DEIMOS
SSC Presentation: July 13, 2000
Twenty-Fifth Quarter

Camera/optics:

- A pupil simulator is being designed to mimic the Keck pupil. It will sit in the parking lot at a distance of 66 feet from the focal plane and carry a hexagonal pattern of bright lights at the corners of the pupil, plus aimable lasers.
- The shipping box for the camera was fabricated; it will be shock and thermally tested.
- A quote was received for $44 K from Spectrum Thin Films for the AR coating on the front window. This is much higher than the old quote of $20 K from Coherent. We are waiting to get quotes from Coherent and Cleveland Crystal.
- Key optics installation dates:
  - Camera installation: done
  - Collimator installation: July 21
  - Tent mirror installation: Aug 4
- Key first-light dates:
  - First light through optics using pupil simulator and Cohu camera: Aug 7
  - First light images of slitmask with Cohu camera: Aug 23 (first test of flexure)
  - First light through optics with science detector: Sept 4

Detector/mosaic:

- The first (blue) version of the science mosaic is assembled and is ready to be installed. It is quite flat.
- Approximately 18 more high-ρ CCDs remain to be tested from Lot 14. DEIMOS' share of these is 4 devices. Given previous yields on Lot 14, it is promising that we will receive the one additional device needed to fill out the high-ρ side of the science array.

Dewar/LN2 system:

- The ion pump glow problem appears to have been solved by installing an optical baffle in front of the ion port. Long darks appear to be dark, provided the dewar is well sealed.
- Various electronics problems mentioned in our last report were corrected.
- The temperature regulation software is largely complete, including custom temperature calibration curves for each diode. CCD temperatures are uniform to within 2 C. We will probably run too cold in Hawaii and will need to cut some of the copper-braid connections in the thermal circuit after delivery to the summit.
- Delays with the dewar/electronics were encountered:
  - A dewar leak reappeared. Repairs are occuring this week.
  - The CCD temperature-sensor circuitry proved fragile and had to be replaced.
  - A resistor burned up on the power monitor board. This was repaired, but the failure exposed the engineering CCDs to a dangerous voltage condition for several hours. Corrections are being designed that would insure against such accidents in future, but these will not be ready until fall. Another safety change is being made to deal with unexpected loss of power to the UPS.
  - Altogether, testing destroyed or damaged a total of three engineering CCDs, triggering a comprehensive review of the electronics. It is suspected that uncontrolled electrical transients during power-up and power-down may have temporarily reverse-biased the gate voltages in the reset transistor in the output amplifier. Operation of the clock voltages under this condition would short out this transistor, as seen in at least one failed CCD. (Some of the CCDs might have been damaged during the above power-monitor board failure, which created such a condition.) Software was changed to energize the gate voltages in the proper sequence and to prevent application of the clock voltages at unsafe times. Cooldown and test of this final

configuration began on July 3. Installation of the science array is now scheduled for July 25, delaying its installation into the spectrograph until Aug 25.
∘ Static grounding caps have been fabricated for the 61-pin connectors on the electronics boxes to insure that CCDs are never inadvertently exposed to stray charge while in the dewar.
∘ Water contamination may still be a problem. A slow leak may exist at the front window O-ring seal, leading to a faint ring of condensation that was seen during the last engineering cooldown. Zeolite capacity may also not be adequate for extended operations at Keck. We will be watching both of these problems during tests of the science array.
- Tests of the pumping capacity of zeolite and activated charcoal at various temperatures were conducted in the test dewar.
- We are currently running in single-amp mode and have ordered 4 extra Leach video boards to convert to dual-amp mode. We also need to install the 4 high-ρ CCDs in the science mosaic before delivery. It looks like both of these changes will occur after the Pre-ship Review while the instrument is being shipped to Hawaii.

Structure:
- A milestone was passed in that components for all major systems have been fabricated (with the single exception of the slitmask form, see below).
- Torque and speed tests were completed for the grating slide drive. This involved a lengthy alignment procedure to compensate for nonflatness of the drive disk, which holds the grating mounting box and the slide drive. Total drive time is 240 seconds from Position 1 to Position 4, but we hope to reduce this by a factor of three in final tuning. Aligning the grating system is proving tricky, and we are several weeks behind schedule. The next step is actually to mount gratings on the mounting box; this is just starting.
- Fabrication has started on the final slitmask form (redesigned to eliminate vignetting). It should take about three weeks.
- The gear ratio of the filter wheel had too much mechanical advantage and had to be replaced. The new gearbox is on order and will be installed the first week of July. The unit will then be ready for mounting in DEIMOS.
- Cladding around the electronics boxes is being fabricated, and cladding for the nose structure is being designed. Holes are being drilled in the structure for mounting the cladding.
- Key system installation dates in spectrograph:
  - Filter wheel: Jul 19
  - Slitmask form: Aug 18
  - Shutter: Jul 17
  - Dewar with science array: Aug 25

Electronics:
- The electronics staff are busy with the final wiring of various subsystems and of the spectrograph body.
- The AC power system is being installed.
- A third, still simpler scheme to run the PA rotation drive off DCS was devised, and computer equipment and a Galil interface are being purchased.

Flexure compensation system:
- The FC engineering CCDs and FC controller circuitry were installed and tested on the engineering array.
- The fiber feeds in the focal plane/slitmask area are being fabricated.
- Final placement of the fiber feeds revealed a potential collision between the slitmask cassette and the slitmask form. The cassette mounting points were moved about one inch.

Calibration system:

- Penray and Oriel lamps arrived, and their spectra were inspected in the laboratory. Novel cadmium and zinc lamps from Oriel appear to give an improved selection of spectral lines in the difficult blue-green region.

TV guider:

- All parts have been fabricated.
- The offset guider mirror and folding flat were polished.
- An alignment plan for the slitmask form and TV guider was devised; necessary jigs are being designed.

Software/testing:

- John Gates was hired as the programmer for Mt. Hamilton, freeing Will Deich to work 100% time on DEIMOS; June was the first month we've had with full software manpower.
- Tasks were re-distributed among software and electronics staff to improve communications and fill the testing void formed by Jim Burrous' loss.
- Software waveforms were programmed to run the FC CCD controller.
- Several systems are now available for operation under software keyword control: filter wheel, grating tilt drive, slitmask cassette, tent mirror piezo control, and barcode readers. There is suddenly too much work to do.
- Software was written and tested to write the FITS header tables containing the slitmask design information.
- The design of science keywords was largely completed.
- The DS9 real-time display system to be used by DEIMOS was adopted as the official IRAF display at Lick Observatory. Expertise with this system will be widespread.

Website/documentation:

- No special report.

Commissioning and shipping:

- Plans for shipping have started. The structure is too large for a regular container and will be strapped to an open container. Matson is the likely shipper. There will be three air shipments: electronics, optics, and the dewar and controller.
- A draft commissioning schedule is being developed with CARA.

Concerns:

- Stages and mechanisms that need extensive rework.
- Leaks, water contamination, and unforeseen electrical problems with the dewar/detector.
- Delays in commissioning the grating system.
- Software schedule and manpower.
- Numerous items that individually are small but collectively add up. Examples include the LN2 fill system, adding and testing the thermal compensator on the camera, installing and testing the thermal sensor system, final tuning of the dewar cooling circuit, enclosing the nose and making it light tight, baffling, and final definition of the calibration system.

Schedule and Budget:

- The Oct. 11, 1999, baseline schedule showed the dewar/detector as installed in DEIMOS at the beginning of May. We presently estimate late August for this, for a slip of 10 weeks, taking advantage of the allotted 18.6% contingency. This is an additional slip of 4 weeks since the May 24 report.

- The same schedule also showed the spectrograph as fully assembled and ready for first light in early May. We are now also showing this in late August, for a slip of 10 weeks, or an additional slip of 4 weeks since May 24.
- Our last detailed schedule on March 14, 2000, showed a Pre-ship Review date in early December, which was a slip of 4 weeks from the date in the October baseline schedule. In March, we also predicted a further slip of 11 weeks beyond this, based on our scheduling accuracy from October to March, for a total predicted slip of 15 weeks relative to the baseline schedule. As of May 24, 2000, we had accumulated a slip of 6 weeks, and as of this report, this slip has increased further to 10 weeks.
- In March, we calculated a schedule inaccuracy of a factor of 1.27, in the sense that it takes us 1.27 actual weeks to do 1 week of budgeted work (including the 18.6% contingency). That was based on 5 months' experience. The new schedule inaccuracy factor is 1.30, averaged over the nine-month period October 11, 1999, to July 13, 2000. Thus, this factor seems to be holding fairly steady.
- Revised total slip: Applying this new inaccuracy factor to the 53 weeks of work before the Pre-ship Review in the baseline schedule yields a new total predicted slip of 16 weeks, an increase of 1 week since March.
- The nominal Pre-ship Review date in the current schedule is Jan. 31, 2001, assuming the present slip of 10 weeks. A total slip of 16 weeks would move this to Mar. 15, 2001, which we consider more likely.
- Based on a total slip of 16 weeks, the revised total project cost is \$7,626, up from \$7,078 K in March, which was based on the 4-week slip at that time. The cost increase reflects the bigger slip together with unexpectedly high manpower hours in Q25. The weeks of additional slip have been budgeted assuming high effort and cost.