



CTIO: DECam Installation, Commissioning, & Operations



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DARK ENERGY
SURVEY

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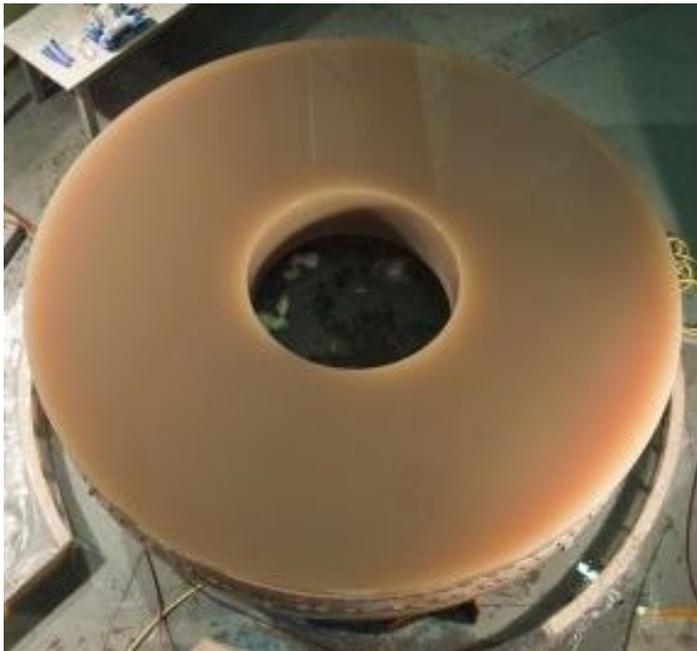


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Status – Facility Improvements



- Blanco primary radial supports
 - No breakages after 2 years, & x10 improvement in movement
- Primary mirror successfully realuminized



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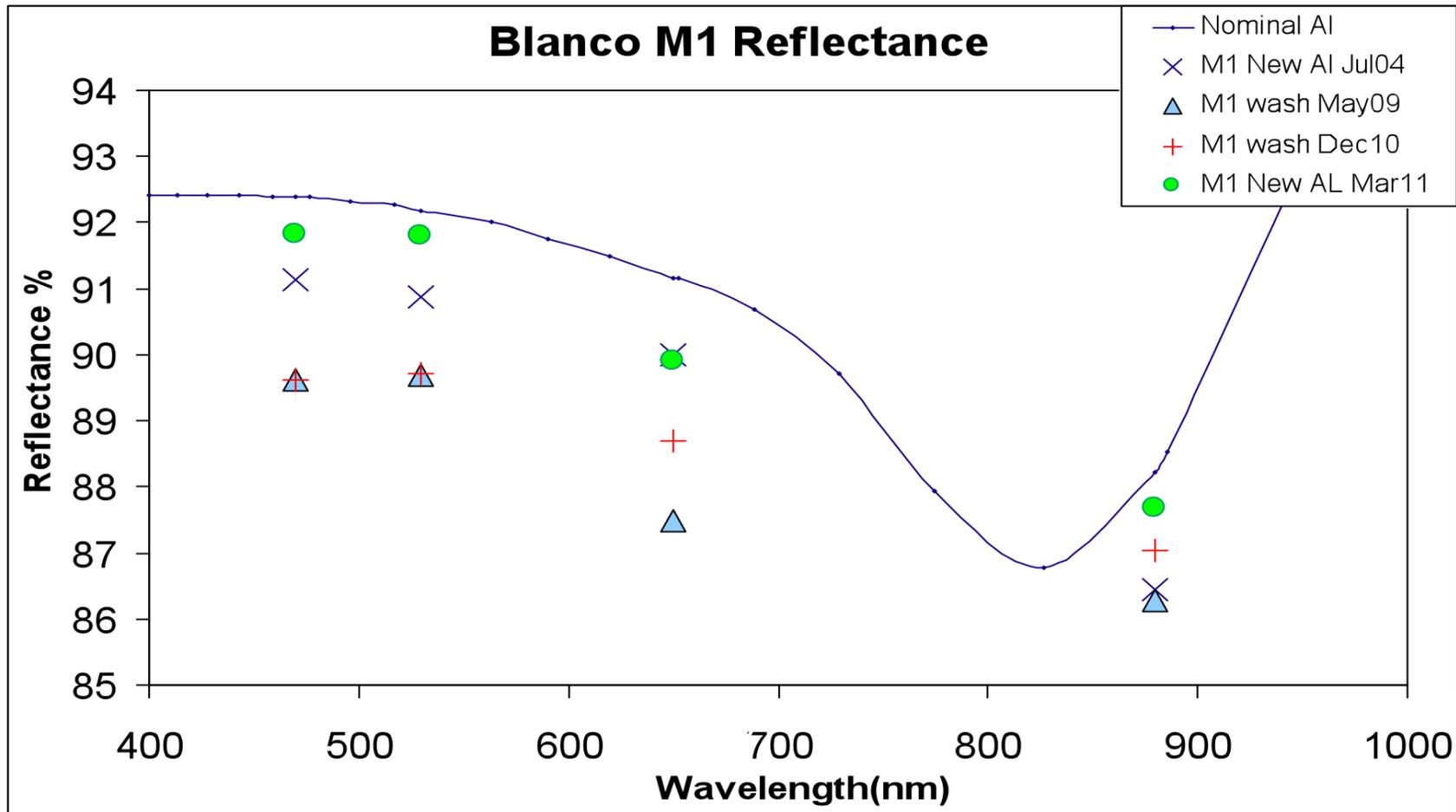
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Re-Aluminization of M1





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Console room upgrade: Before



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Console room upgrade: After





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ALSO: Computer Room



- Before After





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Cooling Plant



- New 40 Ton Chiller installed
 - Was 30 Ton+10 Ton, now 40 Ton+30 Ton
 - Gives headroom for future dome cooling project
- Glycol contaminant
 - Pulled out leaking part
 - Removed oil from system



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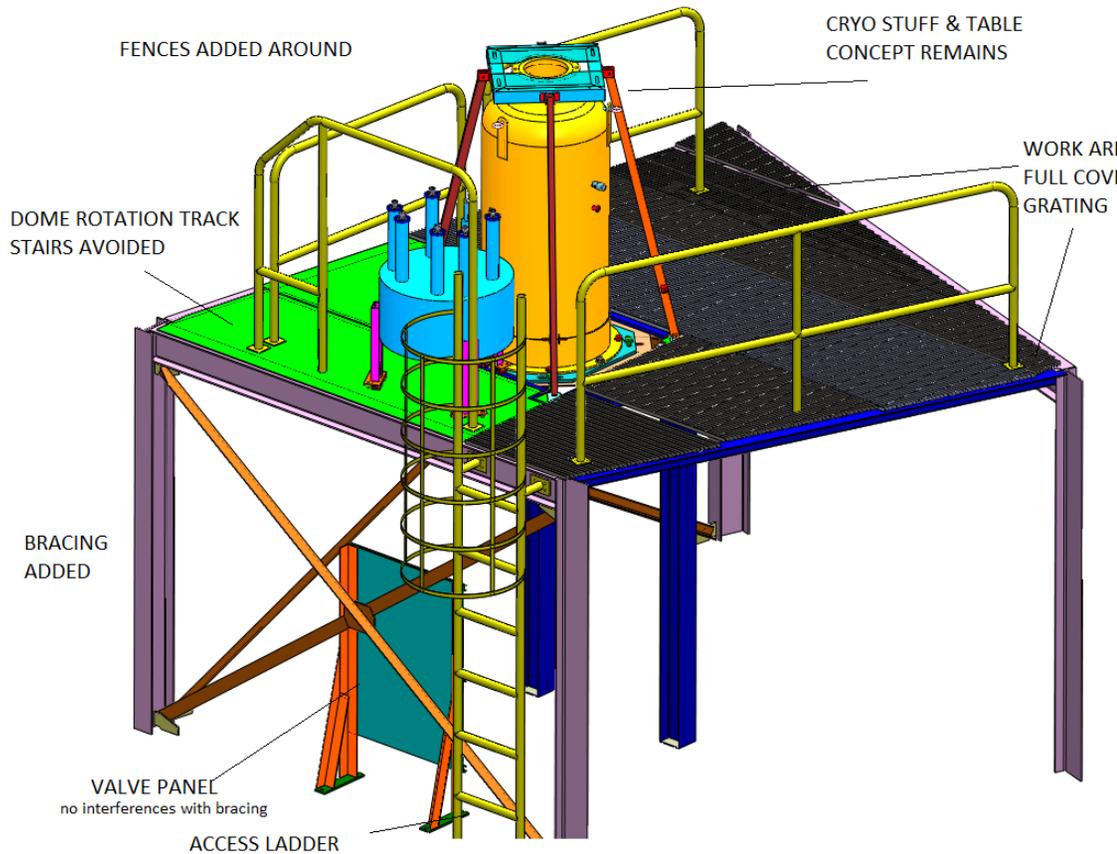


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DECam Cooling System



- Design and implementation



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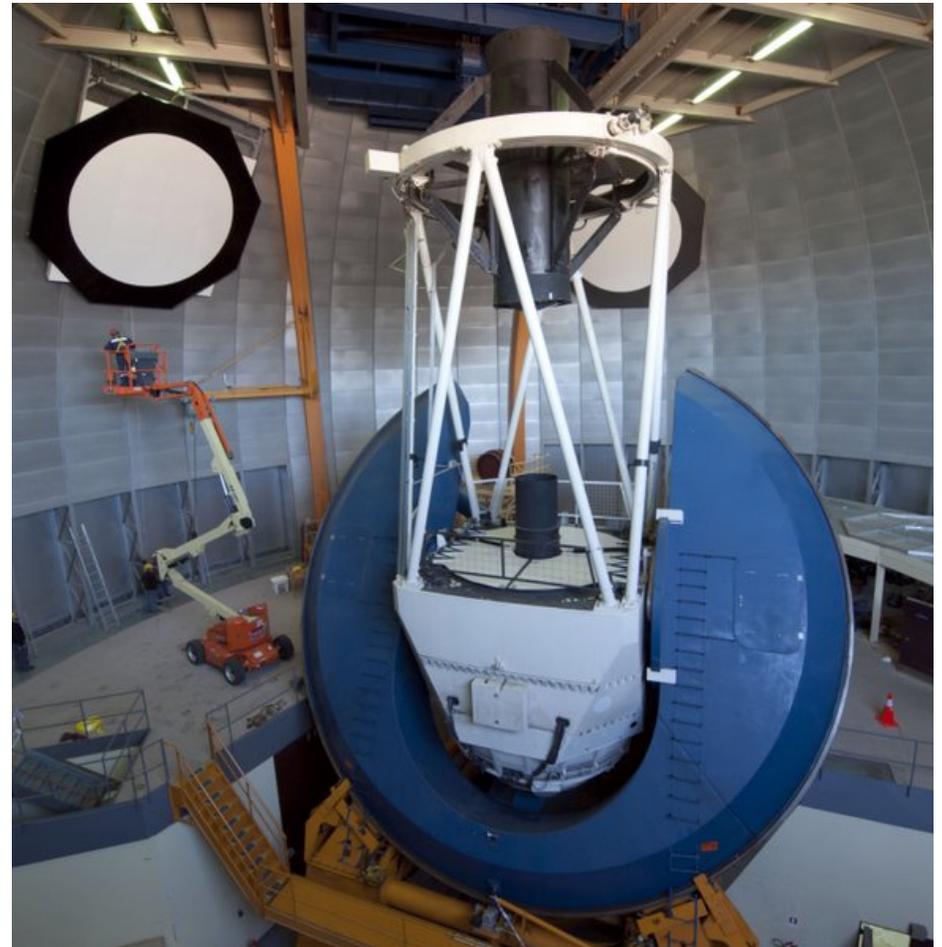


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DECAL System: New White Spot



- New white spot (left) installed in dome
- Illumination system pending shipping from TAMU





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G-floor Prep



- G-floor = DECam cage & optics prep area
 - New crane installed for cage and optics assembly



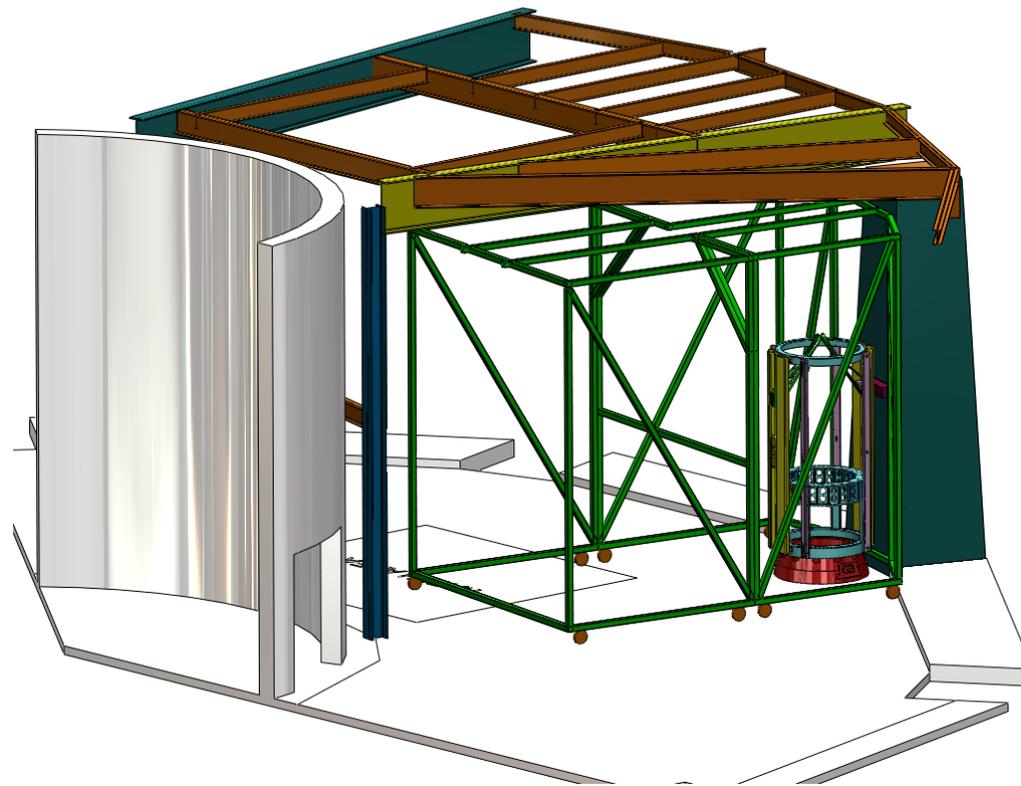


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G-floor Prep



- G-floor = DECam cage & optics prep area
 - Next step: Clean(ish) work tent for optics integration





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Facility Improvements



- Blanco UPS and generator improvements
- Telescope Control System
 - Basic Performance Demonstrated; issues identified with tuning
 - Software tests in Sep/Oct/Nov
 - Impact of extra weight of DECam+Counterweight under re-evaluation



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Blanco Improvements



- Instrument Maintenance Facility (ex Coudé room) on telescope Main Floor
- Clean Room in use, with added humidity





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Community Workshop



- Highly successful workshop
 - 42 attendees from many institutions
 - Talks online <http://www.noao.edu/meetings.decam/schedule.php>
 - **Purpose:** provide information on capabilities of DECam & how community can use DES data
 - **Program:** informational talks, invited plenary science talks, short project talks, and breakout sessions
 - **Organizing Cmte:** D.James (chair), Walker, Allen, Norman, & Weintraub



CTIO Director's Installation Reviews



- Integration & Installation review = April 2011
 - External committee charged to review procedures & safety of integration & installation
- Installation & Safety review = Oct 2011
 - Revisit installation procedures, recommendations of I&I review, and in particular look at safety to personnel & instrument



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Installation Phases



- Phase 1: Pre-Shutdown (Oct – Jan):
 - Work on cooling systems
 - Work on imager
 - Fabrication of counterweight components, platforms, & cart
 - Assembly of Cage & Optics
- Phase 2: Shutdown (Jan – Apr)
 - Telescope disassembly
 - Top-end Change
 - Telescope reassembly & tuning
- Phase 3: Post-Shutdown/Commissioning (Apr – Aug)
 - Re-commission telescope (tuning, f/8)
 - Install imager
 - Commission imager



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Shutdown – gross phases



- Remove f/8 cell and stow
- Install platform mounts & plates
- Telescope to zenith
- Measure current telescope alignment
- Remove & stow primary mirror
- Remove old cage
- Install new cage (cage, hexapod, corrector)
- Reinstall primary mirror
- Preliminary optical alignment
- Rebalance telescope
- Tune TCS
- Check out f/8
- ~~→ Image quality checks with SBIG cameras??~~
- Install remaining DECam components at NW station
- → Commissioning



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Shutdown part 1/3

Telescope disassembly



- 2 - 23 Jan 2012
- Work day: 08:30 – 16:30, 1hr for lunch, 5 day week.
- The usual shutdown crew

- Throughout the shutdown:
 - Foreman
 - Beginning of day/shift meetings
 - End of day/shift meetings
 - Short report distrib by email after every end of day/shift meeting.

Name	Position
Gale Brehmer	Head TelOps
Jorge Briones	Mountain mechanic
Eduardo Aguirre	Mountain mechanic (Pachon)
Gerardo Gomez	Mountain mechanic (Pachon)
Dario Guajardo	Mountain mechanic
Esteban Parkes	Electronico (jefe)
Javier Rojas	Electronico
David Rojas	Electronico
Andrés Montane	Mechanical engineer
Freddy Muñoz	Mechanical engineer
Patricio Schurter	Mechanical engineer
Fabian Collao	Mechanic (ETS, jefe)
Victor Robledo	Mechanic (ETS)
Victor Pinto	Mechanic (ETS)
Juan Orrego	Mechanic (ETS)
Cristian Diaz	Mechanic (ETS)
Roberto Tighe	Optical Engineer



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Shutdown part 2/3

Top end change



- 23 Jan – 7 Feb
 - Additional telescope staff from Tucson coming down to help speed things up
- Two shifts:
 1. 08:30 – 16:30, 1 hr for lunch.
 2. 14:30 – 22:30, 1 hr for lunch.→ 14 hour day, 2 hour overlap between shifts.
- Two shifts: Team Gringo & Team Chileno
 - 4 on top ring, 1 on lower platform, 1 crane operator
 - Also: lookout, foreman, safety engineer.



Shutdown part 3/3

Telescope reassembly & shakedown



- 8 Feb – 16 April, 08:30 – 16:30, 1 hr for lunch, 5 day week.
- Dress telescope (run feeds)
- Reinstall M1 & align
- Install modified Cass cage
- Rebalance telescope
- Tune servos
- Verify f/8 handling
- Team:
 - As part 1, plus...
 - 4 Arizonans, 4 for “Dress telescope”
 - TCS support for tuning



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Commissioning Strategy



- **Phase 1** - F/8 mirror optical alignment and test
- **Phase 2** – ~~DECam optical corrector tests using the SBIG cameras~~
- Then there is a month of installation and checking out of DECam and other cage contents
- **Phase 3** – Full DECam System tests, on the sky
- **Science Verification** - JULY/AUGUST 2012
- **Observations** - SEPTEMBER 2012



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Commissioning Schedule



No	Phase	Activity	Time (w)	Elapsed (m)	
1	ONE	F/8 commissioning	1	0.25	
2	<i>Observing</i>	Observe F/8	1	0.5	Contingency
3	TWO	Optics tests SBIGs	1	0.75	
4	<i>Observing</i>	Observe with F/8	2	1.25	Contingency
5	<i>Installation</i>	Install Imager	2	1.75	
6	<i>Installation</i>	Functional tests	2	2.25	
7	THREE	DECam Tests (A)	2	2.75	
8	<i>Observing</i>	Observe with F/8	2	3.25	Contingency
9	THREE	DECam Tests (B)	2	3.75	
10	<i>Observing</i>	F/8	1	4.00	Contingency
11	<i>Observing</i>	Science Verification	2	4.6	
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Science Verification



- Community science verification time
 - How it works
 - Two several night programs from experienced teams, selected by special TAC
 - Chosen for both science impact and for exercising the equipment
 - The teams sign up for rapid data reduction and publication
 - Proprietary time set to zero to encourage this!
 - Why?
 - Allows community to access real DECam data early, to help them plan their own programs
 - This model was successful with NEWFIRM
- DES verification time
 - Do a mini-survey using DES protocols



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Schedule Caveats



- Shutdown depends on
 - Optics delivery & alignment verification
 - Counterweight design and implementation
 - TCS tuning tests and plans
- f/8 observing = contingency
 - Plan to schedule any community observations flexibly, via remote or service observing, so that we can adapt to schedule changes
 - Additional contingency needed for TCS tuning
- Sub-optimal season = weather
 - May need additional time due to change in commissioning season
 - June/July/August is worst weather for Cerro Tololo
- The SV time will actually be scheduled as science verification / engineering. The following engineering blocks will be written as engineering / science verification.
 - SV includes both Community & DES time for testing
- Survey commencement also depends on Community Pipeline deliverable



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DECam+DES Operations



- DES Scheduling

- DES commitment: 105 nights/yr for 5 years

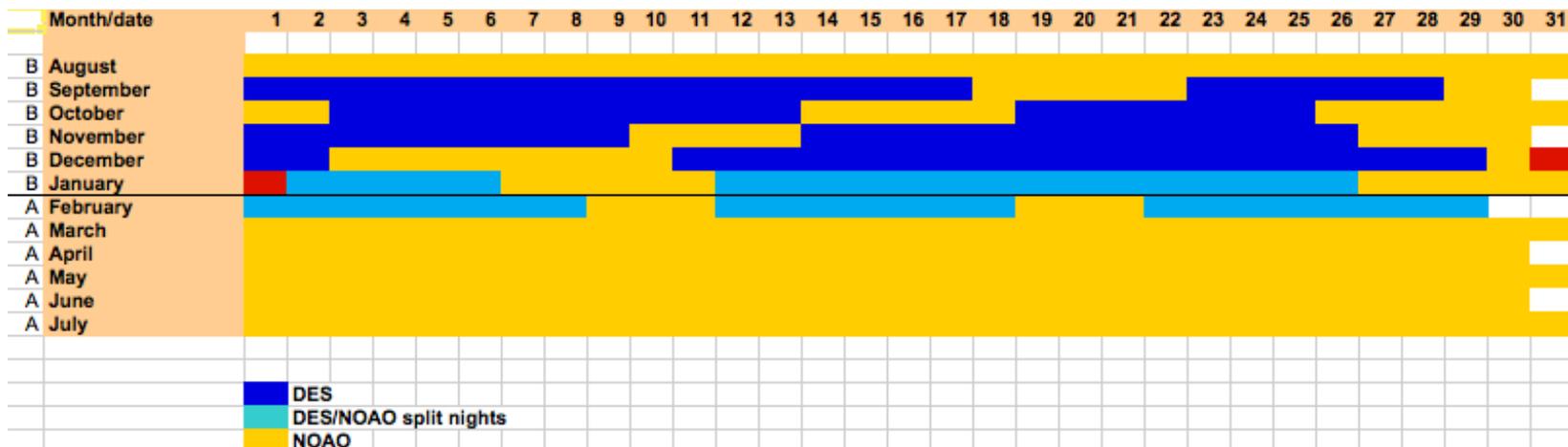
- Baseline is Sep-Dec, occupying ~70% of time, plus Jan/Feb half nights

- Result: about 1 week/month for community time in Sep-Dec

- Bottom line:

- “A” semesters almost normal community use,

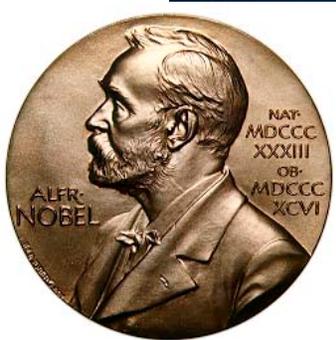
- “B” = DES, limited community time





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The Beginning



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Backup slides



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- On Commissioning
 - From Alistair's talk in Portsmouth
 - Pending updates in current round of revisions



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Pre-Commissioning



- All components tested and ready for end-end system tests
- Pre-Requisites for Phase 1
 - PF cage installed & aligned
 - F/8 ready
- Pre-Requisites for Phase 2
 - Hexapod functioning correctly
 - ~~SBIG-system ready~~
- Pre-Requisites for Phase 3
 - All utilities installed and working
 - DECam passed functional tests
 - Data system ready



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Phase 1 F/8



-
- Verify correct operation of F/8 focus and tilt mechanisms
 - Analyze optical performance with IMAN, make sky map
 - Remove and re-install F/8, check all still OK
 - Use the CTIO IR Imager (ISPI) for imaging tests



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Phase 2: DECam Optics



- At Zenith
 - Focus at center of CCD
 - Evaluate and correct for tilt using radial cameras
 - Evaluate image symmetry, adjust x-y
 - Evaluate image quality
- Over Sky
 - Evaluate image quality over sky, built approximate LUT for top-end deflections
 - Focus stability
 - Image ghosts
 - Test our understanding of the effects of misalignment and defocus



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Pre-Phase 3: DECam Installation



-
- Cabling, LN2 system, install if not already done, check
 - DECam install
 - Functional tests of DECam and its data system
 - SISPI and all interfaces working, alarms work
 - Air systems OK
 - Initial reliability tests
 - Install (and remove) filter, then install all filters



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Phase 3: DECam Imager Commissioning



- Phase 3A
 - Monitoring & exercising activities
 - Daytime calibrations and CCD tests (some are every day, others less often)
 - Telescope & TCS tests – pointing, tracking
 - Focus – map, in-and-out, sky position, filter, temperature
 - Donut, Bcams, alignment
 - Autofocus
 - Crosstalk, ghosts, scattered light
 - Guiding
 - Calibrations – dome flats, star field flats, sky flats
 - Photometry, astrometry
 - Reliability, efficiency, user interface, tool evaluation



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Phase 3 DECam Commissioning



- Phase 3B
 - Community protocols qualification - test DECam performance and reliability and the ability of the Community Pipeline to reduce the data.
 - Deep dithered field. Long exposures, high background
 - Low galactic latitude field, multiple filters
 - Variable star density – e.g. large globular cluster or resolved nearby galaxy
 - Establish optimal dither patterns
 - etc
 - DES protocol qualification – Test DECam performance and reliability and the ability of the DESDM pipeline to reduce the data
 - Test also analysis codes on real DES-like data
 - Test ObsTac
 - Test QuickReduce in the DES context
 - etc



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Staffing I



- CTIO instrument support scientists and technical staff will be trained, procedures will be developed and/or optimized.
- Operation and first-response support will pass from the DECam Project to CTIO. Technical backup from the DECam Project team will be very important, especially in the first year of operation.
- Both DES Collaboration and NOAO scientists & engineers will participate in commissioning – the scientists will be drawn from those with technical expertise relating to DECam, and/or astronomical experience
- Scientists
 - NOAO DECam Instrument Scientist heads up commissioning (1)
 - On-duty scientists, one will be Chief (~5-6 people, ~3 on night shift)
 - Work a day shift, a swing shift, or a night shift depending on tasks
 - Pipeline scientists – Tucson, NCSA (a few)
 - Analysis scientists – especially the DES science teams (many)
- Schedule – no more than 7 nights on...



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Staffing II



- Engineering/technical support - CTIO
 - Telescope Operator (1)
 - Blanco Observer Support (1)
 - TELOPS staff (lead Gale Brehmer) – mechanical support (2) daytime, electronic support (2) swing shift on call
 - ETS staff (lead Tim Abbott) support for commissioning – 8-9 people covering all the technical specialties and who have been involved with the DECam Project. They are based in La Serena, on mountain when appropriate.
- Engineering/technical support leads – DECam
 - Vacuum/cryogenics H. Cease
 - Electronics T. Shaw, S. Chappa
 - Software K. Honsched, A. Elliott, L. Buckley-Geer
 - CCDs J. Estrada
 - Instrument integration T. Diehl
 - The final commissioning roster will be iterated given the experience of integration and installation.



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Communications



- Daily meeting
 - Update engineering and analysis activities relevant for the short term
 - Prepare revised plan for the coming night
 - Review any changes to the longer range plan
 - Update any requirements met/missed
- Ad hoc meetings, using videocon, IP phone, Skype
- WWW tools to foster rapid dissemination of results
- SISPI provides logbook, image header information, alarms