



US Testing Update

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(On behalf of the US testing group)

(Brief) Description of Qualification Testing Results
Status of Equipment/Production Readiness
Results with ARCS 7.2 α
Module Cut Requirements



ST Qualification Testing Program

- 177 modules have been built using ST qualification sensors
 - 75 OB1, 90 OB2, 6 R5N, 6 R5S
 - 1 OB1 module built with CMN potential sensors
 - Goal of measuring stability and noise performance in modules
- Testing program
 - Sensor re-probing
 - Only first set of 178 sensors re-probed due to time constraints
 - Standard ARCS tests
 - Long term tests
 - Extended (3 day) tests of sensor stability
 - Majority (77) of first set of modules
 - The remainder of the modules only had a 15 hour thermal cycle due to time constraints
 - Visual inspection of anything unexpected

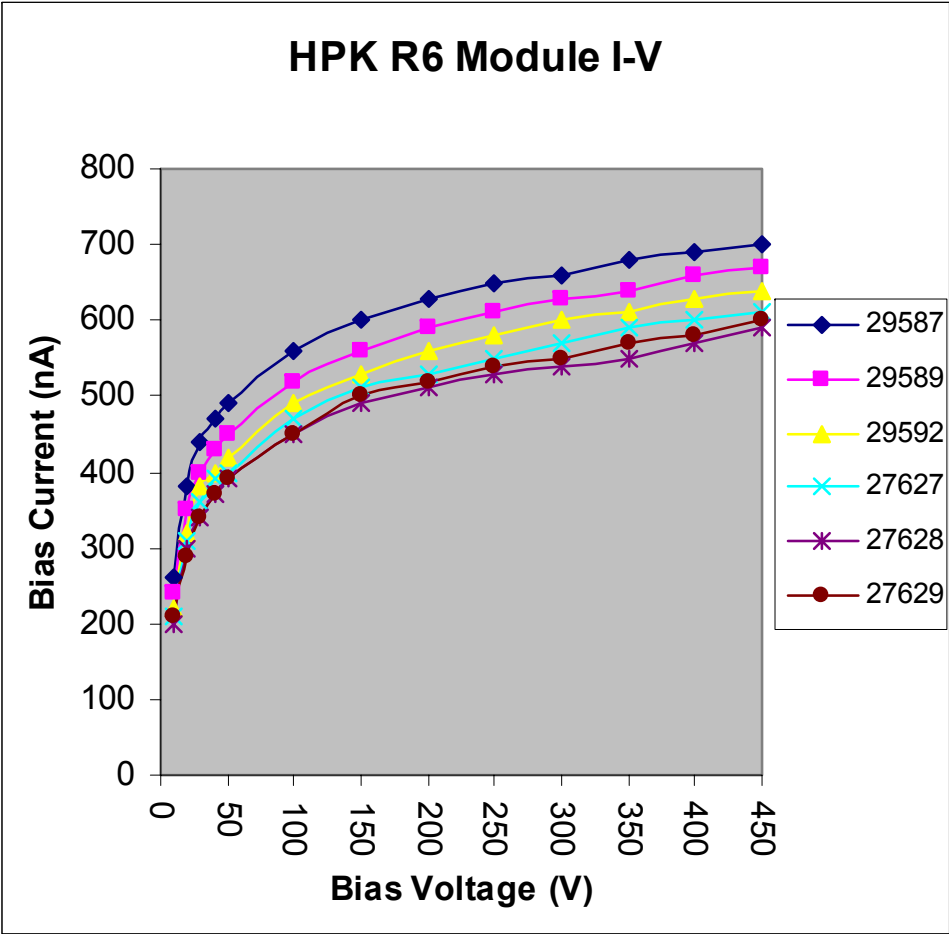
See L. Spiegel's talk in sensor meeting for details of results



First Thick HPK Modules

- 6 R6 modules built using new HPK sensors
- All 6 modules are perfect
 - Not a single flaw
- IV profile as expected
 - Turn-on at low voltage
 - Plateau bias current between 600-800 nA

See L. Spiegel's talk in sensor meeting for more details about the R6 thick sensors





Hybrid Thermal Cycler/ARCS Status



- Recently upgraded to Bruno's current code

- PLL forcing
- Drifting pedestal check
- Added xml file auto-upload

- UCSB, FNAL and Mexico City thermal cycler commissioned

- Still have a few minor "features"
 - Single channel shorts, etc.

We have all ARCS equipment+spares we need



DAQ Equipment Status

- 2 fully equipped Vienna boxes
 - 1 slot in UCSB non-functional
- 2 single rod stands
 - Missing TPO to be able to use MUX
 - FNAL missing rod FEC
 - Cannot run single rod stand and rod thermal cycler at same time effectively
- 2 rod thermal cyclers
 - Both MUXs have been used to test 5 rods tested simultaneously
 - Have enough equipment to fully commission system
 - Only 2 MUX cards + DAQ spares missing
- To instrument UCR long term testing station + spares of critical components we need:
 - 2 TSC
 - 5 TPO
 - 5 rod FEC
 - In hand + replacements for all module FEC at CERN
 - 1 eMUX crate
 - 5 eMUX boards
 - 4 oMUX boards
 - 7 CCU
 - In hand + replacements for all CCU6
 - 10 VUTRI
 - 10 PAACB
 - 19 hybrid-to-utri adaptors

See K. Sogut's talk in this meeting for more details about operational status and experiences



DAQ Equipment Status II

•With current TPO complement:

- Cannot run single rod stands effectively. Needed to pre-test rods prior to loading into cold box
- With 1 failure we lose either:
 - 70% capacity of a Vienna box
 - 1 rod thermal cyclers
- Cannot run more than 16 APVs in UCR stand

•Without the additional MUX, CCU, VUTRI, PAACB, hybrid-to-utri adapter boards

- Cannot run UCR long-term testing station

•With current TSC complement:

- With 1 failure we lose either:
 - 1 Vienna box
 - 1 single rod stand
 - 1 rod thermal cyclers

•Without additional hybrid-to-utri adaptors:

- We cannot load Vienna box fast enough to run two cycles at either UCSB or FNAL. Will have to go to sample cold testing during production on that stand

Component shortages and failures have potential to severely limit production testing capacity which can no longer afford



ARCS 7.2 α Data Taking/Analysis

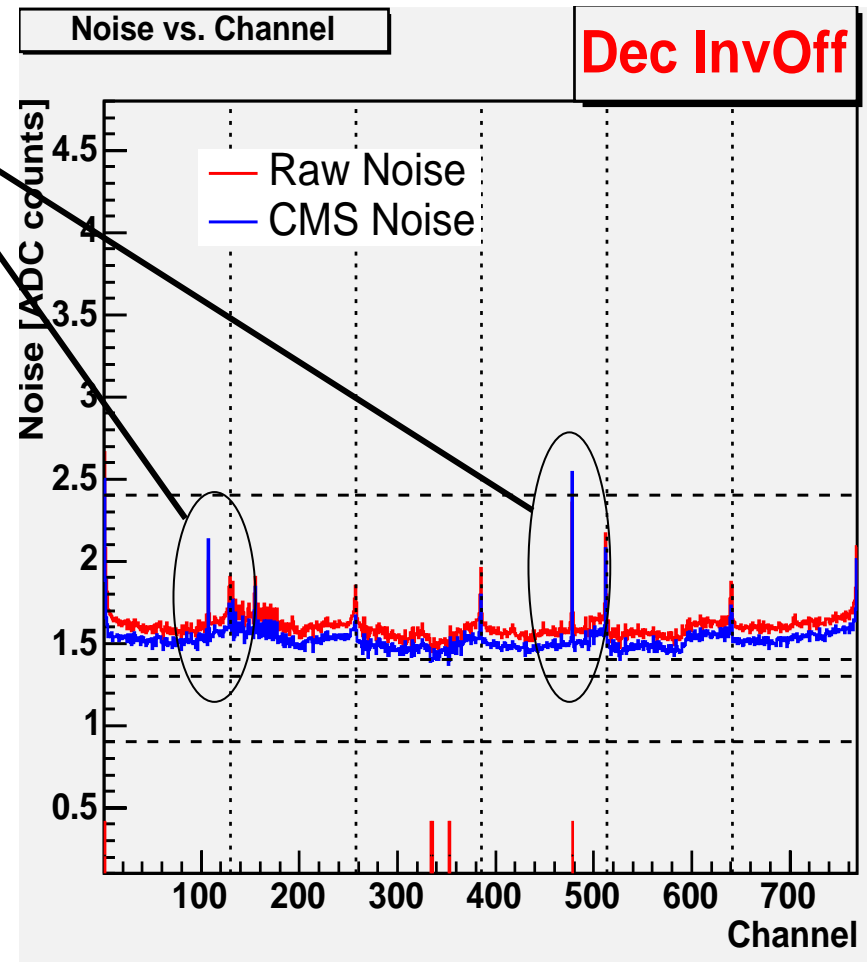
- Upgrade to 7.2 α went fairly smoothly
 - DLL file is not found automatically
 - Need to point to arcs_dll.dll
 - arcs_main_config.cfg needs to be modifying to proper cut file used
 - OB1, OB2, R5, and R6 cut files needed additional line added so that fast test works properly
 - Cut files available at <http://hep.physics.ucsb.edu/people/dbarge/testing.html>
- ARCS 7.2 α has many advantages which prompted us to use upgraded version
 - Fast test more subtle-not just pass/fail anymore
 - Much improved fault flagging
 - Automatic generation of xml file for each record



UCSB DEPP Problems

- Using the DEPP HV power supply at UCSB, we find that the noise for opens in dec. mode high enough so that fault flagging algorithm will not work
 - Cause is not understood
- Due to the noise issue, we are forced to use Keithley power supplies with no DB capabilities

Until DEPP understood at UCSB, the Keithley will be used. **Thus, IV and bias current data will be missing from xml files until problem is solved!!**





ARCS 7.2 α Testing Procedure

- In arcs_main_config.cfg, change pointer to correct cut file
- Initialize module
- Select and run fast tests, noise tests (all modes), pulse shape tests (all modes), pipeline test (peak on), and pinhole test
- Check xml output to see if bad channel list matches ARCS online output and ARCS macro
 - After first ~100 modules match, we will stop checking xml files
- Upload checked xml file
 - Will automate xml upload after first ~100 modules

It is not clear to us if all required xml fields are being filled

- Because we are not using DEPP boards, UCSB's files will be missing bias current information
- Fast test information also might not be complete



ARCS Database Entry

- We are generating xml files using ARCS 7.2 α
 - We will finish uploading them soon. Due to DEPP board problems, IV and bias current missing from xml files at UCSB
- The ARCS xml file bad channel list in 7.2 α match the ARCS macros bad channel list (almost) perfectly
 - Few channels marked as “unknown failures” due to a slight difference in how the pinhole test is used
- Bad channel flagging is nearly identical to ARCS macro in 77 TOB files checked
 - 1SO marked as 2SO in peak time tests for unknown reason
- We believe ARCS 7.2 α xml files will match ARCS macro output and should be uploaded
 - About 100 modules will have ARCS macro and xml bad channel list compared to confirm this
 - Once this is finished, we will auto-upload ARCS testing data

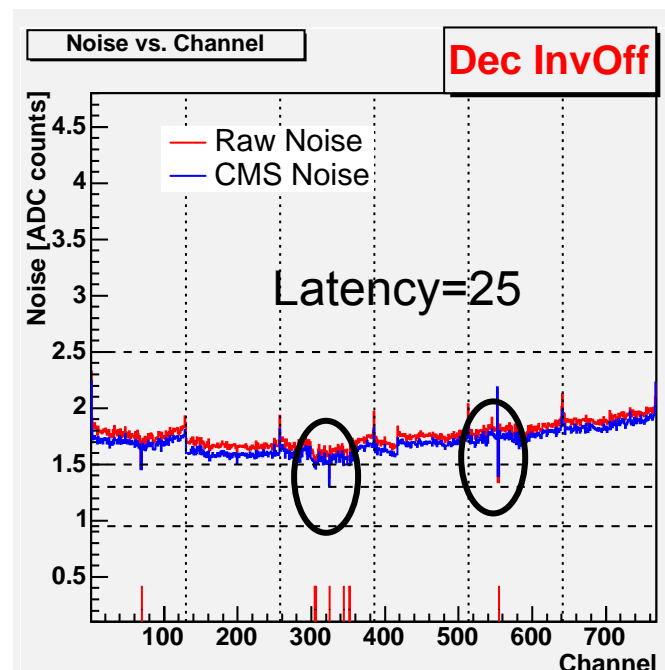
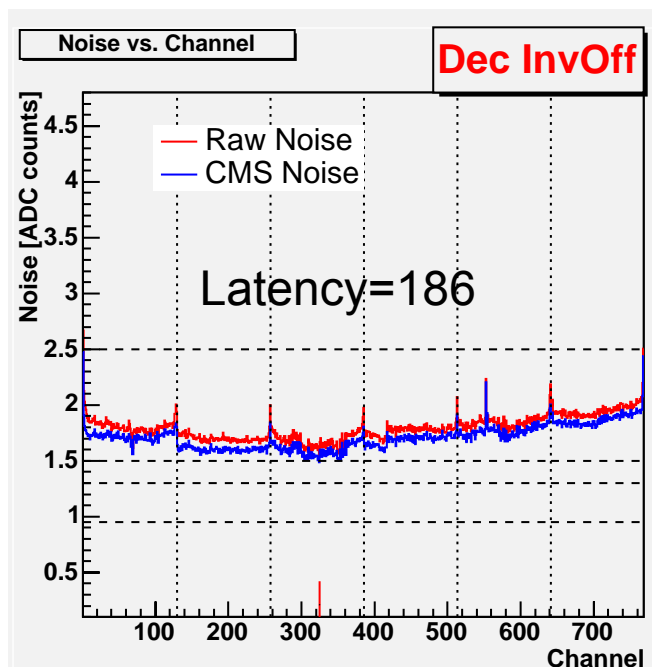


Module Fault Finding Requirements

- In an effort to minimize the different set of cuts used in the US, we have begun effort to re-tune requirements
 - We have found that the peak time, pulse shape, and pinhole requirements can be made common.
 - Unfortunately, the noise requirements have to be different to mark open location correctly
 - Load capacitance different in OB1, OB2, W5A/B, W6A/B sensors
 - We still do not have enough TEC modules to finalize R5 requirements
- We also found the common mode noise requirement on the R5 has to be tightened
 - Dec. Off CMN < 0.5 to have consistent bad channel flagging
 - As Aachen saw with the R6 modules
 - Also saw dependence with latency setting



R5 Noise Issues and Latency



- We cannot reliably find opens using the noise measured in Dec. mode started using All Tests menu (Latency=186)
- Opens much more obvious when testing directly through Deep Tests (Latency=25)
 - Same effect seen previously when upgrading to different ARCS versions
- We may need to tune latency to provide best test performance



Noise Fault Finding Requirements

Peak Mode

	OB1	OB2	R5	R6
Pinhole	0.6	0.6	0.6	0.6
2SO	0.85	1.0	0.85	0.9
1SO	1.2	1.3	1.05	1.15
Noisy	2.0	2.0	2.0	2.0

Deconvolution Mode

	OB1	OB2	R5	R6
Pinhole	0.95	0.95	0.95	0.95
2SO	1.3	1.4	1.3	1.2
1SO	1.55	1.7	1.35	1.5
Noisy	2.5	2.5	2.5	2.4

- We believe that the OB1, OB2 and R6 requirements are “finalized”
- The R5 requirements still have to be tuned



Peak Time Fault Finding Requirements

Peak Mode

	OB1	OB2	R5	R6
High	10	10	10	10
1SO	-4	-4	-4	-4
2SO	-8	-8	-8	-8
Pinhole	-30	-30	-30	-30

Deconvolution Mode

	OB1	OB2	R5	R6
Noisy	10	10	10	10
1SO	-2	-2	-2	-2
2SO	-4	-4	-4	-4
Pinhole	-30	-30	-30	-30

- We believe that the OB1, OB2 and R6 requirements are “finalized”
- The R5 requirements have to be confirmed with more data, but all indications are that we can use the same peak time cuts for all modules



Pulse Height/Pinhole Test Fault Finding Requirements

Peak Mode

	OB1	OB2	R5	R6
High	15	15	15	15
Low	15	15	15	15

Deconvolution Mode

	OB1	OB2	R5	R6
High	25	25	25	25
Low	25	25	25	25

- We believe that the OB1, OB2 and R6 requirements are “finalized”
- The R5 requirements still have to be verified
 - Have every reason to believe it will work
- We use the same cut of 40 for the pinhole test



Conclusions

- First 6 HPK R6 modules perfect
- Commissioning of hybrid, module, and rod testing progressing
 - But limited by equipment, and testing capacity could be severely reduced if a TPO or TSC fails
- Until noise due to DEPP understood at UCSB, no IV or bias current information will be available in xml file/database
- We have found a set of testing requirements for OB1, OB2, R5, and R6 modules
 - All cuts identical except for noise cuts
 - The R5 requirements still need to be confirmed with more modules
- Results of the ST qualification testing will be shown in the sensor meeting