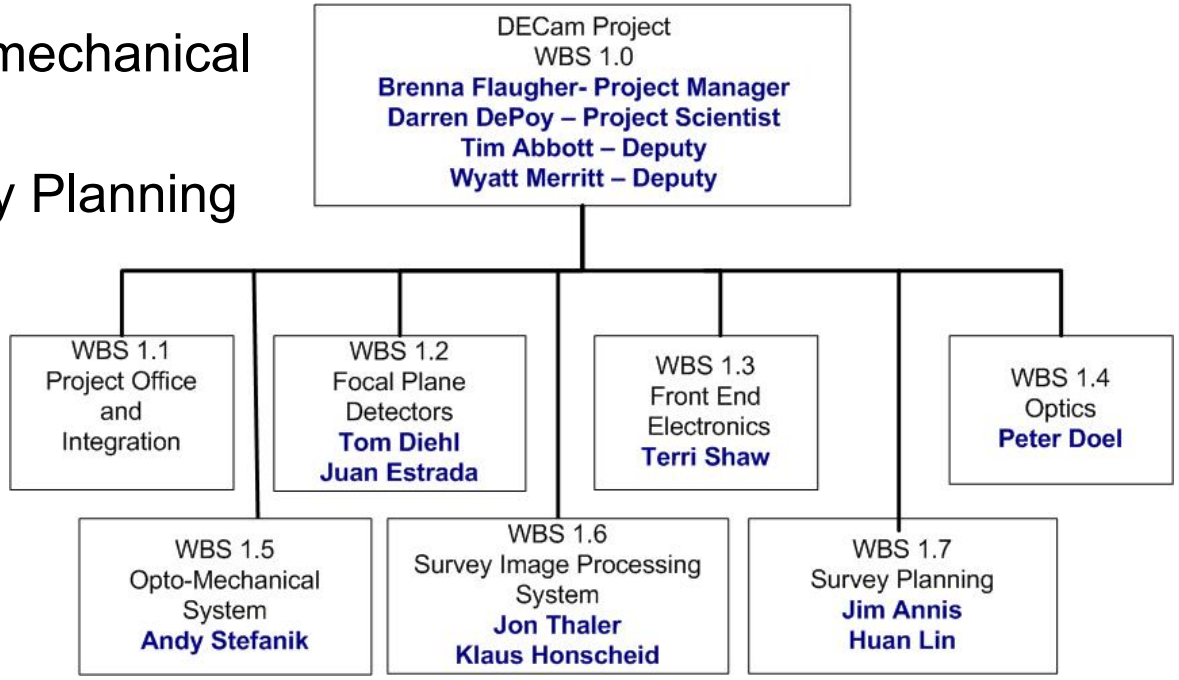
DECam Project Summary

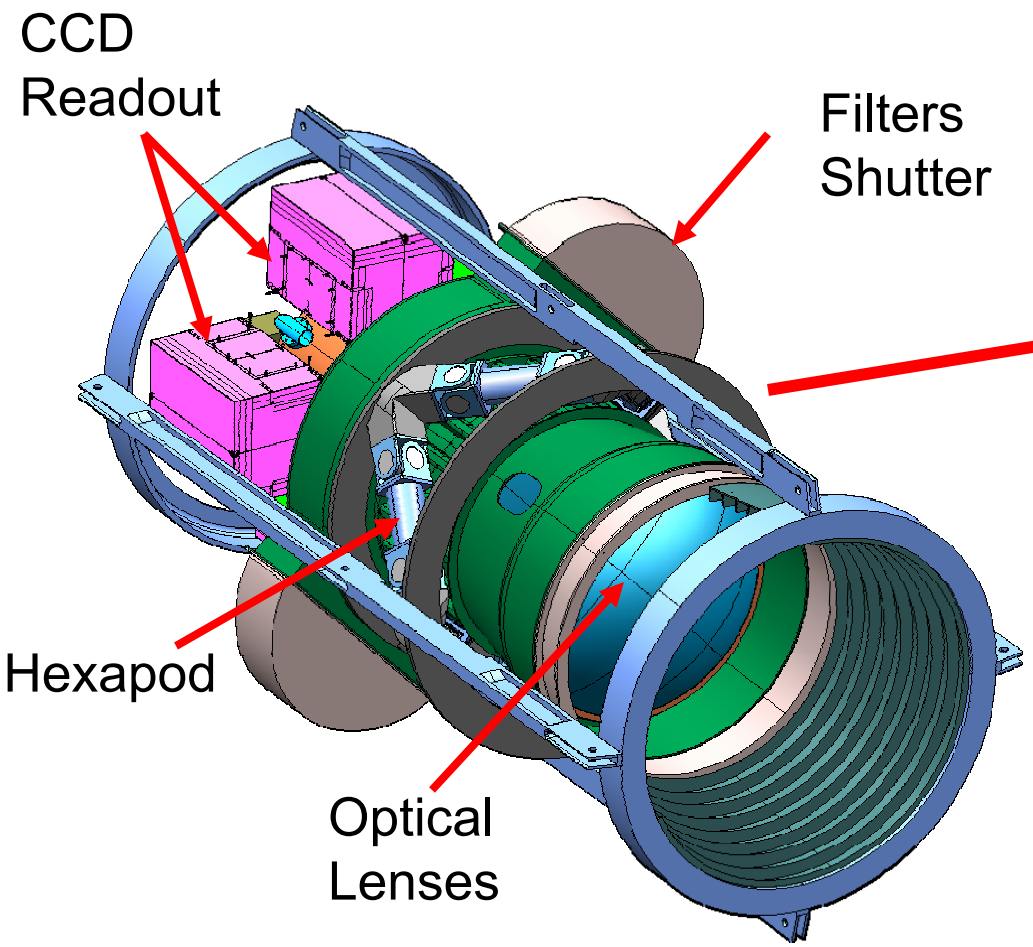
DARK ENERGY SURVEY

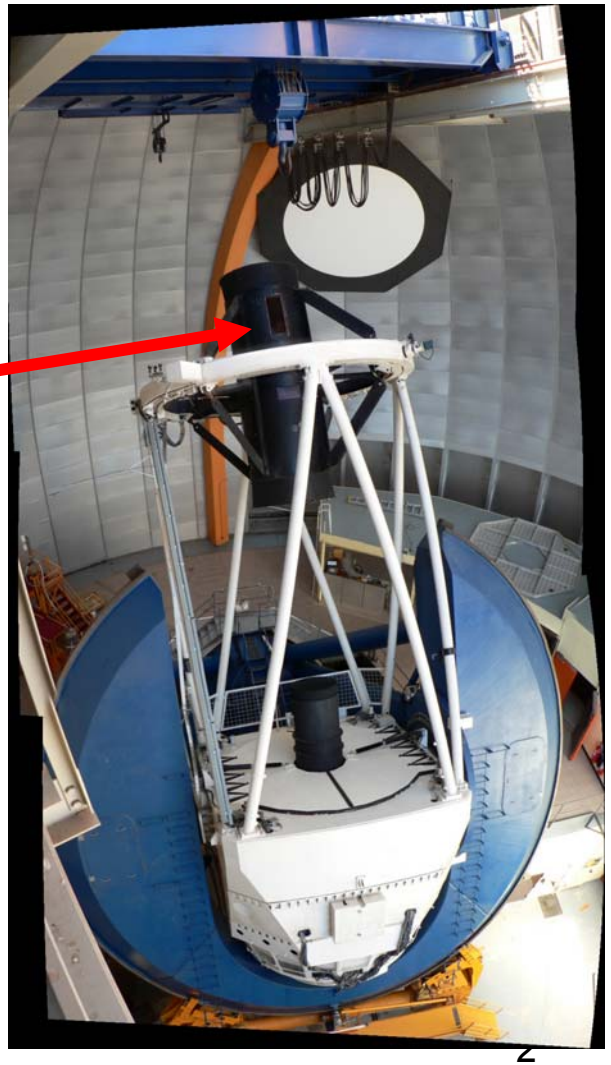
- Outline
  - WBS 1.1 Management and Integration
  - WBS 1.2 Focal Plane Detectors
  - WBS 1.3 Front End Electronics
  - WBS 1.4 Optics
  - WBS 1.5 Opto-mechanical
  - WBS 1.6 SISPI
  - WBS 1.7 Survey Planning



DES Instrument: DECam replaces the Prime Focus Cage of the Blanco

DARK ENERGY SURVEY





News: WBS 1.1 Management

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- Still responding to questions/changes from Kathy on the Acquisition strategy! Paul sent latest version in Thursday Morning.

- Schedule and Funding
  - Cost accounts have been assigned and are open
  - Funding ($900k) from the R&D proposal has been received an distributed on the new codes
- 1st Monthly (July) report is in progress
  - TJ and Dale have been busy with Minerva!

DARK ENERGY SURVEY

FY07 summary

From July Obligations report (end of Generic codes)

- M&S direct: $901k (really $941-$40k credit)
  - CCDs: $706k
  - FEE: $104k
  - Opto-mech: $131k
- Labor direct (PPD)
  - Technical: $1404k
  - Scientist: $418k

DARK ENERGY SURVEY

MIE Funds

- Last meeting - memo from Glenn Crawford:

For further delineation of “what do you mean by design” I provide the following quote from DOE CFO guidance:

- “CD-0 must have been obtained to request any funds for an MIE project. For Projects that are Pre-CD-2, funds for engineering design may be requested. These funds cannot be expended until CD-1 has been obtained. OECM concurs that engineering design for an MIE project could include some fabrication and testing of design concepts. The Acquisition Strategy should describe the extent of such fabrication and testing in support engineering design.”

Paul added text to the AS:

- “MIE funds might be used on a limited basis for final design activities between CD-1 and CD-2 approvals. These activities could include fabrication and testing of final design concepts in such areas as mechanical infrastructure, CCD packaging and readout electronics. These expenditures would be carried out in compliance with funding guidance from OHEP. “

MIE Funds Continued

DARK ENERGY SURVEY

- After the JOG meeting I discussed this with Mike, Glenn and Kathy.
- I gave examples of
  - packaging a few CCDs with the hopefully final packages to determine if this was indeed the final package
  - Fabricating the prototype barrel to prove (or not) that the tight fabrication tolerances could be met.
- I made it clear that we would submit a request to her first if we wanted to spend MIE funds to fabricate anything prior to CD-3.
- They seemed to think it was OK.
- This will likely be the most useful in the spring of FY08 when we are running out of the R&D funds and waiting for CD3a approval.

DARK ENERGY SURVEY

Meetings and Workshops

- Cooling Review
  - Working defining the “external review”
  - Current plan: request 2-3 experts from Accelerator Div. and/or Tech. Div. review the Cooling system and our responses the previous reviews
  - Considering if Roger Smith should be included, contacted separately or saved for the directors and/or DOE review

- Brenna, John and Darren are going to CTIO Aug. 19-24 to work on integration of DEcam with CTIO, preparations for the CD2 review
  - Technical topics include the F/8 handling and cooling system design
  - Review of the planned upgrades to the telescope control system
  - Decide on measurements for setting a heat load spec in the PF cage
  - Map out Clean room space needs, and assembly plans
  - Discuss design sign-offs
  - Safety rules

Meetings and Workshops

DARK ENERGY SURVEY

- Filter group will send out final specs out for review by Collaboration on Monday.
  - Early Sept. go out for quotes (need to get a firm cost estimate for the CD2 review)
  - Plan is to procure a g filter as a prototype to demonstrate the vendor capabilities. Michigan will test it. If it meets specs we would be ready to procure the rest next year.

- Front End Electronics workshop Sept. 17-19
  - 4 hour meeting sessions each morning; working sessions in the afternoon
  - Make choices on JFET location, Power supplies
  - Evaluate performance of prototype 12 channel board, clock board and SLINK
  - Monday –Focus on Monsoon Electronics
  - Tuesday – Grounding & Focus on the internal dewar instrumentation
  - Wednesday – Power supplies, Crates, Slow Controls & Heater

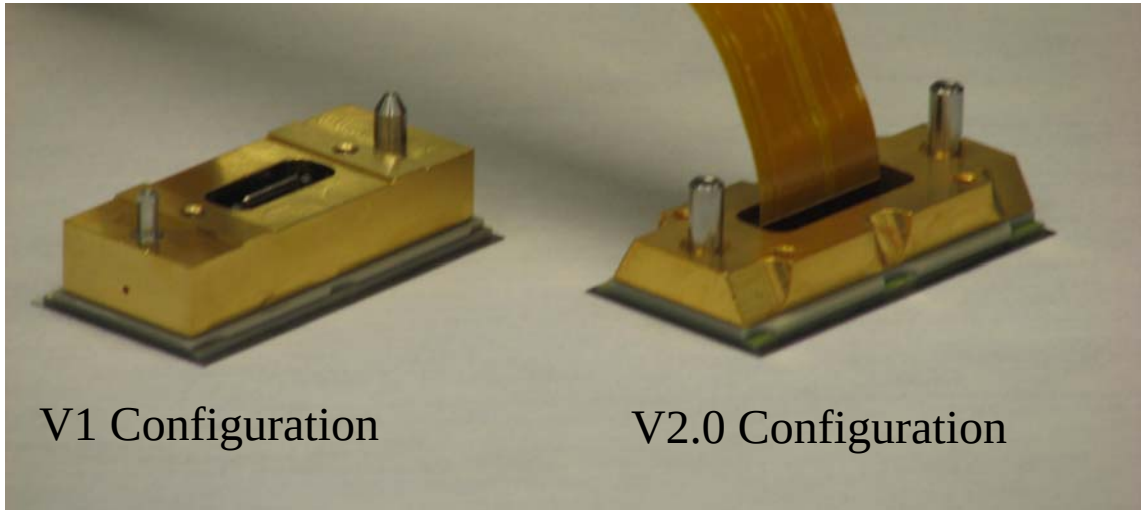
- DECam Cost and Schedule review Oct. 30th

- DECam Technical workshop Oct. 31, Nov. 1
  - DECam team will to go over everything and make sure it all fits together.

V2.1 Pedestal Packaging

DARK ENERGY SURVEY

- The V1 module design was based on previous work done with these CCDs at LBNL & Lick Observatory / UCSC
- The V2.0 design was developed to test moving selected electronics closer to the CCD and evaluate an alternative connector type.
- The V2.1 package design will incorporate various changes identified during V1 development. This effort has just begun and is scheduled as follows:
  - Module design: Aug 9 – Oct 20
  - Fixture design: Oct 22 – Jan 9



DARK ENERGY SURVEY

V2.1 Pedestal Packaging

- Redesign module to allow wirebonding on the completed package rather than partway through assembly. This could reduce CCD handling during assembly and would potentially allow damaged bonds to be repaired on completed modules.
  - The K&S 4523D manual bonder at FCC was used on a mockup module to verify that it would work with a sample configuration
  - In July, three PF-512 pictureframe modules were bonded on this machine
    - Once the initial setup was complete, all three modules were bonded in one hour
    - Only one of these has been tested to date and it functioned normally
  - A new pedestal module is being made this week that will be bonded as a completed assembly
    - V2.0 foot used (these feet were intentionally designed with features that permit bonding in this way)
  - Assuming tests are positive, we need to begin acquiring one of these bonders and training the technician(s).

DARK ENERGY SURVEY

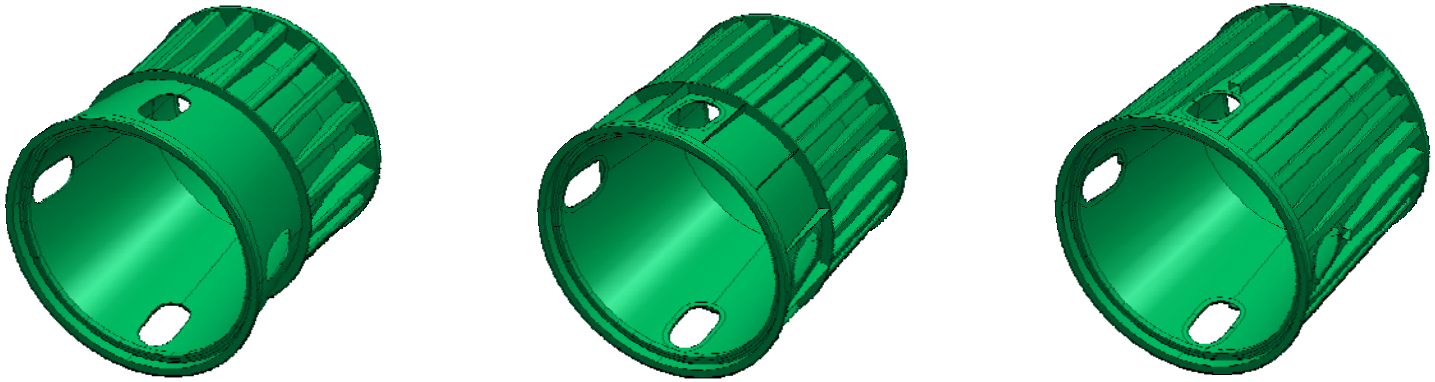
WBS 1.4 Optics

- Ready to order glass blanks – currently waiting for university contracts to be signed
- Corning has identified a boule for C1 (the largest lens)
  - Sent measured homogeneity data to UCL Optical engineer and she concluded that this boule meets our requirements
  - This happened with the 1st boule so they are offering a 5% reduction in cost!
  - They are also starting on the fixturing for handling the blanks
- Tender for lens polishing went out July 27th
  - will be a 50 day response cycle
- Received one cost estimate for a stray light analysis and baffle design – $35k from the best company
- Darren found another company and we will request an additional quote

WBS 1.5 Opto-Mechanics

DARK ENERGY SURVEY

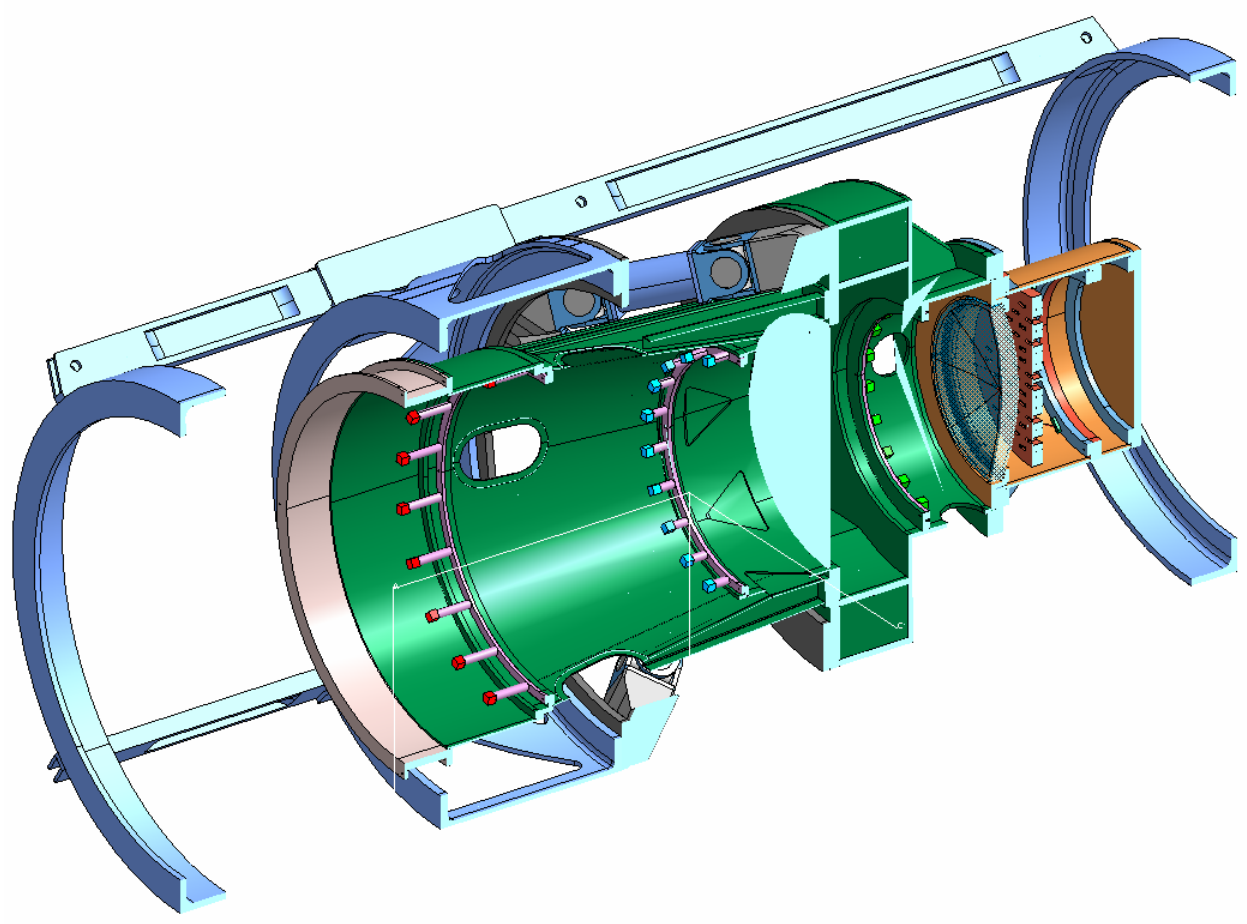
- Matthew leaves Friday. Herman will talk with Bert to get someone to finish the focal plane physical model. All the materials are here.
  - Has already paid off by uncovering a misunderstanding in the VIB dimesions!!
- Finishing 3-D telescope and floor model for next week's visit to CTIO.
  - preliminary clean room dimensions; cage, corrector and imager in the clean room; telescope simulator on the console floor; and telescope parked at the service platform.
- Barrel cone value engineering:
  - Have one design that is under the deflection budget.
  - Considering two alternatives.
  - Running behind on this task because of dome modeling work.



WBS 1.5 Opto-Mechanics

DARK ENERGY SURVEY

- EAG will start DECam FEA task this week. Here's the model they will start with:



WBS 1.5 Opto-Mechanics

DARK ENERGY SURVEY

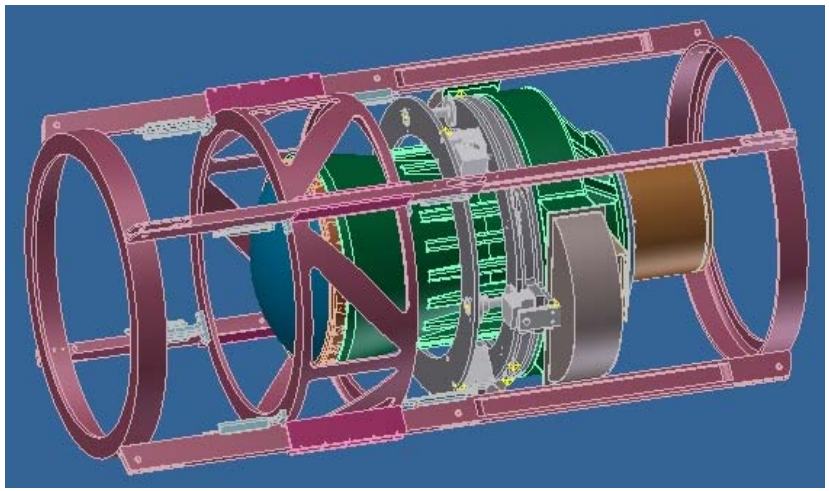
- ANL presented a conceptual idea for a non-hexapod alignment system and is preparing a proposal on how they plan on proceeding.

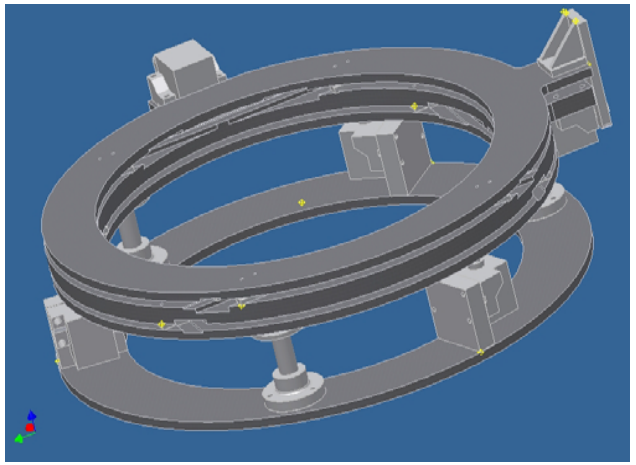
- Uses 3 actuators plus 3 guides in z (focus) and one actuator and a pair of slides for each of the x and y adjustments for lateral alignment.

- Same attachment footprint to corrector as hexapod.

- ANL designed the system to moved Atlas detectors ranging from 120-1800 tons with 10 micron accuracy.

- CTIO will take measurements on the telescope this week to see if tilt adjustment must be added to the list of design requirements for the alignment system.





WBS 1.5 Prime Focus
Steady State Heat Load Calculations
Doc #693

DARK ENERGY SURVEY

Item		Cold Night CCD Temp. **-100 ºC** Ambient **-5 ºC**	Design Case CCD Temp. **-100 ºC** Ambient **20 ºC**	Warm Night CCD Temp. **-100 ºC** Ambient **27 ºC**
Focal Plate	Thermal Radiation	27.2 Watts	37.7 Watts	43.0 Watts
	Conductivity Supports	0.48 Watts	0.52 Watts	0.67 Watts
CCD Electronics	Conductivity cables	7.6 Watts	9.6 Watts	10.3 Watts
	CCD JFET (70 CCDs)	0.6 Watts	0.6 Watts	0.6 Watts
	CCD ouput amplifier (70 CCDs)	2.8 Watts	2.8 Watts	2.8 Watts
	VIB Interface Card Amps.	28 Watts	28 Watts	28 Watts
Thermal Control	Trim Heaters	30 Watts at -100C 40 Watts Max	23 Watts at -100C 40 Watts Max	19 Watts at -100C 40 Watts Max
Heat Exchanger	Radiation	4.8 Watts	7 Watts	7.6 Watts
	Conductivity Supports	1.0 Watts	1.0 Watts	1.0 Watts
Imager Total		**112 Watts**	**127 Watts**	**134Watts**

Nominal Heater power required to maintain -100 C

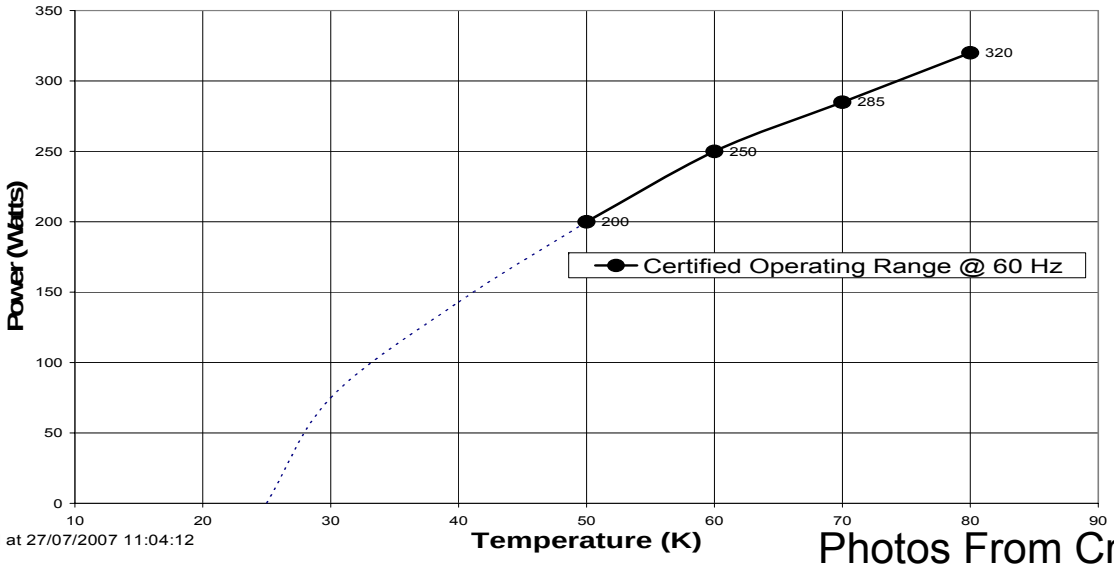
Cold night 30 Watts, Design night 23 Watts, Warm Night 19 Watts

Cu Braid Cross Section can be adjusted as needed

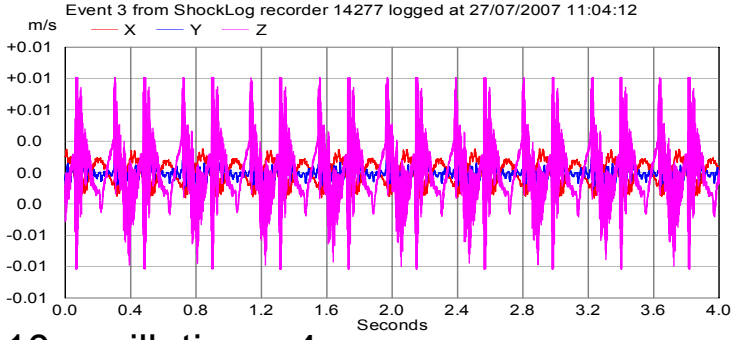
WBS 1.5 Vibration analysis (CryoCooler bolted to MCCDTV)

DARK ENERGY SURVEY

Z



Photos From Cryomech.com



10 oscillations, 4 secs

Displacement amplitude on Prototype Vessel

~ 50 microns X

~ 30 microns Y

~150 microns Z

High cooling capacity in a single unit

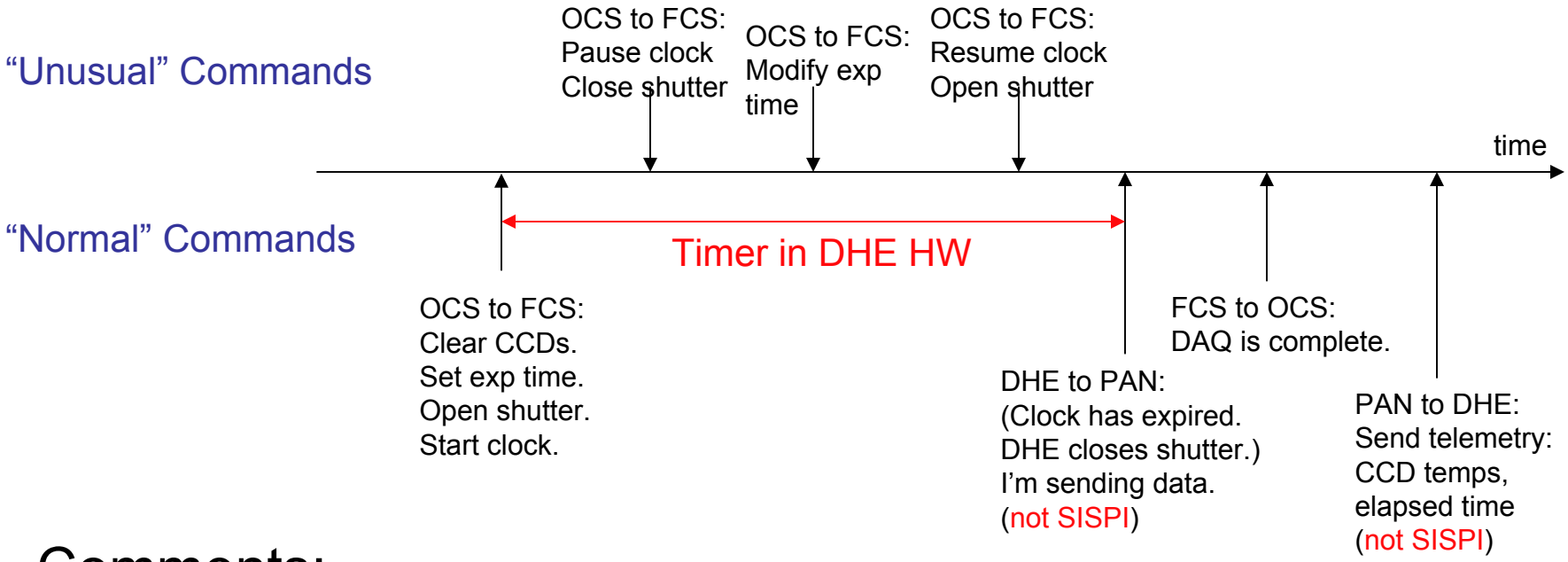
<u>Vibrations are an issue</u>

Vibration isolation requires
passive spring and
active compensator with
~1 mm travel, 2-5 hz response, 20Kg load
communications with vibration isolation company,3-D problem and out of typical range.
Doc Db #XXX

WBS 1.6 SISPI

DARK ENERGY SURVEY

Timeline if Monsoon controls the shutter:



Comments:

- This is the Monsoon design. Not yet completely implemented.
- Shutter open/close times must be put in by hand.
- Cable from DHE to shutter is a potential noise source.

DARK ENERGY SURVEY

WBS 1.5 DECam Shutter Technical Specifications

DECam requirements are standard

Linearity - 1 percent uniformity at a 1 second exposure time.
Exposure time repeatability - 5 milliseconds.
Exposure time accuracy - less than 50 milliseconds
Exposure time measurement - measure to 10ms and record
Exposure duration - 1 second minimum
Shutter performance maintained from -5°C to +20°C.
Shutter performance maintained after high duty-cycle tests.
Shutter MTBF and MTTR based on a 10-year lifetime (125,000 cyc/yr).
All instrument components shall perform to spec. at all orientations.

- Design and fabrication – plan contract to Bonn University
- Similar sized Bonn shutter used in PanSTARRS (delivered and works!)
- Stepper motors drive blades via belt drives
- Independent or synchronized motion of shutter blades
- Bonn meets all the DECam requirements – still have some questions about controls and error reporting

Bonn Shutters

DARK ENERGY SURVEY

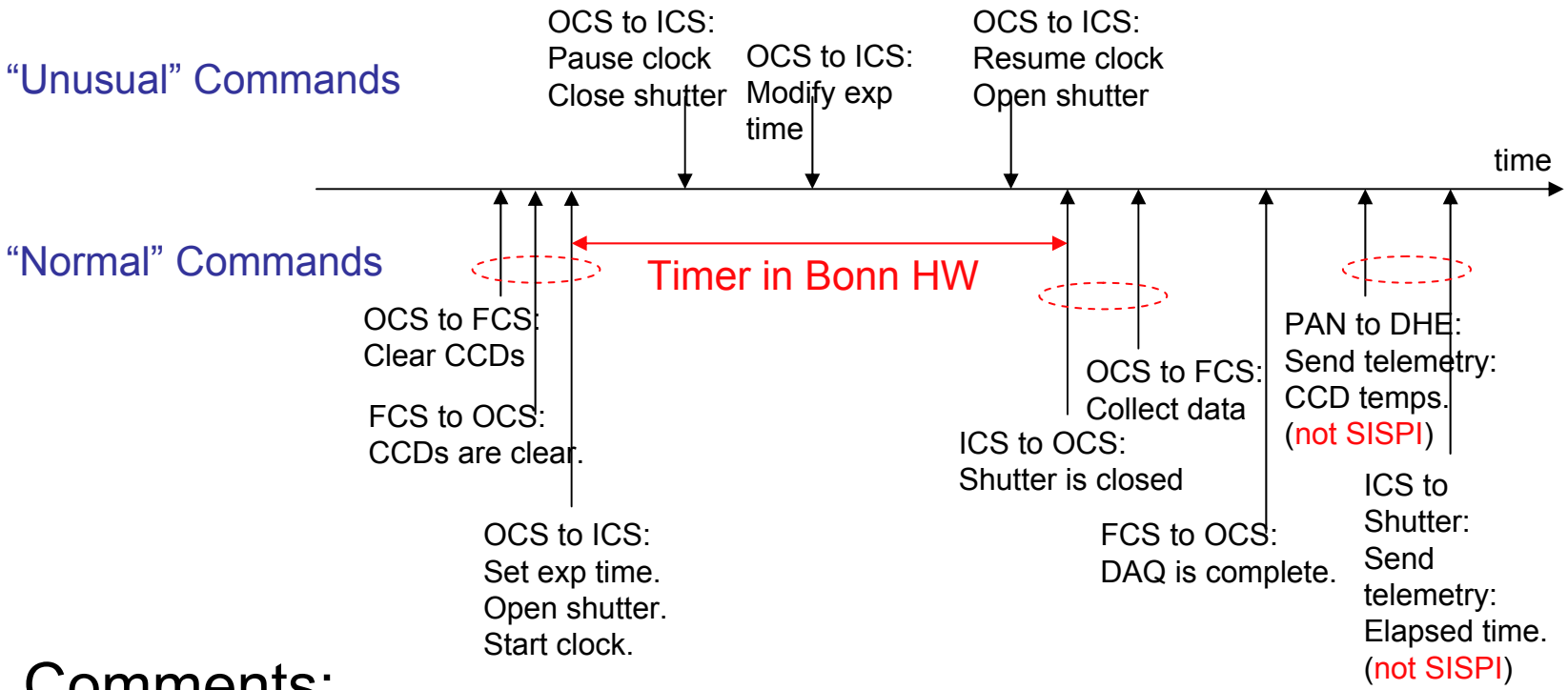
PanSTARRS
Length: 1664 mm
Width: 632 mm
Depth: 50 mm
Aperture: 480x480 mm
Mass: 30 Kg

DECam
Length: 2060 mm
Width: 760 mm
Depth: 56 mm
Aperture: ~600 mm dia.
Mass: ~40 Kg

WBS 1.6 SISPI

DARK ENERGY SURVEY

Timeline if ICS controls the shutter:



Comments:

- More modular (more SW messages). OCS knows the state of the system. Monsoon doesn't need to know exposure time.
- Bonn shutter web page does not indicate control or readout of the clock.

DARK ENERGY SURVEY

WBS 1.7 Simulations Update

- We are getting ready to use the Open Science Grid (OSG) to produce the full "Gold Standard Night" (GSN) image data set for DES Data Management
- GSN will cover 50 deg^2 of sky x 4 pointings x 4 filters = 256 1-GB science images, plus standard star and calibration images
- Data set will be processed by DESDM and results and QA plots will be used for presentation purposes
- Serves as validation data set as we enter production phase this month for the ImSim3/DC3 image simulation/data challenge round
  - GSN is about 10% of the 500 deg^2 image simulation data set we will provide for DC3
- Raw and roughly reduced images and some initial photometry/astrometry QA plots on the following slides

DARK ENERGY SURVEY

CD2 Review plans

- Current plans:
  - DECam Cost and Schedule Review Oct. 30-31
  - CD2/3a Directors review week of Dec. 11-13
  - Joint NSF/DOE CD2/3a review Jan. 29-31
  - Approval expected by April 1 2008. ?
  - Joint NSF/DOE CD3b review June? 2008. This would focus on the rest of the DECam project and integration with DM and CFIP
  - Goal is full CD3 approval by end of fiscal year 2008

- Strawman CD3A List for DECam =tasks that are ready and need to make procurements of final parts before the end of FY08 (Oct. 2008):
  - WBS 1.2 CCD wafer processing (not packaging)
  - WBS 1.5 Procurement of the Shutter ($120k, 1-1.5 yr delivery)
  - WBS 1.4 Filters (~ $100k each for 4 production filters, could be long lead time, need new estimate)
  - Reconsidering options in light of possible new flexibility on spending MIE funds on fabrication to prove a final design and a guess that CD3b will be late (Oct. 08 is just a guess judging from CD-1 experience).