

Readout Electronics and Survey Image System Process Integration (SISPI) (W.B.S. 1.3 and 1.6)

Gunther Haller, SLAC

Paul O'Connor, BNL

Comments: Readout Electronics

- Overall: excellent progress. A strong technical team is in place and a good deal of prototyping has already taken place.
- There are still some system implementation options to be decided on. For example, a number of options for conditioning video signals in the dewar were presented; a down-select is needed prior to CD-2
- These options have been presented as empirical fixes without a full understanding of the root causes at the circuit/system level. In addition, the focus on noise as a single figure of merit possibly has the risk of overlooking negative impacts on other performance such as crosstalk and linearity. Configuration changes should be guided by theoretical understanding, and then validated by experimental measurements
- The allocation of the noise budget between the CCDs and the electronics was not presented. The noise allocation to the electronics should provide margin to allow for considerable variation in CCD performance, as the CCD yield may otherwise be adversely affected.
- Planned system tests in summer with the multi-CCD test vessel are essential to measure performance (cross-talk, noise, etc)
- Power supply and grounding details are still being investigated and further understanding is needed

Comments: SISPI

- Where to run the focus algorithm still needs to be decided and can impact the cabling
- Whether the thermal control system needs to be synchronized with data-taking to avoid EMI interference is to be evaluated
- There are two potential issues related to guiding:
 - Guider information is unavailable when the shutter is closed. How does this impact the tracking performance of the telescope control system?
 - The guide CCDs are operated at fast frame rate without an “erase” cycle. The impact of whether persistence effects influence the centroid finding should be evaluated.
- Plans on how to protect the CCD’s from possible damage due to either ESD or electrical transients should be formalized.

Recommendations

1. Down-select, before CD2, the configurations of electronics modules with justification why each option was chosen. Experimental results should be compared with theoretical expectations.
 - JFET on or off AlN substrate
 - Paralleling JFET's versus having a preamplifier board
 - Preamplifier in or out of dewar (if applicable)
 - Single-ended or differential signal transmission
 - Kapton versus micro-coax cable
 - Mechanical design choices of connector attachment to CCD package
 - Power supply configuration choices
 - Multi-crate synchronization choices
2. Consider, as an option, calling an external review of the video signal chain prior to CD-2.
3. Analyze scenarios which could put CCD's at risk and evaluate mitigation strategies if applicable (e.g. power-on or off, or software initialization transients exceeding safe voltage limits.)
4. List and review all material properties for vacuum compatibility (e.g. outgassing)
5. Ensure that a failure in one CCD string does not impact the operation of other CCD's
6. Evaluate tracking errors caused by the unavailability of guiding information immediately prior to the exposure and resulting from persistence effects in the guide CCD's.