

Recap of Cold Issues Observed During CRP 4-6 Coldbox TEsts

CE Consortium Meeting 2/13/2024

Roger Huang

Background

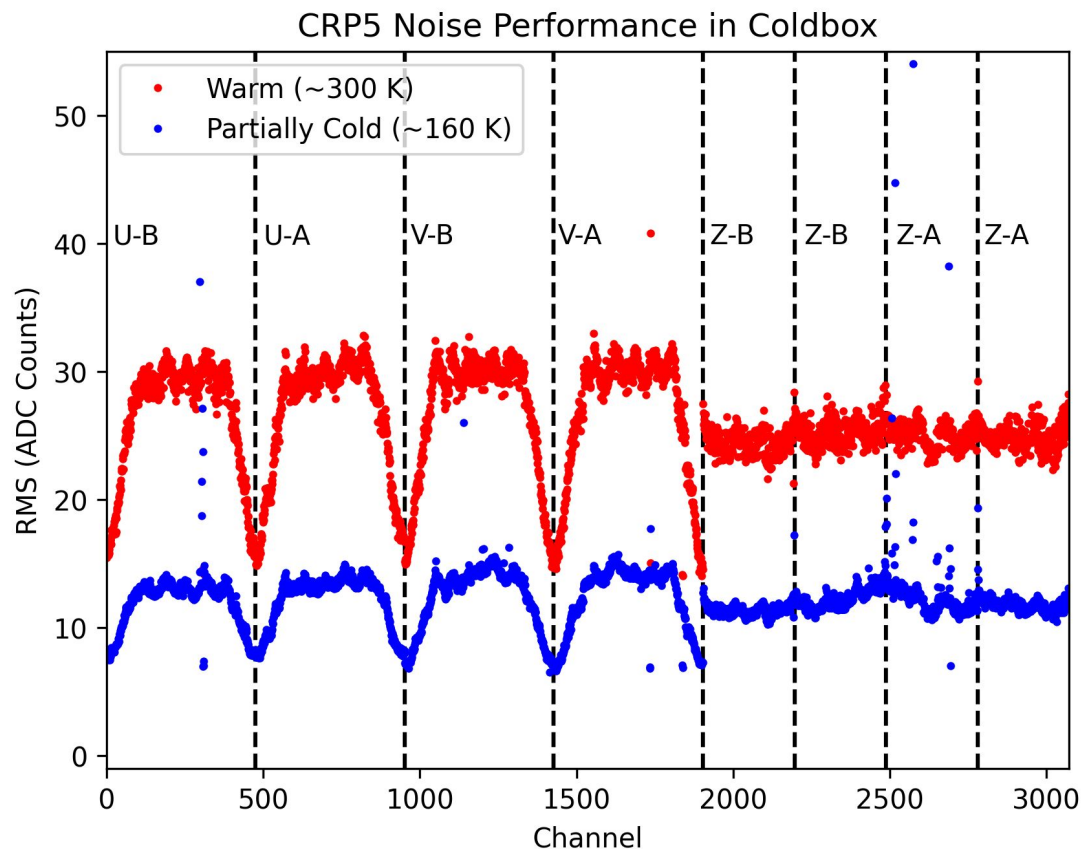
- There is currently debate around whether the FD2 CRPs need to be LN₂ tested at the factories or whether they can just be cold gas tested
 - Reminder: the bottom CRPs will have FEMBs installed at the factory sites, so they will have full charge readout for these tests
- CRP factories estimate that LN₂ tests would require 8000 L per week to keep up with CRP production rates, which would require investment in additional cryogenic infrastructure
- **Question:** how many of the issues we've seen in CRP coldbox tests so far would have been caught in only a cold gas test, and how many only appeared in LAr?

Summary of CRP Cold Issues

	1st CRP5 Test	CRP4 Test	2nd CRP5 Test	1st CRP6 Test	2nd CRP6 Test
Issues appearing in Cold Gas	Random channel disconnects and noise	None	Random channel disconnects and noise	1 FEMB lost during pre-cooldown warm purge 2 FEMBs lost in mid-100s K cold gas	Random channel disconnects and noise
Issues appearing only in LAr	1 FEMB inoperable due to loss of clock signal More excess noise	None	More excess noise	More random channel disconnects and noise	None

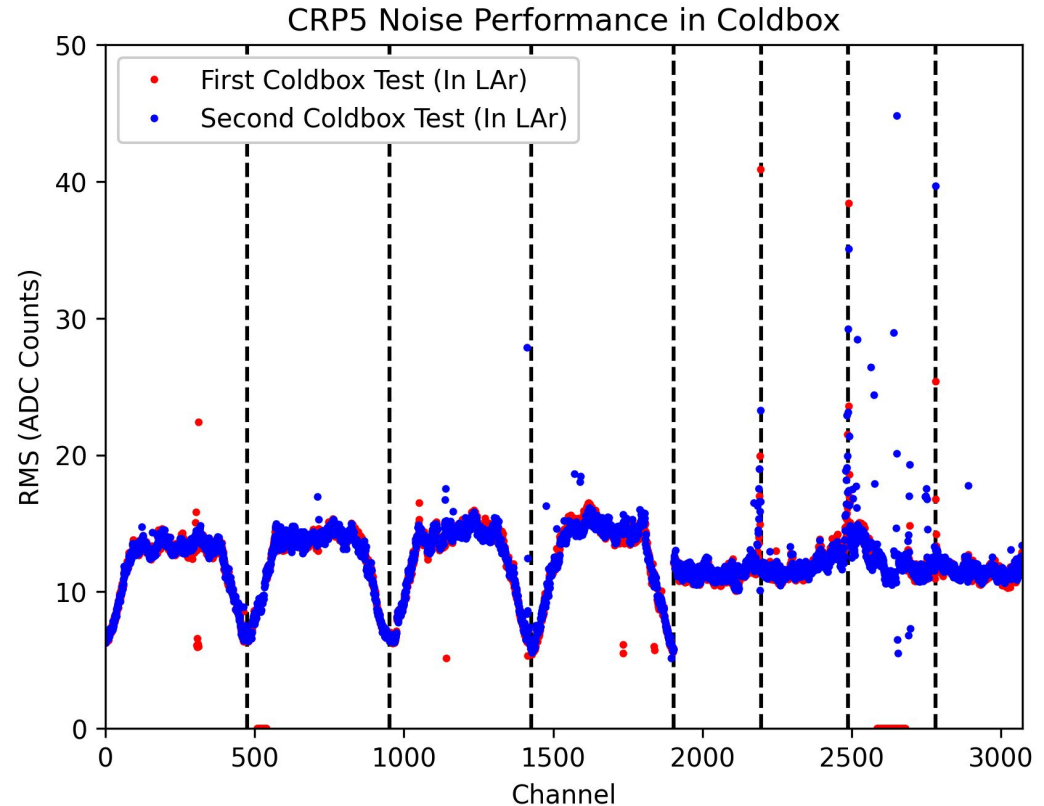
CRP5 1st Partial Cooldown

- 1st CRP5 test had a cryogenic mishap that resulted in sitting in cold gas for a few days
- At this point all FEMBs were functional but we see clusters of abnormal channel responses appearing



CRP5 in LAr

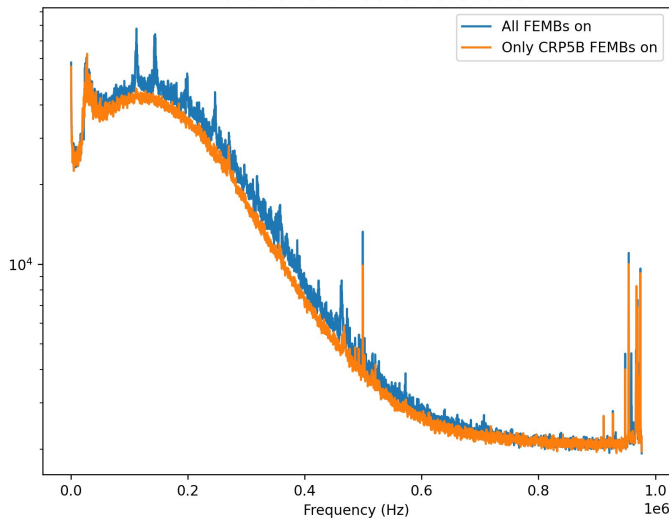
- 1st CRP5 test had one FEMB lose its clock signal in LAr, which made it inoperable
 - Believed to be a cable issue, but was not conclusively shown
 - FEMB recovered itself at warm
- In both CRP5 tests, some excess noise appeared near the CRU border in LAr



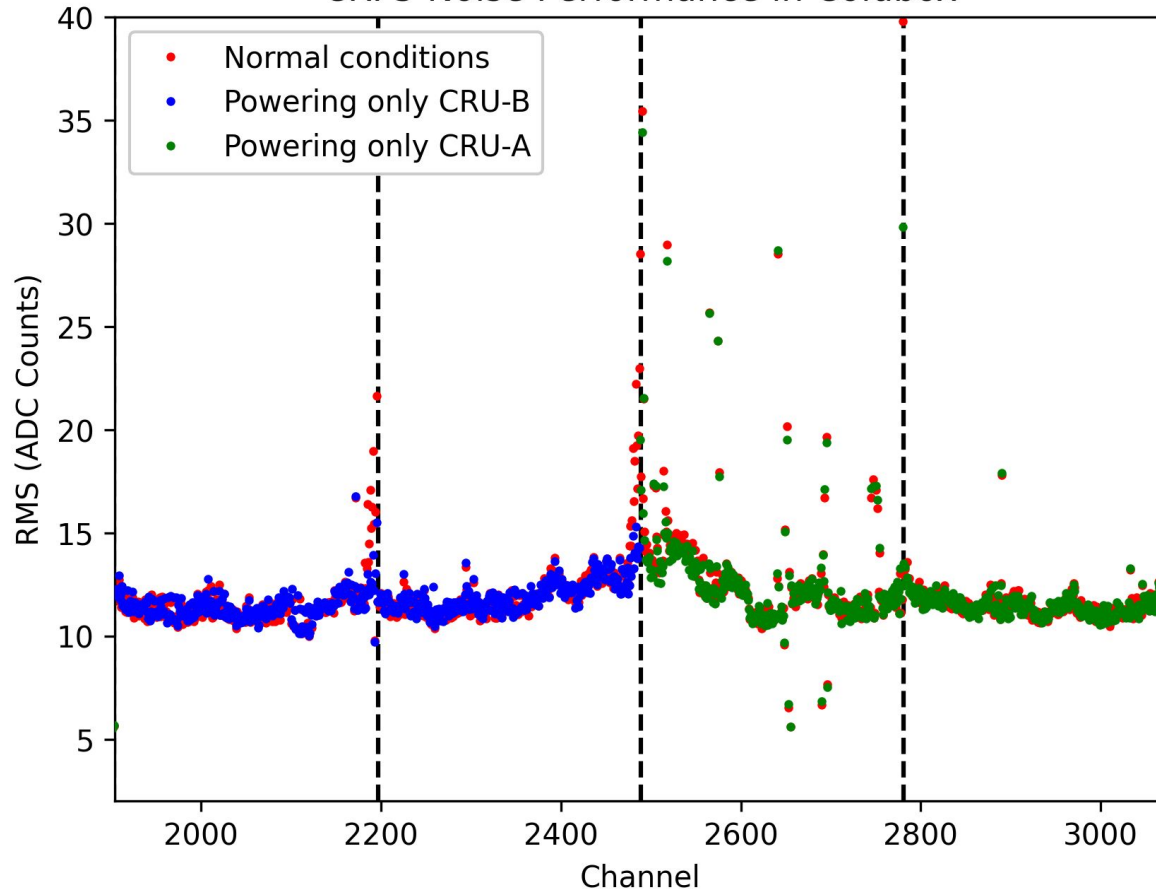
CRP5 Border Noise

- Powering on only the FEMBs on one CRU at a time suppresses the noise on the CRP5B collection channels near the CRU border
 - Indicates an electronics effect

FFT for CRP5B Channels near CRU Border

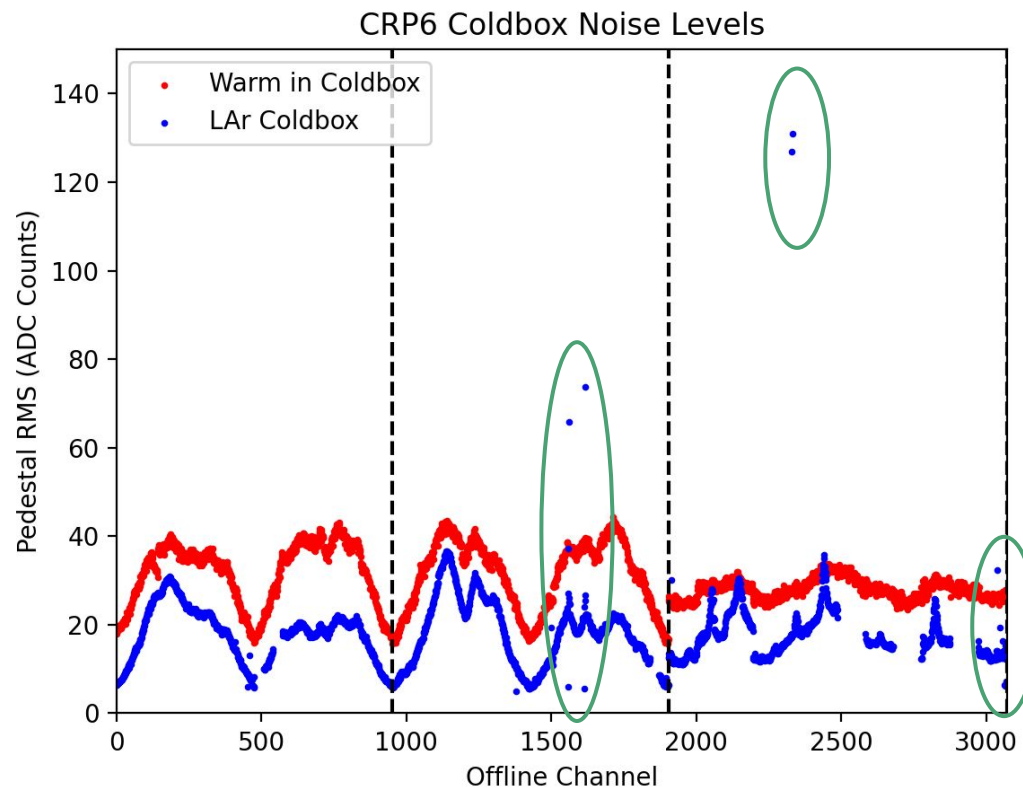
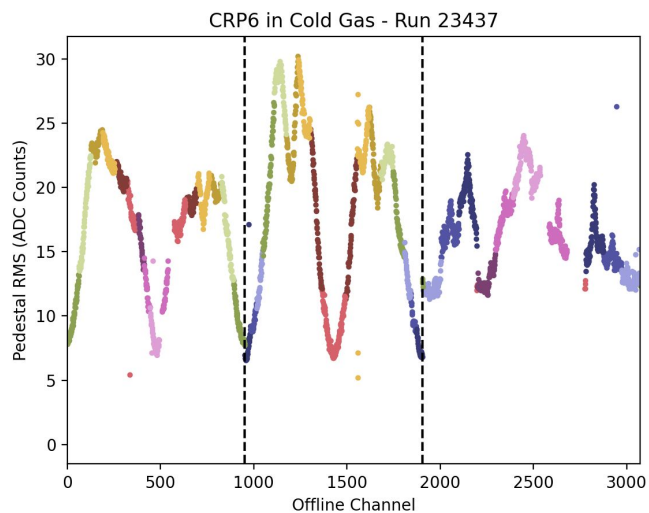


CRP5 Noise Performance in Coldbox



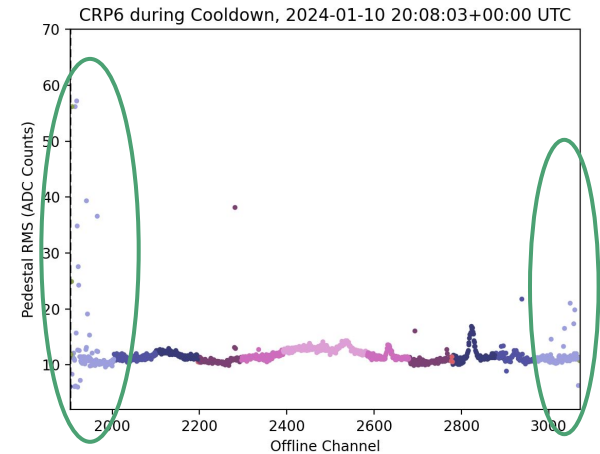
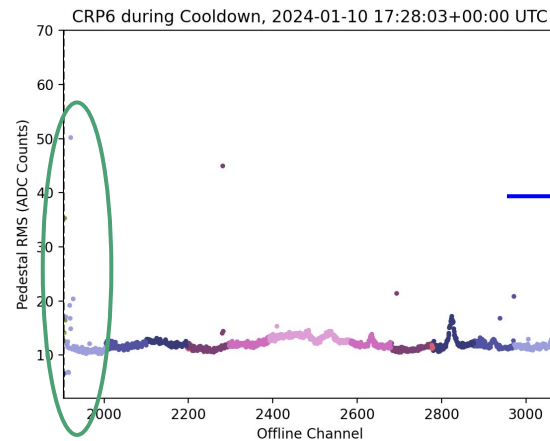
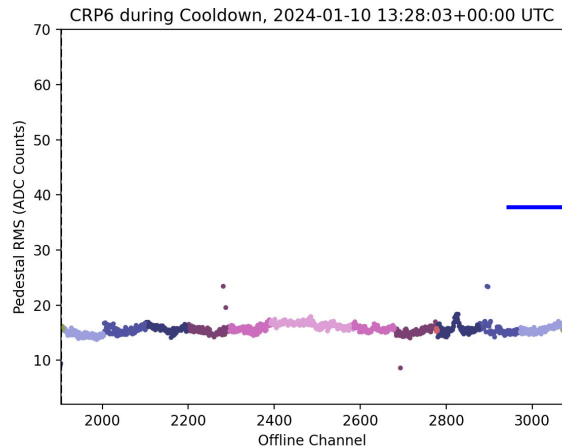
CRP6 First Cooldown

- Some noisy/disconnected channels only appeared once in LAr
- 3 problem FEMBs were all recovered at warm and believed to be cable-related
 - But again, not conclusively shown



CRP6 Second Cooldown

- The random clumps of disconnected and high-noise channels on the collection plane appeared in cold gas, in the mid-100s K
- The afflicted channel tally changed a bit after a few days of running in LAr



Summary of CRP Cold Issues

	1st CRP5 Test	CRP4 Test	2nd CRP5 Test	1st CRP6 Test	2nd CRP6 Test
Issues appearing in Cold Gas	Random channel disconnects and noise	None	Random channel disconnects and noise	1 FEMB lost during pre-cooldown warm purge 2 FEMBs lost in mid-100s K cold gas	Random channel disconnects and noise
Issues appearing only in LAr	1 FEMB inoperable due to loss of clock signal More excess noise	None	More excess noise	More random channel disconnects and noise	None