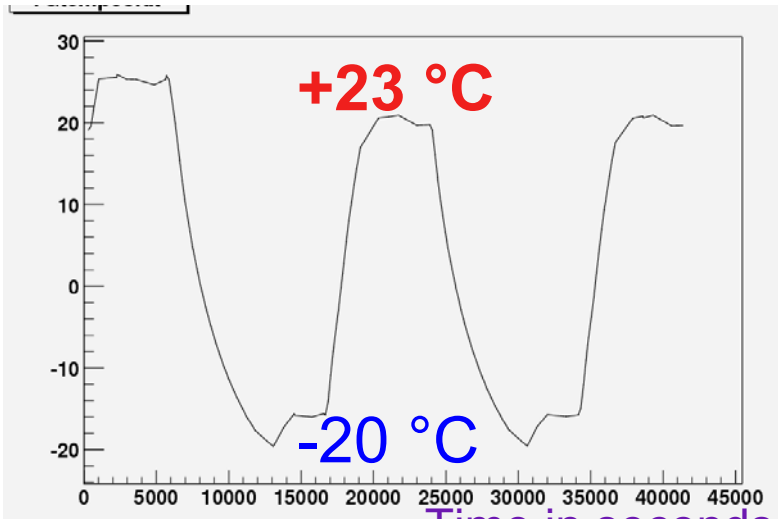


Module Testing

- The testing cycle ~12 hr
  - In order to maintain 15 module per day rate of production
  - 10 modules/test session
  - Includes readout at
    +23 °C, -20 °C, +20 °C, -20 °C, and +20 °C.
  - LT_1_24 used;
  - results tend to agree with ARC fast test results
    - Module grades are based on ARC testing
- System ran reliably throughout the high-rate exercise



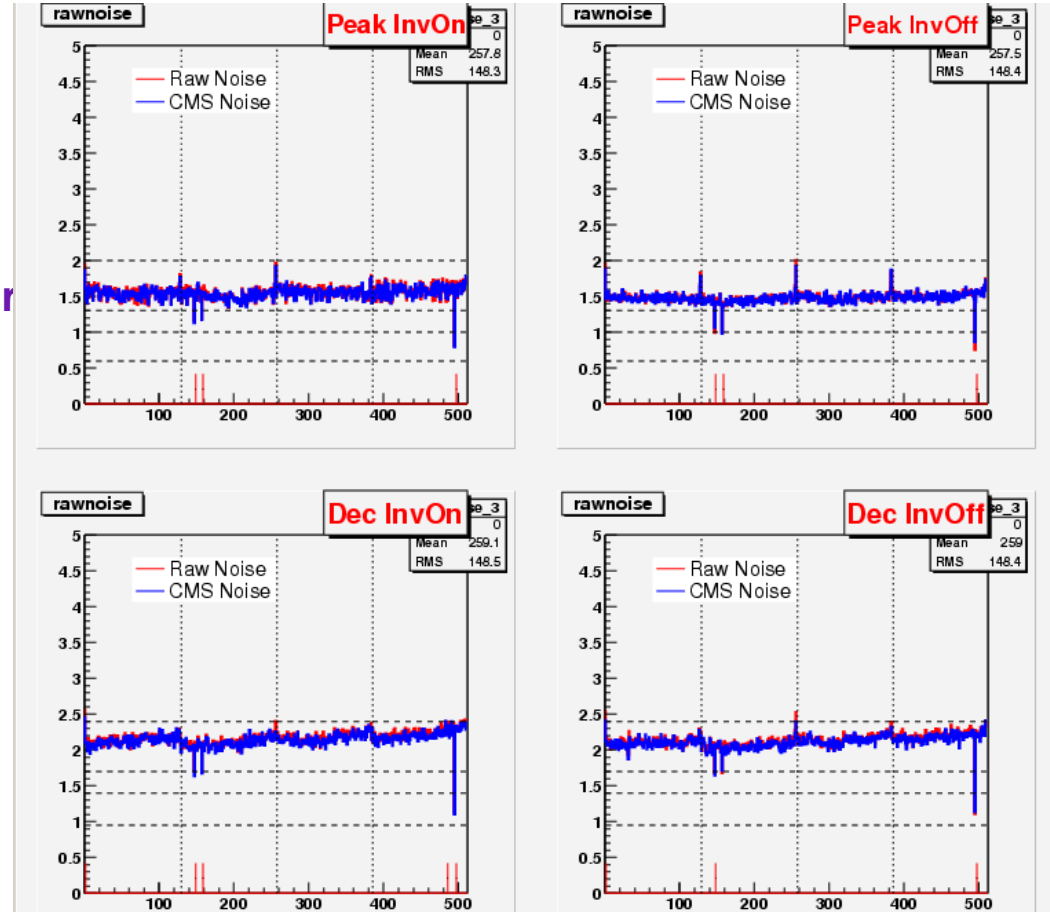
LT system



Testing Results - LT

- Some modules showed high noise at –20 °C in the PeakInvOn mode.
- Traced to cases with 8 or more modules in the Vienna box. Re-testing, with fewer than 8 modules, showed that the noise is an artifact of the testing arrangement.

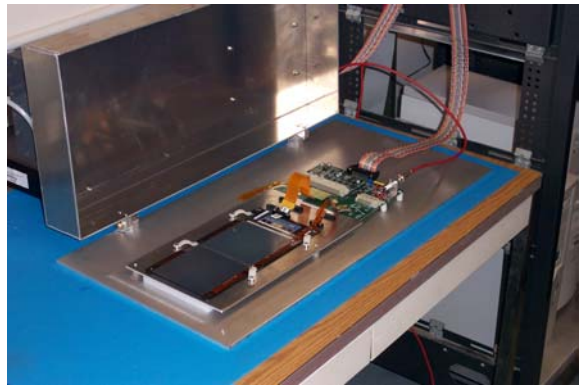
In general there is good agreement between the ARC and LT test results and we do not see (real) problems at low temperature.



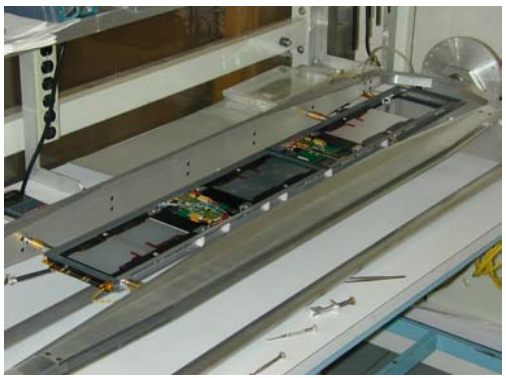
Module Testing

Gantry makes modules

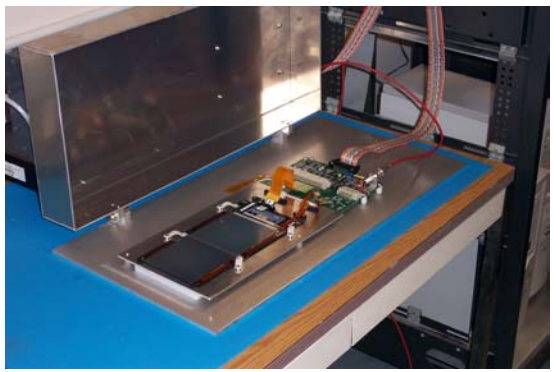
Wire bond



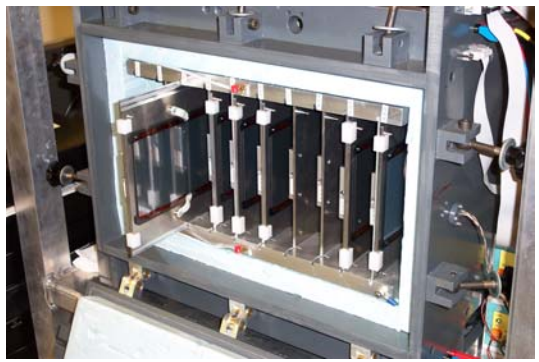
Module quick test



Storage/Mount on Rods



Pinhole tests



Thermal cycle modules
2 loads, 8 hours each

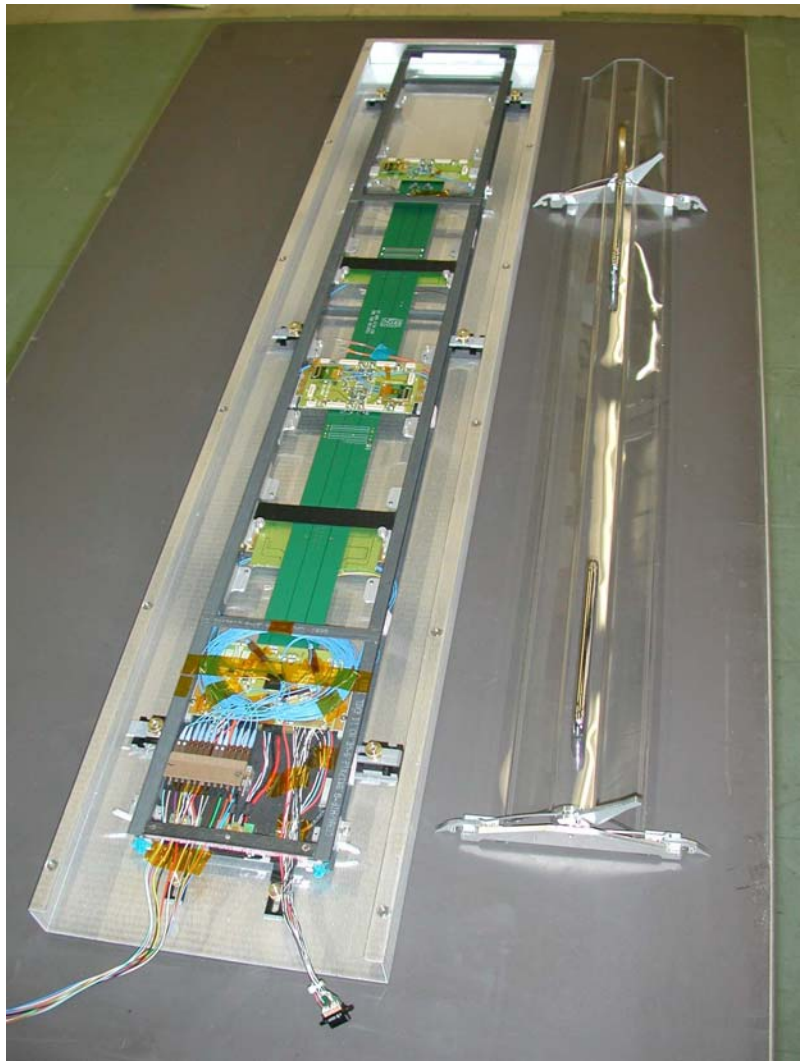
Summary of Tests

- Production Rate of 15 modules/day demonstrated.
  - techniques, procedures, and equipment were refined.
- 302 modules were produced and fully tested in US
- Quality of the modules is high.

  Problems should drop with new hybrids, new ST, & HPK sensors
- Testing infrastructure is ready for the large scale module production
- Testing facilities have trained personnel and with sufficient experience

ROD Structures

- Major components are Command and Control Unit (CCU), and Analog Opto-hybrids (AOH).
- CCU handles communication between rods, and between rod and readout electronics.
- AOH converts module's electrical output to optical signal.
- Both of these components, as well as electrical connectivity of the whole, are tested at CERN prior to shipping.
- Carbon-fiber frame produced in Helsinki, and assembly of CCU's AOH's and support electronics at CERN.



Rod Testing

- Plan is to perform burn-in once rods are assembled
  - Use of commercial chest freezers and chillers for the burn-in facility
  - Thermal-cycling tests to be done during burn-in specified.

•Rods are cycled over 72 hours

- 15 modules/day ⇒ 12.5 (SS) rods/week
- 2 1/3 cycles/week ⇒ 5-6 rods/cycle

•As with the ARC and LT systems we expect that much of the loading, initializing, and monitoring will be carried out by technicians.

•The single rod and multi-rod readout systems are commissioned at FNAL and UCSB, but these are very similar to the LT system (CMS DAQ components).

•Basic functionality achieved.

The multi-rod burn-in thermal controls and interlocks are working well ahead of schedule at both production sites.

Rod Testing

- Single rod test stand commissioned
  - Rod to fiber optic cable to OEC to F-MUX with 4 cards to 4 FED channels
  - HV/LV operational
  - FEC to FECtoCCUM patch card to FECtoCCUM card to CTRL IN and CTRL OUT on ROD
- Configured LtStruct to readout single rod
  - Fiber optic channels mapped to F-MUX channels
  - Timing adjustments to FED to get it to readout after F-MUX switch

Multi Rod Test Stand

- DAQ System setup
  - FEC connected to FECtoCCUM card.
    - Two types of FEC's with different interconnections
  - Need one more TPO to make Rod Test systems identical
  - Software LtStruct used for both
  - Multi-rod configuration files checked out
  - Mapped additional (6) optical fibers to other F-MUX channels

Power Supplies

- All power supplies have arrived from CERN
  - 8 rod power supplies, cables and tails
    - 2 tails had short circuits
  - 1 power supply with cable to power CCU ring through FECtoCCUM board
  - All power supplies are mounted in the rack and integrated with the interlock
  - HV channels added using patch cables

LT Rod Test Stand

8 Rods assembled and being readout

Conclusions

- Module LT Test Stand handling up to 10 modules.
- Single and Multi- Rod Test Stands commissioned.
- 6 rods readout at FNAL (and UCSB) in the rod burn-in stand
- The Test Beam results show good performance of components.

LT SW Status - June 2004 (Wim)

- Two versions available:
  - LT_1_24 (in 3 flavors: TIB,TOB,TEC)
  - LT_2_0 (beta version; 1 flavor fits ALL!)
- Status of LT_1_24 release:
  - TSC driver modified to increase reliability for 10-module operation.(I2C commands scrambled)
- Status of LT_2_00 pre-release:
  - Many changes (new TSC driver, DCU integrated w/ DB,…)
  - More convenient AFS distribution
- Status of LSubstructure_0_13 release:
  - Basic functionality implemented: time and opto tunings, multiple structures (6 run tested!), integrated with slow controls.