

# *DECam Installation & Commissioning Schedule*



**Alistair Walker**  
**CTIO/NOAO**



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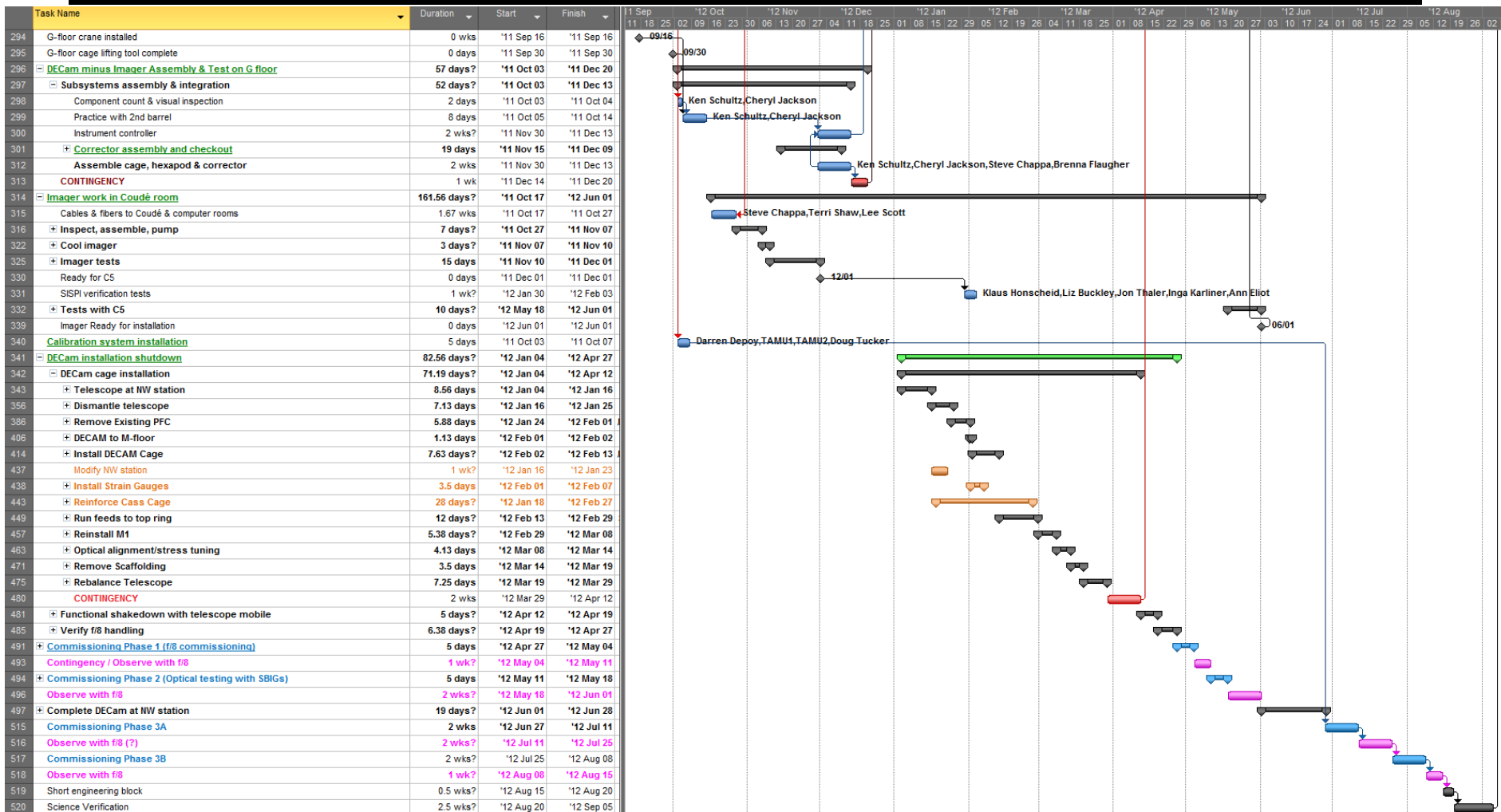
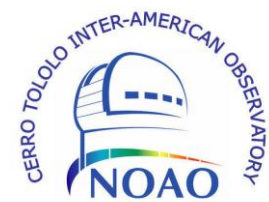
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- Integration – Installation
- Commissioning
- Post-Commissioning

# Top level Gantt chart



# Integration-Installation

- This has started already



F/8 Handler

SISPI Computers

RASICAM

LN2 cooling system

Hexapod, Filter Changer, Shutter

Prime focus cage

Flat field screen

# Trucks and Boxes...

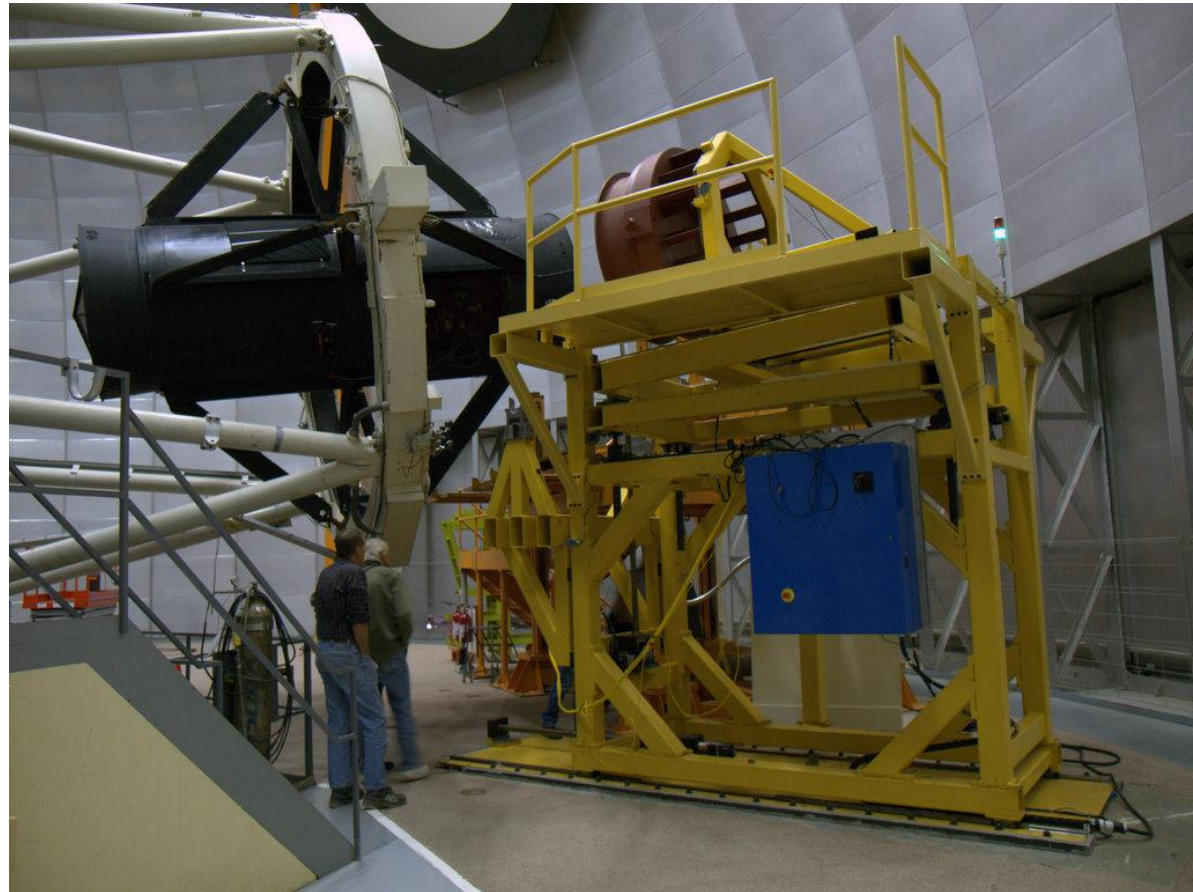
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# DECam Early Arrivals: f/8 handling fixture

- DECam Prime Focus Cage
  - Fixed, no 180° flip possible
- f/8 secondary
  - Mounted in front of DECam
- f/8 handling fixture
  - Arrived & installed at Blanco
  - Shown here in yellow, with telescope in position



# RASICAM



- RASICAM 10 $\mu$ m all-sky camera

provides

- 320x240 pixel images every 90s (average of 5400 exposures)
- 14-90 deg from zenith, equi-resolution
- Publishes to web
- Photometricity indices



# What happens next?



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- Flat field System Arrives – installed October 3-7
  - Imager Arrives – connected to cooling system and data system – starts October 17
  - Telescope Cooling System Final Pieces Arrive – install in February
  - Rest of Calibration System Arrives – install in October, test with Mosaic during November-December
  - Assembled Optical Corrector Arrives - tested on rotary table - starts November 15
  - Assemble Cage, Corrector, Hexapod – starts November 30



# Installation

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- Installation leader is Tim Abbott, combined teams of CTIO and DECcam Project staff install DECcam. The detailed schedule is an MPP file (DES-doc 5238)
- We are already in the preceding phases of *shipping* and *check-out after arrival*.
- Lots of planning, discussions, documentation.
- *All systems operating correctly* gates the start of installation of the new Prime Focus Cage,
- The installation procedure design is being led by CTIO's DECcam installation engineer Freddy Muñoz.

# DECam cage installation – gross phases



- Remove f/8 cell and stow
- Install scaffold mounts
- Telescope to zenith
- Measure current telescope alignment
- Remove & stow primary mirror
- Remove old cage
  - Remove with spider fins/vanes/legs attached
  - Lower to telescope ring girder
  - Remove spider fins
- Install new cage (with cage, hexapod, corrector & SBIG cameras)
  - Raise to telescope ring girder
  - Install spider fins
  - Raise to top ring, attach spider fins
  - Preliminary mechanical alignment
- Reinstall primary mirror
- Preliminary optical alignment
  - Tune spider fin tension
- Rebalance telescope
- Check out f/8
- → Image quality checks with SBIG cameras
- Install remaining DECcam components at NW station
- → Commissioning

# Cage alignment



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- Cage alignment is a critical process.
  - The F/8 mirror is mounted onto the cage, there are operational adjustments, but they are limited
  - DECam is mounted via the hexapod, but we want to start with the hexapod positions nominal. Especially tilt.
  - Roberto Tighe (CTIO Optical Engineer) is in charge of this stage.

# Commissioning Strategy



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- Begins after installation and alignment of the prime focus cage, which will contain the optical corrector and dummy imager with SBIG camera system mounted.
  - **Phase 1** - F/8 mirror optical alignment and test (start Dec 21 2011)
  - **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**

# Phase 1 F/8

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- 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

# Phase 2: DECcam 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

*Note - the SBIG cameras have very fine pixel scale*

# Pre-Phase 3: DECam Installation

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- 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

# Phase 3: DECam Imager Commissioning

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- 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



# 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

# Science Verification



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- See Dara & David talk

# Schedule



No	Phase	Activity	Time (w)	Elapsed (m)	Nominal Date
1	ONE	F/8 commissioning	1	0.25	27 Apr-3 May
2	<i>Observing</i>	Observe F/8	1	0.5	4 May-10 May
3	TWO	Optics tests - SBIGs	1	0.75	11 May-17 May
4	<i>Observing</i>	Observe with F/8	2	1.25	18 May-31May
5	<i>Installation</i>	Install Imager	2	1.75	1 Jun-14 Jun
6	<i>Installation</i>	Functional tests	2	2.25	15 Jun-26 Jun
7	THREE	DECam Tests (A)	2	2.75	27 Jun-10 Jul
8	<i>Observing</i>	Observe with F/8	2	3.25	11 Jul-24 Jul
9	THREE	DECam Tests (B)	2	3.75	25 Jul-7 Aug
10	<i>Observing</i>	F/8	1	4.00	8 Aug-14 Aug
11	<i>Observing</i>	Science Verification	2	4.6	Late August
August 24, 2011		DECam Community Workshop, Tucson			19

# The End

