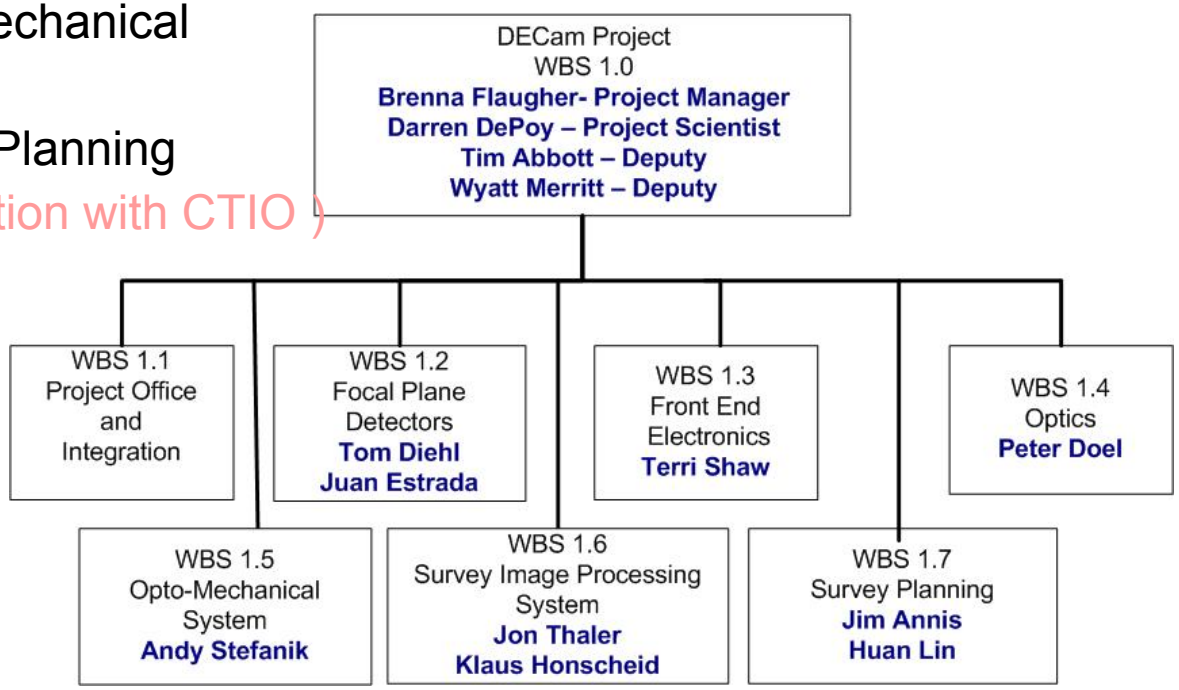
DECam Project Summary

DARK ENERGY SURVEY

- Outline
  - WBS 1.1 Management and Integration
  - WBS 1.2 Focal Plan 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
  - (WBS 1.8 Integration with CTIO)



News: WBS 1.1 Management

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- Labor
  - Mechanical:
    - Kurt submitted a req. for a new engineer to Mike Crisler. Idea is that the person would work ~ 50% on the camera vessel design and start in ~ Dec.
  - Opening for an engineering physicist to help with the CCD testing and analysis was posted yesterday. Hope to have position filled by mid. September
- M&S
  - CCD req is on hold (120k) (more discussion later)
- Schedule
  - Cost accounts have been assigned and will be opened today or Monday. All costs after this will be on the TPC.
- 1st Monthly report is in progress

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FY07 summary

From July Obligations report

- M&S direct (includes CCD req): $731k (really $770-$40k credit)
  - CCDs: $550k
  - FEE: $103k
  - Opto-mech: $117k
- Labor direct (PPD)
  - Technical: $1403k
  - Scientist: $418k

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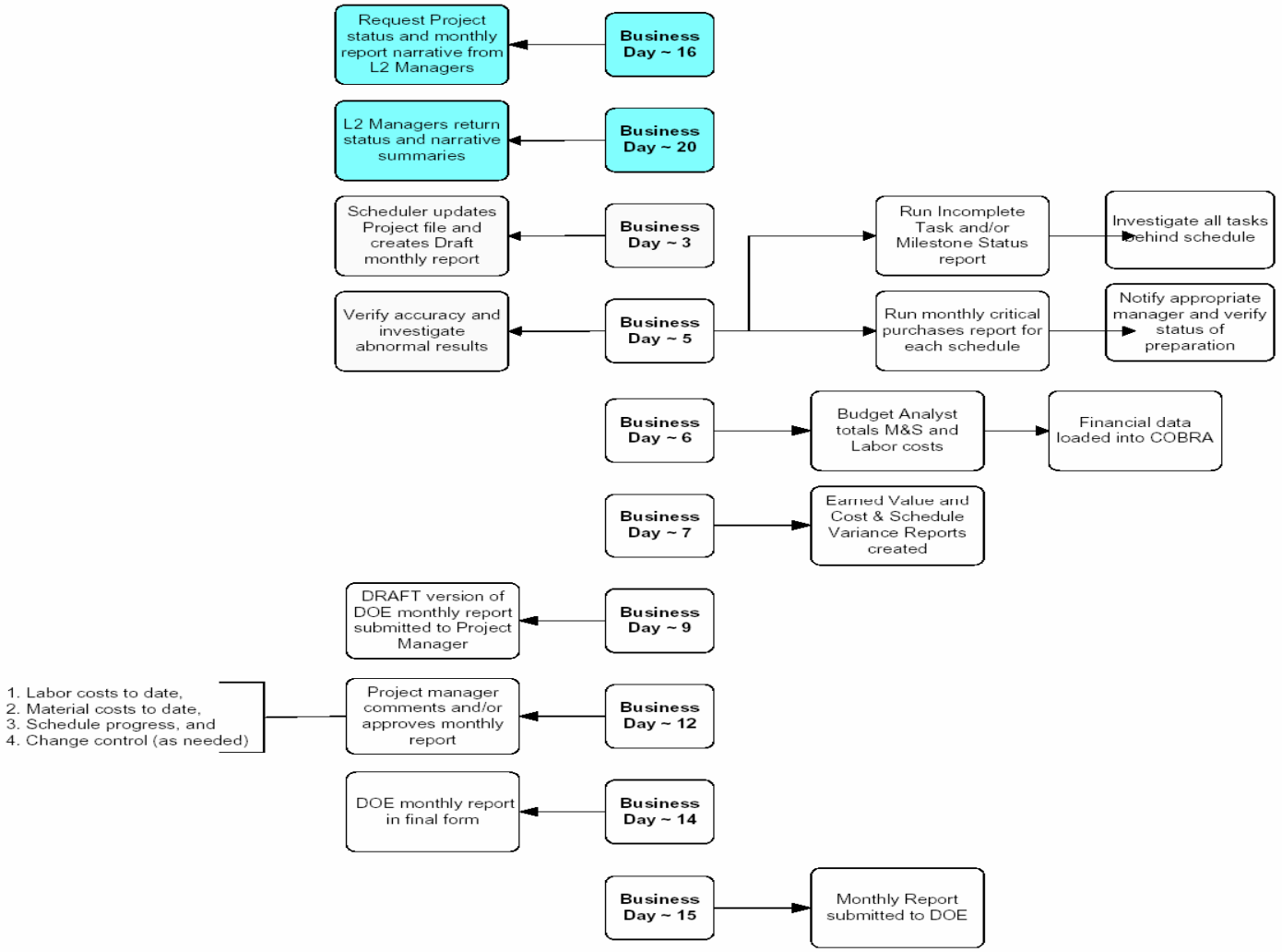
Project Management and Control System Reporting Activities



Funding

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- R&D proposal Funds(k$)

Award	**900**
Non-DECam	**62**
University-DECam	**50**
Overhead	**105**
M&S Base	**683**

R&D M&S	
683	R&D proposal Funding
140	PPD Funding
823	**Total**
940	**Need**
(117)	**Shortfall**

These are base costs

The need assumed the $120k CCD req went through in FY07 on generic R&D

If this has to go into 08 then the shortfall is $237k.

Funding….

DARK ENERGY SURVEY

Current estimated Obligations NEED profile fully loaded tuned to match MIE guidance

	Estimated Total Base w/Ind. & Esc.					
	FY07	FY08	FY09	FY10	FY11	Total
R&D	0.65	3.7	0.1	0.0	0.0	4.4
MIE		3.6	7.5	7.3	2.7	21.1
Total	0.65	7.2	7.6	7.3	2.7	25.5

FY07 need includes two months of labor and $50k M&S
The R&D proposal funds come in August and we will start spending them.
They amount to $838k for M&S on the Project. This will get us through most of the R&D procurements in FY08.
No contingency included on the R&D.
Labor estimates have gone up throughout the project.

Profile submitted by Fermilab to DOE . Note the $838k for M&S is in FY07 but will be spent mostly in FY08

Connee Aug.2 07	FY07	FY08	FY09	FY10	FY11	Total
R&D	1.4	2.5	1.2			5.1
MIE		3.6	7.5	6.7	2	19.8
Total	1.4	6.1	8.7	6.7	2	24.9

DARK ENERGY SURVEY

Revisions to the TPC

- New Guidance on the TPC:
  - We need to include the cost of preparing the Conceptual Design Report in the total project cost
    - Only technical labor counts (Andy, Terri, Greg, etc) = 32 hrs: 4 hrs Greg, 4 hrs Terri, 24 hrs Andy+Herman hours spent reading and editing, this is about $4000. Not a big change in the TPC!
  - ANL LDRD after CD-1 should be included in the TPC (I had it in as in-Kind)
    - Steve Kuhlmann's proposal to the ANL LDRD committee includes a total of $183k for engineering in FY08 and FY09. He will find out how much he will get by Oct. 1st. Kathy seems to want to track it separately. I'm sure I do not understand this.
    - Does seem like I should have included it in the TPC as a cost rather than in-kind (free).

Meetings and Workshops

DARK ENERGY SURVEY

- Successful Cooling workshop on July 31st
  - Cooling design is on track, no fundamental problems identified
  - Next step is an external review ~ Aug. 30 or 31. Format to be determined
- CCD yield and how the cosmetics are counted
  - All parties have agreed to a set of specifications (Decam project scientist, Juan, Huan, Jim, Donna)
  - Donna has revised the testing procedures and analysis code to perform the new tests
  - These will be presented at the Collaboration meeting in Sept.
- Started having regular meetings on the options for handling the F/8. The idea is to work out a plan for mounting it on the front of the cage and removing it for DECam operations rather than flipping.
  - Frees up room for cables, Cryogenic cooling lines, Cooling lines for the electronics, hexapod controls…
  - Frees up space at the back of the cage
    - Backup location for power supplies if the VICORs don't work
    - Potential location of other parts that don't currently have assigned space (e.g heater controller)
- 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
-

DARK ENERGY SURVEY

Meetings and Workshops

- Filter group will send out final specs out for review by Collaboration in Mid August
  - 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
- Klaus had suggested we have some sort of pre-CD2 review overall DECam technical workshop
  - Now we have time in Oct. or early Nov.
  - Idea is for all the DECam team to go over everything and how it all fits together.

DARK ENERGY SURVEY

WBS 1.2 CCD testing

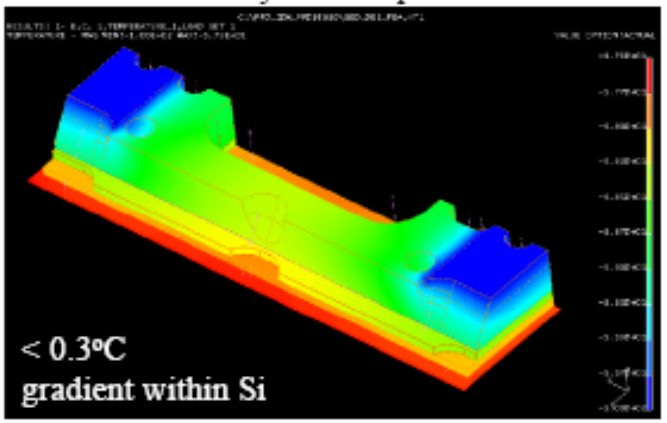
- The technical requirement for cosmetic defects on DECam CCDs is now finalized (J. Annis, J. Estrada, D. Kubik, H. Lin and D. Depoy)
- The 3/4 science quality detectors tested from Lot 2A (2k x 2k) correspond to e2V grade 0 (the best). The other one has 0.3% unusable area, still meets our technical requirement.
- Due to the instability measured in the detectors with active electronics on the package, we are now looking at the stability of the active component at low temperature.
- Started a program to characterize the heat load of the CCDs for refining the thermal model of the camera.
- Routinely using SLINK instead of SYSTRAN optical link for Testing operations
  - This was implemented by the Barcelona group and delivered to Fermilab at the end fo June.
  - NOAO may adopt this too

WBS 1.2 Packaging Design Plan

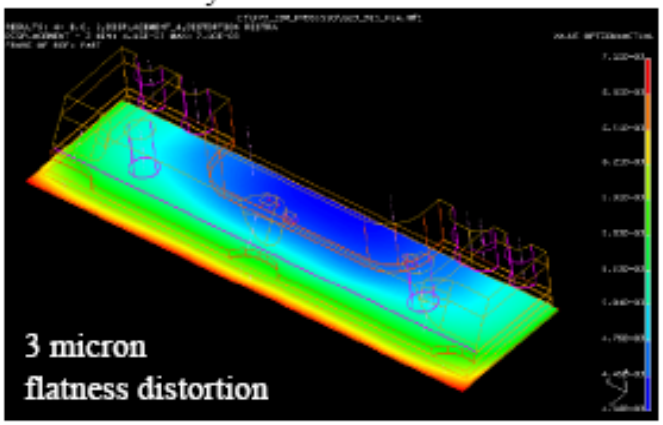
DARK ENERGY SURVEY

- Attempting to have CCD packaging ready for CD3a.
- V2.1 would need to be final version.
- Design underway
  - similar to V1
  - package not as thick allows auto-wirebonding prior to gluing on the foot or manual bonding after.
  - Preliminary design defaults
    - No JFET on AlN
    - AirBorn connector (copy of Nanonics but larger screws)

Preliminary V2 Temperature FEA



Preliminary V2 Thermal Distortion FEA



WBS 1.3 FE Electronics News

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- We have requested a sample connector from Airborn. LBNL is sending one next week too. This connector could be a direct replacement for the Nanonics connector. The advantage is a larger screw that would allow us to use commercial ball end hex drivers.
- VIB V2 is being assembled and tested. When installed in the MCD, we will need to use the new Clock Board and the 12-Channel Board to readout an array of up to 6 CCDs.
- Testing plans underway to do more CCD readouts with the 12-Channel board. We want to see the results with the 3.7us timing and to test the RTD readout. Will co-ordinate this with Juan.
- Laia reports the Clock Transition Boards (V1.1) are being shipped to FNAL. When they arrive, we want to do more readout studies with the Clock Board.
- SLINK (delivered by Barcelona in June) is working well!

WBS 1.4 Optics

DARK ENERGY SURVEY

- Ready to order glass blanks – currently waiting for university contracts to be signed
- Tender for lens polishing went out July 27th
  - will be a 40 day response cycle

- Received one cost estimate for a stray light analysis and baffle design – $35k from the best company
- Other companies my be cheaper so we are requesting additional quotes

DARK ENERGY SURVEY

WBS 1.5

- F/8: Tim has specified location of the new F/8 handler. Modeled pertinent areas of the dome floors.
- Looking at different ways to stiffen and lighten the barrel cone. We will build a pre-prototype cone to help develop weld procedures. The plan is to send either a mounting plate or the cone to UCL to mount the prototype cell.
- Imager LN2 cooling system review took place on Tuesday and we're updating documents. Preparing for the external review; documents will be ready by Aug 17.
- Approved the 200 L LN2 vessel for fabrication by PHPK.
- Completed AL 300 cryocooler capacity and vibration tests. Matthew wrote reports.
- Eric Dede is the new engineer at UM who is picking up the work Bruce Bigelow started on the filter-changer and shutter. He's talking with Bruce and in the process of understanding and outlining the full scope of work from specs to models and prints.
- Hexapod: 4 companies have said they will submit bids, we are waiting to hear from 2 companies, 1 no bid. Purchasing issued the first amendment to the RFI: 1) Extended bid closing date to August 31
- MCCDTV is in the control room. Heat load measurements scheduled for today and Friday. Ready for CCDs Monday when Ken gets back.

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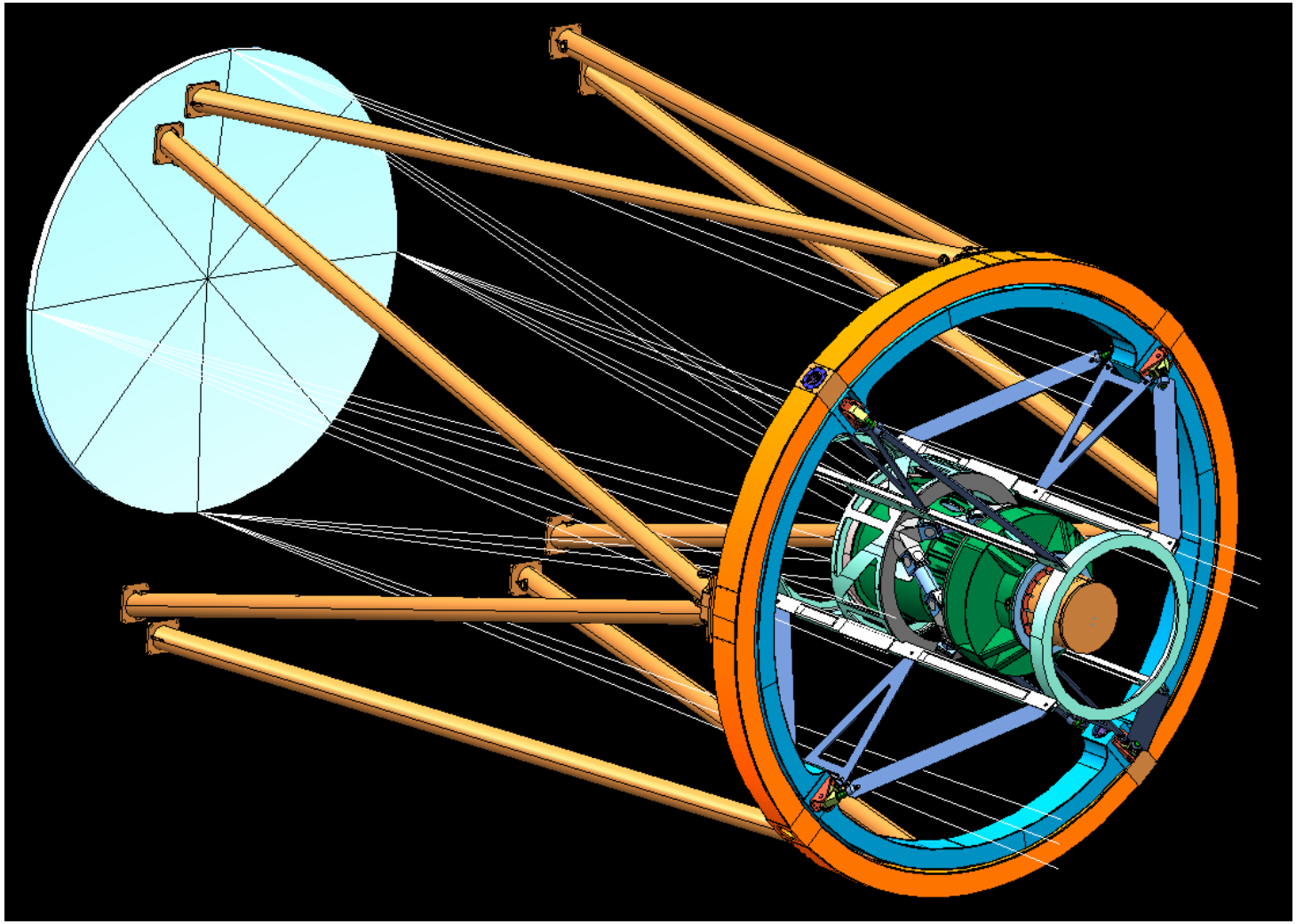
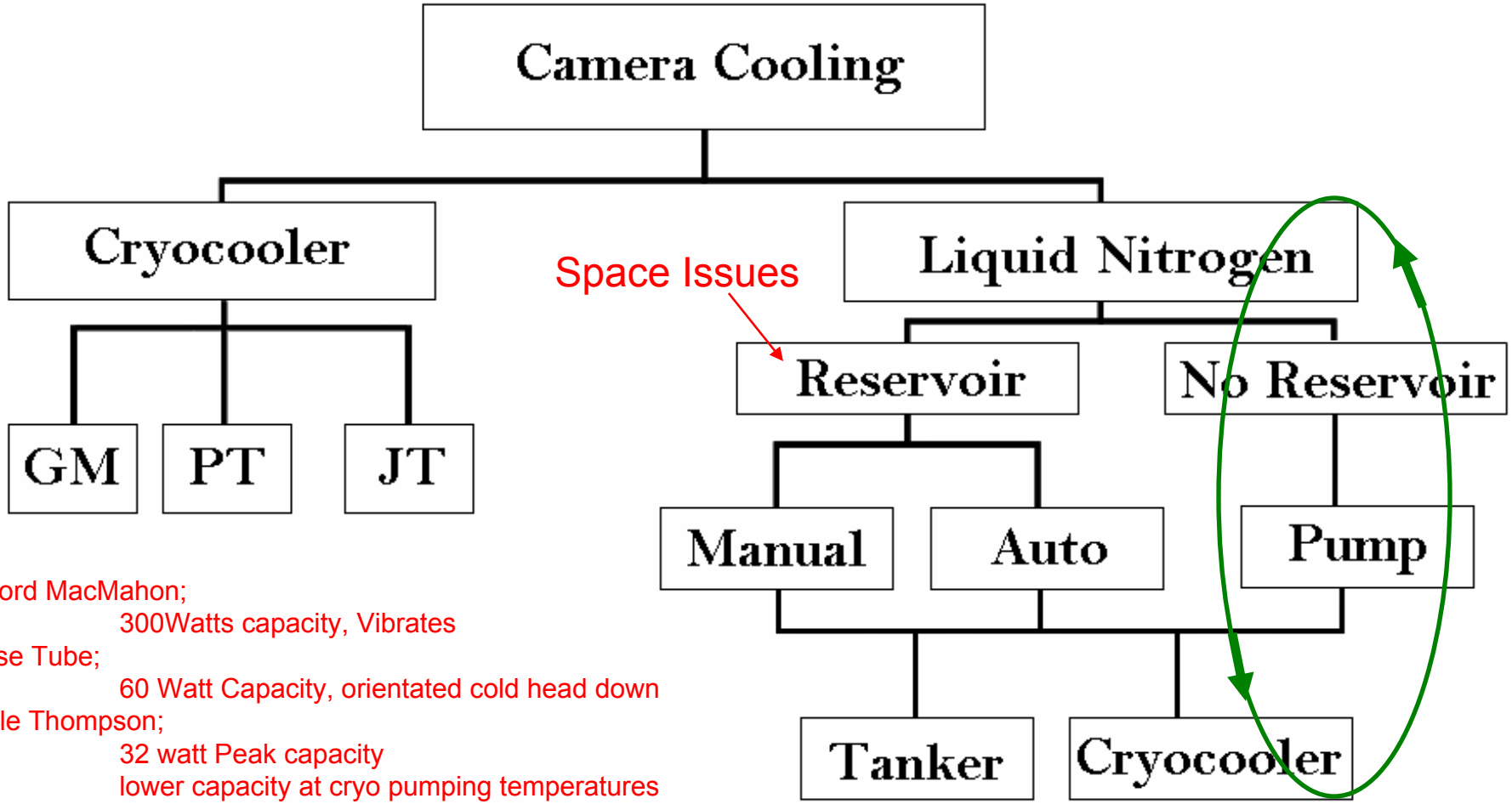
WBS 1.5
Model for the Stray light analysis



How to Cool the Focal Plate (July 31 cooling review)

DARK ENERGY SURVEY

Cryo Coolers or Liquid Nitrogen?



Gifford MacMahon;
300Watts capacity, Vibrates
Pulse Tube;
60 Watt Capacity, orientated cold head down
Joule Thompson;
32 watt Peak capacity
lower capacity at cryo pumping temperatures

Closed loop System

Prime Focus Heat Load Calculations
Doc #693

DARK ENERGY SURVEY

Item		Heat Load Focal Plate **-80 ºC** Ambient **27 ºC**	Heat Load Focal Plate **-100 ºC** Ambient **20 ºC**	Heat Load Focal Plate **-140 ºC** Ambient **27 ºC**
Focal Plate	Thermal Radiation	38.7 Watts	37.7 Watts	45.1 Watts
	Conductivity Supports	0.6 Watts	0.6 Watts	0.8 Watts
CCD Electronics	Conductivity cables	8.7 Watts	9.6 Watts	13.9 Watts
	CCD JFET (70 CCDs)	0.6 Watts	0.6 Watts	0.6 Watts
	CCD preamps(70 CCDs)	28 Watts	28 Watts	28 Watts
	VIB Interface Card Amps.	28 Watts	28 Watts	28 Watts
Thermal Control	Trim Heaters	40 Watts	40 Watts	40 Watts
Heat Exchanger	Radiation	8 Watts	7 Watts	8 Watts
	Conductivity Supports	1.0 Watts	1.0 Watts	1.0 Watts
Imager Total		**154 Watts**	**153Watts**	**165 Watts**

Copper braid cross section and trim heaters
Designed to drive the CCD Temperature -100 C +/- 8 C

Changing copper braids can shift the temperature range

Cooling review: Imager Vessel Heat Exchanger Current Design

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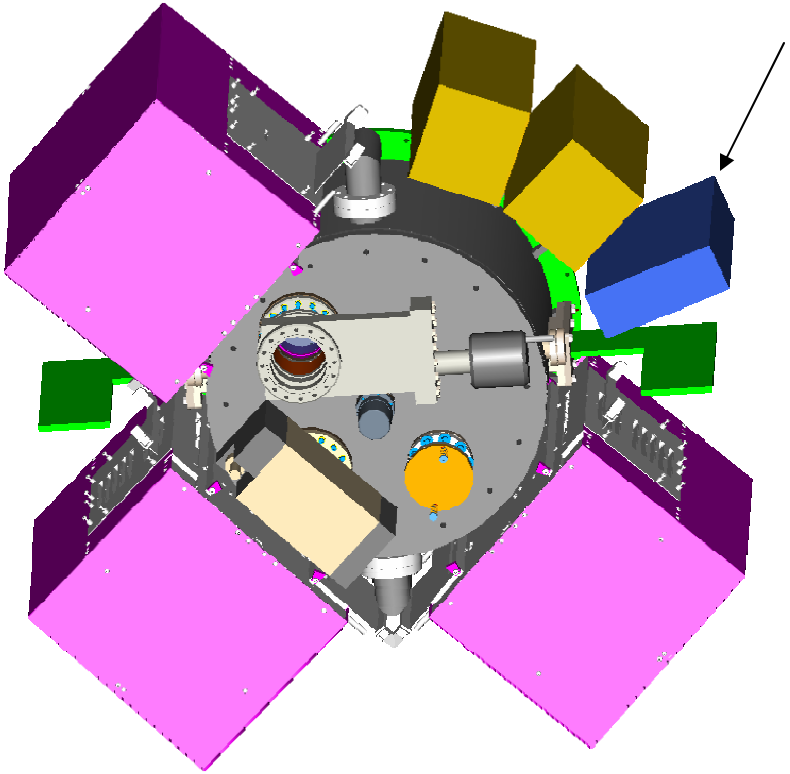
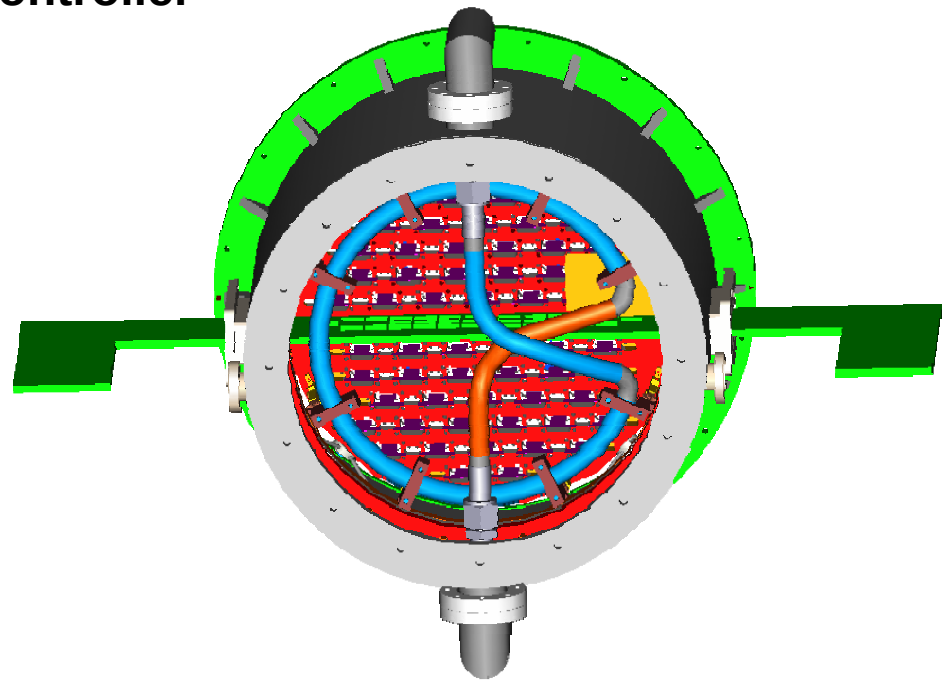
Ion Pump Controller



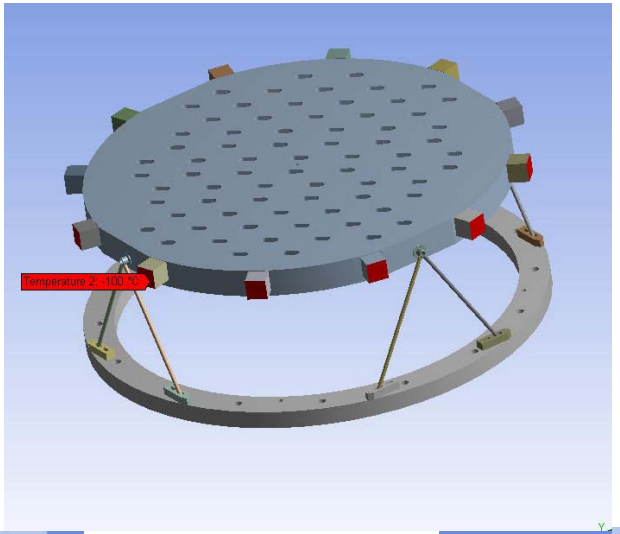


Heat Exchanger Description
1 inch tube
10 Copper braids clamped to tube

Focal Plate Temperature and Flatness

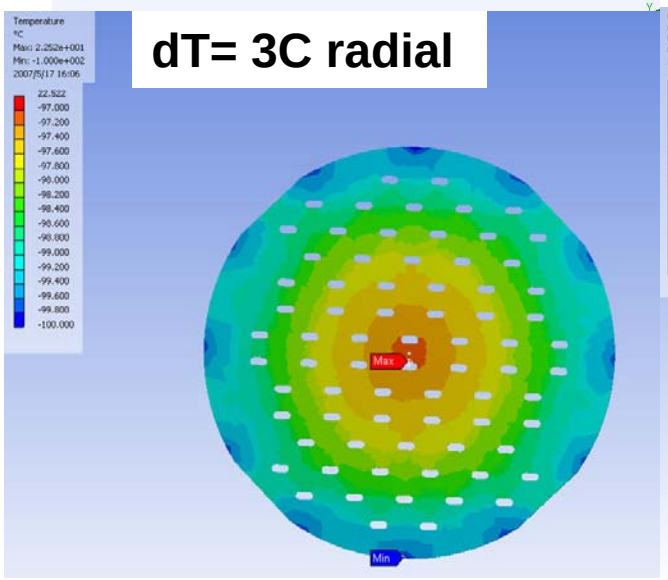
V2 Focal plate FEA by ANL, Doc #586

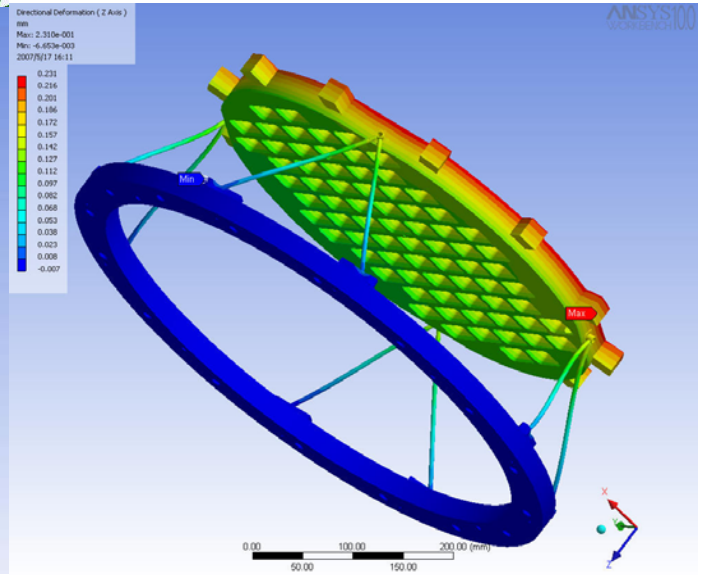
DARK ENERGY SURVEY



V2 Focal Plate, Copper Braids around O.D of the Focal Plate
Parameters and Boundary Conditions:
Radiation heat transfer from the front surface of the focal plate to the C5 lens.
An emissivity of 0.85 was used
ambient temperature of 263K
The support ring was set to a temperature of 22C
The supporting ring for the bipods was rigidly fixed in place
The bottom of the copper braids were set to a temperature of -120C

Results
Temperature within 3 C
Flatness 4 microns





WBS 1.6 and 1.7 Update - 08/02/07

DARK ENERGY SURVEY

WBS 1.6 SISPI

- **Observer Control System: We have a working "state machine" model of the OCS, written in Python; will test the validity of much of the SISPI architecture, and possibly become real code.**
  *** Quality Analysis. Joe Mohr and Jon discussing quality analysis requirements.**
  *** At next week's SN workshop at Argonne, we will discuss what (if any) DAQrequirements follow from SN science needs.**

- **WBS 1.7 SIMULATIONS**
  - **We have produced a so-called "Gold Standard Night Light" (GSN-Light) image data set at the request of DES Data Management**
  - **GSN-Light consists of 45 GB of images**
    - **12 science images: 4 filters x 3 pointings (dithered in position by ~1/4 CCD)**
    - **8 standards: 4 filters x 2 observations**
    - **25 calibration images: 5 biases + 4 filters x 5 flatfields**

- **Data set is being processed by DESDM and results and QA plots will be used for presentation purposes**

DARK ENERGY SURVEY

CD2 Review plans

- Current plans:
  - CD2/3a Directors review week of Dec. 10th 2007.
  - How about Dec. 11-13? Can we book it?
  - Joint NSF/DOE CD2/3a review date proposed by Kathy Feb. 4th 08
  - Approval expected by April 1 2008. ???
  - Joint NSF/DOE CD3b review ?? 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 ~ July 2008):
  - WBS 1.2 CCD wafer processing (not packaging)
  - WBS 1.5 Procurement of the Shutter ($120k, 1-1.5 yr delivery)
  - Reconsidering options in light of 6 week delay in CD2/3a directors review.

Profiles and Dates (from CD1 review)

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- DECam is in the FY08 Presidents Budget Request for a construction start and $3.6 M in equipment funds.
- We were asked to investigate the following funding profiles, with the knowledge that FY-08 and 09 are ~ fixed and there is flexibility in the FY10-11 numbers.

MIE	FY08	FY09	FY10	FY11
Guidance 1	3.6	7.5	5.4	2.3
Guidance 2	3.6	6.5	5.4	3.3

DECam Funding Need Profile (CD-1 Review)

(burdened and escalated to then yr $)

DARK ENERGY SURVEY

	FY07-Q4	FY08	FY09	FY10	FY11	Total
R&D	0.99	2.97	1.20	0.00	0.00	5.17
MIE-base	0.00	2.69	6.15	4.47	0.75	14.05
MIE-Cont.	0	0.91	1.35	2.2	1.3	5.76
MIE-Total	0.00	3.60	7.50	6.67	2.05	19.81
Total (R&D+MIE)	0.99	6.57	8.70	6.67	2.05	24.98

- Contingency on the MIE is heavily distributed in FY10 and FY11 because this is when extra CCD lots would be processed, packaged and tested.
- DES Collaborators are contributing in-kind labor, cash and equipment with a total value of ~ $8M. These commitments include contingency.
- Base Schedule: delivery to CTIO in July 2010, testing complete Oct. 2010
  - No explicit schedule contingency included
  - These dates are used to coordinate with the other DES projects.
- DECam project complete milestone is Oct. 2011. This includes 12 months schedule contingency (~ 31%).
- The slower funding profile (Guidance 2) shifts the end date by ~5 months.