

arcminutes. The beam is sent to the wavefront sensor by a beamsplitter, and brought to an f/100 focus. The wavefront sensor sample the telescope pupil with 19 sub-apertures using a lenslet array.

A mechanical design of the Bonnette has been completed by W. Grundmann of the Dominion Astrophysical Observatory. The diameter of the bonnette is slightly over one meter, and the thickness is 280 mm. At the moment, design of the mounts for the optical components is underway, and there is considerable interaction taking place between the different partners (CFHT, DAO, LASERDOT, and OPM) to ensure that all components will indeed fit in the enclosure.

DAO is also developing the Curvature Wavefront Sensor for the AO Bonnette. J. Stilburn has been involved in the realization of the components and the definition of the interfaces with the control system. The group of F. Roddier (Institute for Astronomy – U of H) is acting as a consultant to DAO for the design details of this particular component, and provides advice in general on the whole system (See the article from Dr. Roddier on the adaptive optics system of the University of Hawaii, in the section Latest News on Instrumentation).

The French company Laserdot is fabricating the 44 actuator piezo-stack mirror for our system and developing the control software of the AO Bonnette – at this stage mainly the closed-loop control of the deformable mirror using signals derived from the wavefront sensor. Many simulations have been carried out to study different aspects of the system including closed-loop bandwidth, the interactions of the curvature sensor and piezo-stack mirror, the design of the off-line Shack Hartmann sensor for flattening the deformable mirror, etc.

Meudon Observatory is studying a solution for the system's tip/tilt mirror which is a separate component from the deformable mirror. P. Gigan is designing a tip/tilt mount driven by 4 linear magnetic motors for the f/20 paraboloid mirror to be used for tip/tilt correction. Another solution also envisioned would be a commercial momentum-compensated piezo-stack tip/tilt mirror sold by the German firm Physik Instrument.

Concerning management of the project, a Kick-Off meeting took place at DAO last February to define the project and the task sharing between the various partners. On May 20-21, preliminary studies were presented to CFHT by Laserdot, Meudon Observatory, and DAO, at the Laserdot headquarters in France. Next August a Milestone 2 meeting will take place at CFHT Headquarters in Waimea to review the detailed design studies of the contracting parties. If CFHT is satisfied with the results of these studies, the contracts for fabrication will be issued shortly thereafter.

R. Arsenault, D. Salmon

Redeye Project Status

At the time of this report the infrared camera project is in a rather dynamic state, with final integration of essentially all components in progress. In late March we received the LiF and BaF₂ lenses needed to complete the cold reimaging optics, and will complete acceptance tests of the two cryostats in late May. We recently ran a bare NICMOS3 multiplexer with the new Generation III controller under development at CFH, paving the way for final tests of our engineering grade NICMOS3 array and

ultimately a science grade device. All of these efforts are being driven in the near term by a June engineering run with one of the cameras. Barring unforeseen problems that prevent us from making tests on the sky, we will distribute through e-mail to the Community the results of our engineering runs in June and August. Such performance characterization will allow future users to design observing proposals for the new cameras. We currently anticipate commissioning the cameras for use at the Cass focus by 1 January 1993, in time to support runs throughout next semester.

D. Simons & C. Clark

MOS-SIS Progress Report: Release for General Use Scheduled for 1st Semester 1993

Highlights of the Past Six Months

Since the last information bulletin a great deal of activity has been taking place around the MOS-SIS imaging spectrograph. Integration of the instrument has been completed at DAO, with frequent trips of CFH personnel to DAO for active testing. As compared to what was announced 6 months ago, we have experienced a two month delay in shipment to CFHT due essentially to two problems, one with the control software, the other with the MOS camera optics. After this first problem was solved, the MOS-SIS plus auxiliary equipment (handling cart, test bench) was shipped to CFHT. Since then the MOS-SIS has been put back together (it was shipped in sub-assemblies), and brought up to the observatory 5th floor for integration into our operations. The MOS-SIS has successfully been installed on the Cassegrain focus and successful communications between the dedicated control system and both our main control computers and the TCS has been obtained. The SIS optical train alignment was checked out and found not to have suffered from shipment. Figure 10 shows the first multi-spectra image taken on the sky in June, 1992, while Figure 9 shows one of the spectra. The last major missing optical component has at the time of this writing finally been completed: the MOS camera aspherical lenses were successfully manufactured by APS and subsequently glued.

Problems and Solutions

One serious problem discovered in the control system while testing proved difficult to track down and solve: occasional crashing of the control software was occurring at a low but definite rate of 1 motion failure over 30 requests. After much effort by DAO/CFHT and external experts, the problem was finally identified and solved. In parallel, the MOS camera optics was being redone by the Applied Physics Specialty (APS) company. Due to the unusually curved aspherics, a first attempt by another company resulted in optical elements largely out of specifications. APS efforts included several attempts at surfacing the aspheres spread over several weeks, and as of today, we are delighted (and relieved) to report that APS successfully surfaced the surfaces close to specifications and that all elements were successfully glued together at APS with DAO guidance.

The camera has been shipped to CFHT and should be installed in time for the first sky tests.

Commissioning Phase: Second Semester 1992

Three engineering runs on the sky are scheduled for June 18–21, July 20–23, and August 17–20. These will be used to establish the basic functionality of both the MOS and SIS in their imaging, long slit and multi-slit spectroscopy and Fabry-Perot spectroscopy modes, at the hardware and software levels, including the user interface. Two science qualification runs will take place on the sky October 13–15 and December 27–31. These will establish the performances of the instrument and be utilized to optimize the observing efficiency via a high level software interface.

We are considering offering the MOS-SIS on a shared risk basis to observers who were allocated observing time with the MARLIN and PALILA in 92 II. We will do so when we feel that the performances and observing efficiency of the MOS-SIS are at least equal to these of the MARLIN, and if it does not slow down the ongoing commissioning schedule. We strongly encourage observers with allocated MARLIN or PALILA time to keep in touch with the MOS-SIS team to get the latest scheduling information.

Following this phase we expect the MOS-SIS to be a fully commissioned instrument available for general use at the start of the first semester 1993.

Notice to Observers: We will welcome applications for the MOS-SIS for the first semester 1993. To help you prepare your observing proposals for September 1st, here is a summary of the basic functions and expected performances.

MOS

1. Wide field, 10x10 arcmin², imaging spectrograph (object selection for spectroscopy in 9.3x8.4 arcmin²), F/2.8 output.
2. Wavelength coverage: 3600Å to 1 μm.
3. Recommended CCD: LICK2 2048² 15 μm pixels. Sampling on the sky = 0.3 arcsec/pix. Other CFHT CCDs are also useable but do not cover the full field.
4. Imaging capabilities: set of 3 inches B, V, R, I filters, limited set of interference filters (check with staff)
5. Long slit spectroscopy: maximum length of slit = 9.3 arcmin, width at user's will (laser drilling with LAMA).
6. Multi-slit spectroscopy: user designed multi-slit aperture masks drilled with the LAMA. Residual r.m.s. drilling errors on slit edges = 2 μm. Current mask drilling time = 15 min (data transfer + checking) + 5 min (laser drilling) for 30 slits 15x1 arcsec. An order selection filter has been purchased for use with the V150 grism and selects a 4250–8500Å coverage. See Table I.

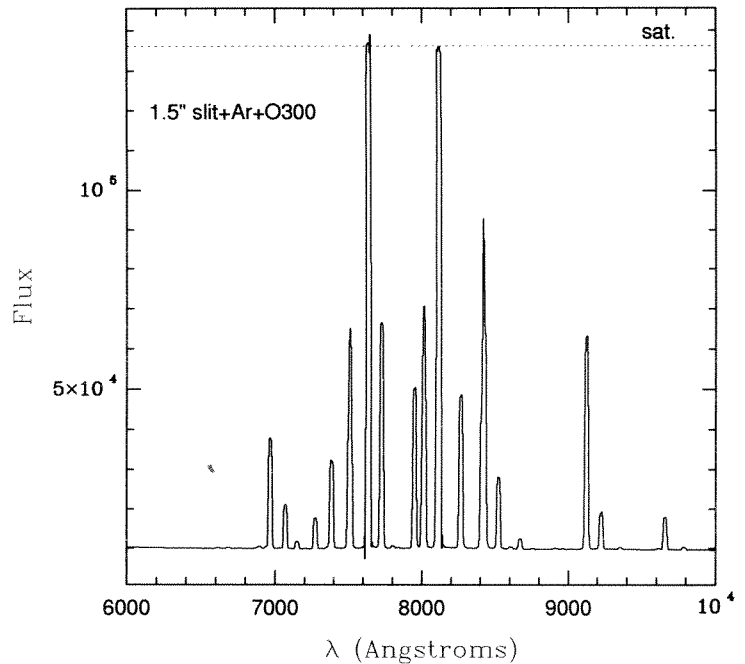


Figure 9

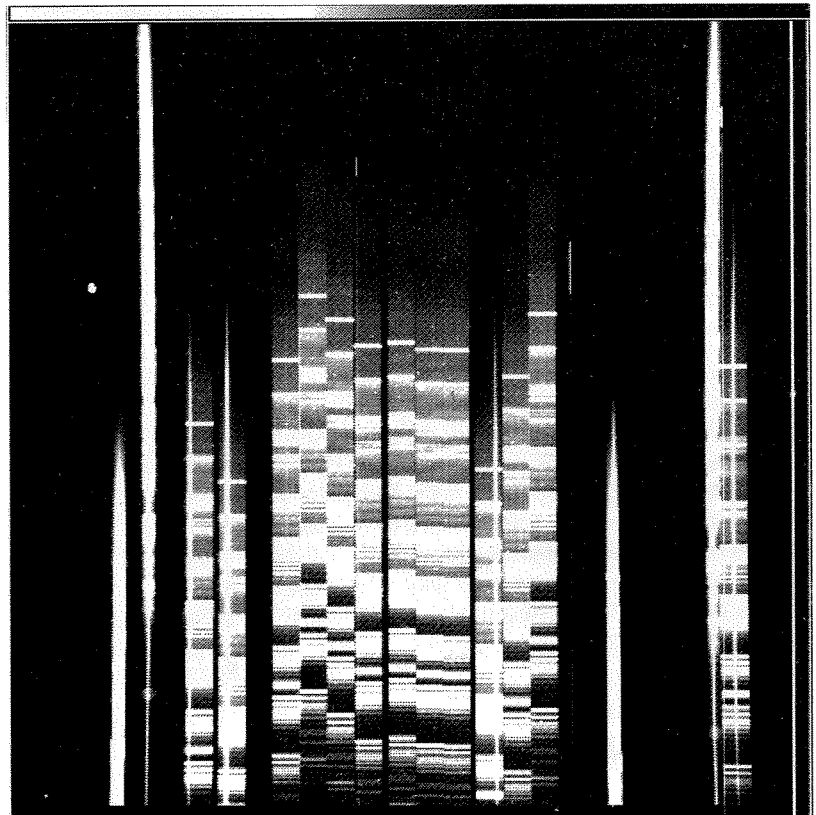


Figure 10

7. Fabry-Perot field spectroscopy: 10x10 arcmin² field, same etalons available as for PALILA. See PALILA User's Manual for spectral resolutions.
8. Limiting magnitude: Long slit/Multi-slit (values are from

MARLIN data, expect slightly better for MOS due to improved transmission) S/N=10 for an elliptical galaxy with R=21 and S/N=5 for I=21, in 1h with the V150 grism and a 1.5x13 arcsec slitlet.

SIS

1. Stabilized Imaging Spectrograph, F/10 output: image stabilization with an active mirror (similar to HRCAM) in a 3x3 arcmin² field. Both images and spectra can be obtained with improved image quality. From experience with HRCAM, we expect SIS to deliver a mean seeing of 0.55 arcsec, compared to 0.7 arcsec for unstabilized images.
2. Wavelength coverage: 3600Å to 1 μm.
3. Recommended CCD: LICK2 2048² 15 μm pixels. Sampling on the sky = 0.09 arcsec/pix. Other CFHT CCDs are also useable but do not cover the full field.
4. Imaging capabilities: set of B, V, R, I filters, limited set of interference filters (check with staff).

5. Long slit spectroscopy: maximum length of slit = 3 arcmin, width at user's will (laser drilling with LAMA). See Table I for list of grisms and spectral resolutions.
6. Multi-slit spectroscopy: user designed multi-slit aperture masks drilled with the LAMA as for MOS. See Table I.
7. Fabry-Perot field spectroscopy: 3x3 arcmin² field, same etalons available as for PALILA. Same spectral resolutions as for MOS.
8. Limiting magnitude: Long slit/ Multi-slit same as for MOS for spectrum integrated along object profile when in readout noise limited regime (takes 10 times longer to reach this than for MOS for 0.09 arcsec/pix sampling). S/N improvement is expected on compact sources from improved image quality. For objects with "constant" surface brightness, expect a S/N per pixel 3 times lower if using 0.09 arcsec/pix sampling compared to the MOS sampling with same spectral resolution.

A draft version of the MOS-SIS user's manual is being prepared and will be made available upon request to lefevre@uhcft. O. Le Fèvre

Table I: Wavelength coverage and Spectral Resolutions with MOS-SIS

(cf also Fig. 7, CFHT Information Bulletin #23). Careful: the spectral coverage strongly depends on your slit location.

GRISM	V150	R150	O300	R300	B400	B600	O600	U900
Central λ	5900	7400	5850	6900	5100	4950	5900	3950
Peak Transmission %	79	82	74	74	65	69	58	63
λ coverage (50% peak)	3700– 10000	4500– 10000	4000– 10000	4100– 10000	3600– 5100	3600– 7000	3750– 7000	3600– 5100
MOS Spectral Resol. (slit 1")	21	21	10.5	10.5	7.9	5.2	5.2	3.5
λ/pix	6.5	6.5	3.2	3.2	2.4	1.6	1.6	1.1
SIS Spectral Resol. (slit 0.5")	10.5	10.5	5.2	5.2	4.0	2.6	2.6	1.8
λ/pix	1.85	1.85	0.93	0.93	0.68	0.46	0.46	0.31

Calibration of New UV Optics for the Herzberg Spectrograph

During the nights of December 7 and 8 1990, a number of spectrophotometric standard stars were observed with the Herzberg Spectrograph when it was configured with Grating # 2 (41 Å/mm; λ_{blaze} ~3000 Å) and the recently commissioned UV optics. The detector was PHX1, and the observations were made with the slit opened to a width of 14 arcsec, to minimize loss of light due to seeing effects. The weather was photometric, so it was possible to calibrate the absolute performance of the spectrograph in this configuration. The results are summarized in Table 2, which lists the number of electrons per second per Angstrom expected from a 0th magnitude star at one airmass using a detector with 100 % quantum efficiency. These values are integrated over the entire stellar PSF.

T.J. Davidge

Table 2

λ	n/10 ⁶	λ	n/10 ⁶
3000	0.9	3600	17.3
3100	6.2	3700	17.1
3200	9.9	3800	16.2
3300	12.1	3900	16.8
3400	15.6	4000	18.3
3500	18.3	4100	19.2
		4200	18.1

New DAGE Guiding Camera on Herzberg

In the process of the implementation of the UV configuration for the Herzberg Spectrograph, a new DAGE camera was purchased to replace the aging ISOCON as the slit viewing camera. Since the detector size of the DAGE is only about a third of the ISOCON, a new 75 mm C-mount lens substituted the original lens to give the same field of view.

The new camera was tested during the engineering night of July 19, 1991. A few spectra of standard stars were taken to establish the transparency of the sky. The sensitivity of the slit/field viewing camera was then tested against known magnitude stars in the M92 globular cluster. The stars M92-IX-26 and M92-IX-100 of magnitudes 16.4 and 17.0 respectively, were easily seen on the video monitor in direct mode (no integration). This indicates that the DAGE is definitely as sensitive as the ISOCON was. Slight vignetting was seen on the edges of the field but this does not affect the usefulness of this camera. The DAGE will, from now on, be the only camera used with the Herzberg.

S. Béland

Note added in proof: The MOS-SIS has been successfully tested on the sky in June, 1992.