



Technical Draft Recommendations

DARK ENERGY
SURVEY

3.1 Optics, Optical Corrector, Mechanical Systems

1. Augment the systems engineering effort within the DECam group. **Brenna, Greg, Jim**
2. Complete the FEA for the DECam structure and combined instrument/telescope assembly for CD-2. Revise the design of the cage assembly and vanes if necessary. **Andy**
3. Perform a cost-benefit trade study of lens fabrication methodology (surface figure only versus transmission testing) for CD-2. Revise lens specifications if necessary. **Peter Doel, UCL**
4. Maintain contact with Corning regarding lens blank availability. **Peter, David Brooks and I will visit Corning June 12-14,**
5. Complete a stray light analysis. **Andy-> Bruce Bigelow (Michigan)**
6. Re-examine the need for a light baffle enclosing the barrel assembly and delete if superfluous. **Andy and Bruce**
7. Resolve hexapod performance issues and consider alternative designs. **Workshop next week**
8. Include the f/8 assembly and counterweight in the weight and balance tabulations. **Andy**
9. Complete the lens cover conceptual design. **Andy->French or ?**



Technical Draft Recommendations

DARK ENERGY
SURVEY

Focal Plane Detectors and CCD Camera

CCD Yield (Tom, Juan, Huan, Jim + input from Science WKG)

1. Fully test a sufficient number of packaged CCDs in time to provide a more accurate yield projection by CD-2, and enable the project to carry a smaller range of budget and schedule scenarios. Determine the dependence of yield on operating temperature (due to freeze out of back side defects).
2. Pursue a testing strategy for lot 2 CCDs, which includes several 2k x 4k CCDs in advance of CD-2, not just 2k x 2k devices, to address the concern that the 2k x 4k devices might present yield or performance issues not seen in the 2k x 2k devices.
3. By CD-2 develop detailed plans and costs estimates for all yield scenarios under consideration.
4. Cost, schedule and impact on science need to be quantified for the fall back scenario in which some CCDs are replaced with better ones in Chile.
5. In both DOE funding scenarios (1 & 2), maintain a *steady pace* in the manufacture, packaging and testing of CCDs to avoid yield losses due to process startup. Ramp up to a pace which will fully engage the various participants ASAP and avoid interruptions to maximize yield.
6. Work with the science team to develop a more sophisticated measure of performance yield. A formal process should be initiated to update the flowdown of science requirements, which should be under change control..

Cooling (Herman, Rich, Andy, CTIO)

1. Obtain empirical data on radiative transfer from window to CCDs and the effectiveness of aggressive radiation shielding, so major expense is not incurred simply to allow margin for large uncertainties in thermal load projections.
2. Conduct an *external* review prior to CD2 to evaluate the cryogenic and vacuum options considering development cost, operating cost, maintenance cost and reliability. The review should address the vacuum system design issues and options raised in the comments section of this report. This mini-review should also examine the (dis)assembly method which is intimately coupled to the vacuum and cooling



Technical Draft Recommendations

DARK ENERGY
SURVEY

Readout Electronics (Terri et al will respond)

1. Down-select, before CD-2, the configurations of electronics modules with justification for each option 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 that could put CCDs 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 CCDs.

SISPI: CTIO (Tim et al) + Juan + Inga/Jon

6. Evaluate tracking errors caused by the unavailability of guiding information immediately prior to the exposure and resulting from persistence effects in the guide CCDs.



DARK ENERGY
SURVEY

COST, SCHEDULE, and FUNDING

Draft Recommendations

1. Re-plan CD-3 to be consistent with the planned state of the design.
CCDs and Final CCD packages are the long lead time and critical tasks for FY08 and prime candidates for CD-3a
2. Monitor the foreign contributions from UK and Spain closely. Delays in funding could be a risk to the overall project. **Brenna with UCL and Peter Doel on the UK part and Terri and Barcelona on the Spanish part**
3. Form a resource management board with director level persons from the primary institutions. **John and Brenna**
4. Add Level 2 milestones with a density of about one per month.
I don't want more L2 milestones, DOE guidance (Kathy) was one L2/6 months. But we will add more L3 and L4 milestones in the schedule ~ one/month per subsystem.



Project Management Draft Recommendations

DARK ENERGY
SURVEY

1. Determine whether it is feasible and justified to seek a simultaneous CD-2 and CD review or revise project plan to reflect staggered CD-2/CD-3 and potentially the use of partial critical decisions (e.g. CD-2a/b; CD-3a/b) and solicit DOE concurrence. **The CCDs and Final CCD packages are the long lead time and critical tasks for FY08 and prime candidates for CD-3a. Will work with L2 managers on this.**
2. Develop and finalize a complete set of MOUs with annually revised appendices describing scope of work and management details at all necessary levels of the DES project before the DES Project review for CD-2. These MOUs must include the principal laboratory directors MOU (FNAL/NOAO/NCSA) and all additional collaborating institutions with in-kind contributions. **Wyatt (and Brenna and John) – Starting with DECam MOUs between Fermilab and the institutions contributing to the DECam project**
3. Provide additional systems management resources at the highest level of the DES Project to ensure complete and proper delineation and integration of the three projects (DECam, DES Data Management, CTIO Improvements) before the next DOE/NSF review. **John and the directors**
4. Separate into a minimum of two separately controlled documents the fundamental scientific requirements and derived technical specifications before July 1, 2007.
**???John?? Need to plan and distribute the responsibilities: Kent, DePoy, Annis, Huan....
Maybe 3 documents: Science Requirements, Technical requirements, Technical Specifications?**



Project Management Draft Recommendations

DARK ENERGY
SURVEY

5. Develop and implement a project monitoring and control approach, that may includes low-level milestone tracking, for Data Management and CTIO Improvements that will ensure the timeliness of progress of explicitly funded and in-kind contributions that make up the balance of these two projects before the next DOE/NSF review. **John, directors, JOG?**
6. Consider developing and implementing an active milestone monitoring of the DECcam project and in particular in-kind contributions that includes frequent explicit monitoring of individual milestone schedule float consumption prior to the review for CD-2. **Brenna, Peter Doel, Terri**
7. Consider the development of a DES Project Resources Board and coordinate its scope and direction with DOE and NSF with respect to any Joint Oversight Group (JOG) that might be formed by the next DOE/NSF review **John**
8. Fill the systems/project engineering position within the DECcam Project as soon as possible. **Looks unlikely we will get additional high level engineering, but with a DECcam project scientist and additional targeted engineering to free up Andy and Terri it might be OK.**
9. Develop explicit criteria and definitions for the end of the DECcam project and its corresponding CD-4 before the CD-2 review. Specifically, address issues of number of acceptable and installed CCDs on the focal plane and *gatepoint* criteria needed to determine when to transfer the instrument to CTIO. **Brenna, Tim John, Alistair, Science WKG?**



News

DARK ENERGY
SURVEY

- All reviews have stated that we need a DECam project scientist or project engineer or technical specialist
 - Darren DePoy (OSU) is considering taking on this role.
 - Experienced Astronomer
 - Many years observing at CTIO
 - Head of the Instrumentation group at OSU since 2001
 - Builder of astronomical instruments
 - Mont, Scott, John are all supportive – now we move to the details
 - Will help translate scientific and technical requirements into detailed specifications that we can use for vendors and engineers
 - Help with the decisions we need to make before CD-2 (and after!)
- Image Quality Workshop: May 22nd 12:30-5 Sidet
 - <http://des-docdb.fnal.gov:8080/cgi-bin/DisplayMeeting?conferenceid=42>
Agenda:
 - 1) Steve Kent : Science Requirements
 - 2) Tim: Review of what has been measured on the telescope flexure
 - 3) Andy: Review what parts of the telescope structure have been modeled
 - 4) Mike Gladders - the focus and alignment chips and donut analysis.
 - 5) Dave Gerdes - review of the BCAM capabilities
 - 6) Dave McGinnis or French - Review of the Hexapod specs



More Up-coming Workshops

DARK ENERGY
SURVEY

- SISPI workshop in June at Fermilab
- Cooling workshop in July/August
 - Review comments were pointed:
 - “The detector cooling system will probably work as presented but a design using commercial components (e.g., Cryo-Tigers) may be simpler and significantly less expensive. “
 - Rich Schmidt, Dave Finley (and Herman) will assemble a technical note on the alternatives. In part this is pulling together the existing technical notes and the meeting presentations from the past year.
 - Herman et al will continue working on the existing system and planed test for the end of the summer and prepare a detailed description of this system (this will be the basis of the Cooling section of the TDR)
 - CTIO input is important to this process, will continue monthly cooling meetings and include them in the preparation of these documents
 - Internal Cooling workshop in July/August to make sure we agree we are on the right path
 - External review in Sept.
- Front End Electronics workshop in ~Sept. to review the full chain and prototype electronics