Period 33
AiC Report to the NOT Council and STC

45^{th} STC meeting, November 23, 2006
&
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Contents

1 Introduction

This report covers the operations of the Nordic Optical Telescope for period 33: 2006-04-01 to 2006-10-01.

2 Down Time

The down time statistics are based on individual fault reports. In Table 1 I give the general down time statistics for period 33.

A total of 95 fault reports were submitted, with an average time lost of 10 min per fault, for a total down time of 1.1% (1.3% on scheduled observing nights). Of these, 66 reported no time lost, 23 reported < 2 hrs lost, and 2 reported 2 or more hrs lost.

Table 1: Technical down time statistic period 33: 2006-04-01 to 2006-10-01

Night included	Time lost	Nights	Percentage[a]	Last period
All nights	935 min	183	1.1%	0.7%
Scheduled observing nights[b]	860 min	137	1.3%	0.6%
Technical nights	55 min	23	0.5%	1.2%
Service nights[c]	20 min	14	0.3%	0.3%
Visitor instruments	20 min	23	0.2%	0.6%

[a] Assuming an average of 8 hr per night
[b] Excluding technical nights and visitor instruments
[c] Excluding service nights with SOFIN

This compares to a down time of 0.7% over all nights (0.6% on scheduled observing nights) in period 32. For that period 83 faults reports were submitted with an average time lost of 9 min per fault. Of these, 60 reported no time lost, 21 reported < 2 hr lost, and 2 reported 2 or more hrs lost.

The most important thing to note is the continuing low down time. The down time is slightly higher than the all time low that was recorded in period 32, but the overall numbers for the fault reports (in particular the number of fault reports with significant amount of down time) are very similar indicating that this is a relatively stable situation.

2.1 Data base

With the integration of the End-Of-Night & End-Of-Run reports in our data-base system it is now possible to provide better defined data on down-time, specifically due to weather. The weather down-time still somewhat depends on the observers as the definition of bad weather is not always the same (e.g., thin clouds does not in general affect differential photometry or spectroscopy much, but makes absolutely calibrated observation in principle impossible), but it should give a good general indication of the time lost to weather.

With the new system we can also define the amount of dark time more precisely compared to the rough estimate of 8 hours per night assumed in Table 1. To partly include the time spend during twilight on regular observations with high-resolution spectroscopy or IR observations, or on flat fielding or standard star observations which are an integral part of normal optical imaging observations, we have defined the dark time taking nautical twilight (the Sun 12° below the horizon) instead of astronomical twilight (the Sun 18° below the horizon). This makes the nights somewhat longer but also means that problems, e.g., during flat fielding can generate down-time in contrast to the old definition, and a whole night lost will mean more observing time lost. Give the normal practice of observing we believe that this is a more correct definition.

For period 33 the total amount of available dark time was 1658hr 37m (99517 min), a total of 196hr 58m (11818 min, or 11.9%) was lost due to bad weather and a total of 15hr 35min (935 min, or 0.94%) was lost due to technical problems. Note also that if we 'correct' the total amount of dark time for the typical difference between nautical and astronomical twilight it turns out that assuming an average length for the night in the semester of 8 hr as assumed it Table 1 is actually fairly accurate and the corresponding percentage of down-time is 1.1% as given above.

The weather down-time statistics depend on input from the observers and is likely not extremely accurate, but the overall result is similar to the weather down-time reported for the WHT and INT telescopes over the same period. Also, a simple cross correlation with the weather reports shows that all nights with too high humidity or wind speed were reported as lost and likely there is little under-reporting of time lost.

In the future we intend to improve the data-base system further so we can provide the data in more details, e.g., we will have a monthly report created automatically.

2.2 Main problems

Below are listed those faults for which 2 or more hours were lost.

- **2006-04-30: Telescope offset**: 2 hr 00 m

  When doing large offsets with the telescope at high declination the guide star was lost in each case. This required the need of an very time consuming offset scheme which is included in the total down time reported. In the end it was found that there was an error in the software that calculate the telescope offsets which caused significant errors at high declination.

- **2006-09-18: Communication failure**: 3 hr 00 m

  In the middle of the night the communication was lost with the instrument. At first, resetting the communication (multiplexer) unit solved the problem before it failed completely. The problem turned-out to be with the power supply of the multiplexer which was replaced. We have a spare, but in the future this will also not be a problem as all the communication will go via Ethernet and we will no longer use a multiplexer.

2.3 General overview

In Table 2 the number of faults and total time lost as a function of the system and kind of fault is presented together with the overall numbers for the previous period (32). Note that at the start of period 34 'FIES' has been added as option and will enter in future down-time statistics.

Table 2: Down-time statistics for period 33[a]

Syst/Type	Soft		Elec		Optics		Mech		Others		Total		P32	
Telescope	9	02:45	10	01:40	0	–	2	01:05	1	00:00	22	05:30	10	04:45
Building	0	–	4	01:00	0	–	4	01:00	0	–	8	02:00	5	00:10
Computers	19	01:30	3	00:00	0	–	0	–	0	–	22	01:30	24	01:55
ALFOSC	13	02:50	4	03:15	2	00:00	2	00:00	2	00:05	23	06:10	14	02:05
MOSCA	2	00:00	1	00:00	1	00:00	0	–	0	–	4	00:00	4	00:00
NOTCam	4	00:05	1	00:00	0	–	0	–	0	–	5	00:05	11	01:00
StanCam	1	00:20	0	–	0	–	0	–	0	–	1	00:20	5	00:35
Others	2	00:00	3	00:00	1	00:00	3	00:00	1	00:00	10	00:00	10	02:05
Total	50	07:30	26	05:55	4	00:00	11	02:05	4	00:05	95	15:35	83	12:35
P32	47	02:35	15	03:15	0	–	14	05:45	7	01:00	83	12:35		

[a]For each system-type category the total number of faults and total time lost are given

3 Instrument use

Table 3 lists the number of scheduled observing nights and technical nights for each instrument. This covers all nights, including CAT, CCI and guaranteed time. In this table I have also included the number of observing runs, and the number of nights per observing run for each instrument.

Table 3: Instrument use

Instrument	No. of nights		No. of runs	Nights/run
	Scheduled	Technical		
ALFOSC	111.5	19	40[a]	2.8
NOTCam	12.5	2.5	3[b]	2.8
MOSCA	13	–	3	4.3
SOFIN	14	1.5	4	4.7
TurPol	7	–	2	3.5
PolCor	2	–	1[c]	2

[a] Excluding 10 service nights. The 9 half night runs for proposal 33-037 were counted as one

[b] Excluding 4 service nights

[c] As part of the Stockholm course in Observational Astrophysics

4 Comments recorded in End-Of-Night & End-Of-Run reports

As before, most comments written in the reports during period 33 were very positive, especially about the support from the staff.

Apart from comments related to problems that were also separately entered in the fault data base and comments about the weather there were only a few specific comments. There were some comments about how to focus when observing in polarimetric mode with ALFOSC, where we have improved the instructions. It was suggested to also have an audible alarm outside when breaking the light beam at the bottom of the stairs to warn people when they are leaving the telescope. This will be installed in the near future. For the TCS it was suggested to add the option to move the telescope in Alt and Az using the arrow keys as is already possible for RA and Dec. It was also suggested to expand the options to define permanent telescope pointing offsets by including a relative permanent offset, and to let the autoguider focus change automatically together with changes in the relative focus value ('foc-del') for different settings of the instrument optics (e.g., different filters). All these things are being considered, but at low priority. There were also two requests for a Sauna.

5 Operations

5.1 Additional services

5.1.1 Educational activities

We have had night time visits by a group of high school students and their teachers and from a group of amateur astronomer, both from Denmark. The groups were assisted by our own students and the visits were very successful and both groups actually prepared web pages, see

`http://www.odder-gym.dk/studietur2006lapalma/index.htm`

(only in Danish), and

`http://flastro.dk/lidemark/NOT/not_en.html`

(both English and Danish versions) about their experiences.

5.1.2 Service observing

A total of 14 nights of service observing were made, excluding the 14 SOFIN nights done in service mode by Dr. Ilya Ilyin. This also does not include a fairly extensive number of observations done for the various ToO and monitoring programs which were executed during technical nights. The service nights consisted of various more or less isolated observing nights spread throughout the semester.

5.1.3 'Fast-Track' Service Program

A total of 10 nights for the 'Fast-Track' service program were spread-out over period 33. During the semester a total of 5 proposals were accepted for execution, all of which requested observations with ALFOSC. There are now a total of 11 grade 1 proposals of which 8 have been completed and one has half been completed; there are 6 grade 2 proposal of which 5 have been completed, and; there are 5 grade 3 proposals of which 1 has been completed.

5.1.4 Publications

Direct links to ADS have been made for all papers in the NOT publication lists. This also provides easily extractable 'bib-codes', e.g., for statistical investigations.

5.2 Observing conditions

5.2.1 Weather station

A study has been made of the weather station to check if adequate spares exist and if it can be maintained properly, where it was concluded that an upgrade is needed. Comparing the options of upgrading the existing weather station or purchasing a new one it was found that the relative costs of the two options were similar. Considering that in the long run it should be easier to maintain a more modern installation, which is also more likely to be compatible with other new hardware and software, it was decided to purchase a new Vaisala weather station. The plan is to install the new station along with the old system, which allows for a directly calibration between the two systems making a changeover relatively simple, and where one system will serve as back-up for the other.

5.2.2 Dust meter

There has been some more discussion with the IAC about the dust meter, and it has become clear that they do not have the proper software to remotely extract the data from the meter. The responsible at the IAC is discussing this now with the company that delivered the system.

5.3 Building

5.3.1 Cooling system

The new cooling system has been working properly and the old cooling system has been dismantled. With the increased cooling power we are now capable of cooling the dome much better. During the winter period we will see if there is any improvement or fine-tuning needed. We also plan to install a new ventilation system for the electronics and machine room to further limit problems when there is a general power cut.

5.3.2 UPS batteries

The batteries of the UPS that bridge the gap between any power cut and the start of our generator were starting to fail at an increased rate, indicating that they were getting towards the end of their life-time. A new set of batteries have been purchased, and they were installed recently. With the new set we have a somewhat increased capacity which allow us to bridge a large gap if there is a problem with the generator if the main power is cut. The new system is expected to last for a decade.

5.3.3 Drive System

The telescope building drive system is now 20 years old, and though has never produced any serious problems we believe it is time to upgrade it to a new system as it will be increasing difficult to obtain proper spares if any failure might occur. A complete package has been identified that will replace the entire drive system including the four motors, amplifiers, servo control electronics and cabling, to modern off-the-shelf components. It will not be simple to do this swap and will require down time of the telescope, especially since the motors need changing but also to optimize the system.

5.3.4 Rain sensor

We still occasionally get spurious alarms from the rain sensor. The plan is to review and possibly improve the conditions under which the rain sensor is activated and the way the TCS uses this information such that spurious alarms are limited.

5.4 Telescope

5.4.1 New TCS

The full system 'burn-in' test to verify the long term reliability of the hardware was continued at the start of the semester without any glitches. A full test of the new TCS on the telescope was made in May and was fairly successful in that the system basically worked from the moment it was started. There were a few mostly minor problems which had to be corrected, and in the end there were two issues which prevented the system to be taken in use directly. One was some intermittent problems with the rotator stopping with tracking which was found to be due to some noise on a communication line. The second was a problem with the electronic communication with the top unit, where both the unit and its spare failed in a relatively short time. For this a new, commercially available unit was found and replacements were ordered.

The new system was finally installed in August. As expected a few small problems resulting in a small amount of down-time have occurred, and we might expect (at an ever decreasing rate) a few more in the coming semesters.

At the start of the new semester the old TCS has been dismantled and the installation of the new TCS has been tidied-up. The old system has been carefully packed and stored in the machine room, and it the worst case we can still return to the old system in a matter of 1 or 2 days.

In the coming months the documentation will be completed and the logging system of the TCS will be further developed. Specifically, we will expand the options for logging and an interface will be provided to view and analyze the logs.

5.4.2 Telescope header information

There is a problem with the information from the telescope that goes to the FITS headers. When the load on the TCS is high this info sometimes takes too long to arrival and the fits files is stored without this information. This happens very sporadically, typically when many short images are taken which is why this affects NOTCam data relatively frequently.

5.4.3 Mirror compressors

A new compressor has arrived for the mirror support system as a spare for the one that was installed during period 32. The system has been modified such that both compressors are connected permanently and switching from one to the other is a matter of opening and closing some valves, reducing any down time in the case of problems to a minimum.

5.4.4 Counter weight motor

During some tests the counter weight motor was damaged. A new motor has been purchased which has been mounted and tested. The reason for the original problem was found to be a mistake in the original installation of the system. This requires some rewiring, and in the mean time the system is operated manually.

5.4.5 Amplifiers

The telescope altitude and azimuth amplifiers are very old and four have already been sent for repair with the cause of the faults typically been associated with the age of the units, approximately 20 years. A search for alternative amplifiers has been done and two options are available: buy some commercial units that are not direct replacements, either mechanically or electrically, or; get exact customized replacement built. An initial quote for the customized units was obtained but found to be much higher that the commercial alternatives, a more reasonable offer for the customized amplifiers has been solicited.

5.4.6 Remote observing

The new TCS in principle allows the telescope to be operated remotely from any terminal. This has been tested on a limit scale from a terminal in the control room itself, but a proper test with truly remote observing should be made.

5.4.7 Wavefront sensing

Due to the change to the new TCS little progress has been made. Some tests will be needed to determine the proper calibration between the test results and the applied corrections in the TCS. When the calibration is made the active optics corrections will have to be implemented in the new TCS.

5.4.8 Mirror cleaning

The mirror has been washed and has been CO_2 cleaned a few times. In one case, some bird droppings had to be removed. Although the CO_2 cleaning provides some improvement, the washing seems to work much better. However, washing the mirror is a more complex operation while it is also more dependent on the weather and in the long run we intend to make this easier and less work intensive such that little time and planning is needed.

It has been found that the overall efficiency of the secondary mirror has decrease significantly by $\sim$1.5-2% with respect to a test mirror and we are considering to aluminize this mirror in the coming summer. However, the long-term variation in reflectivity does not show a well-defined trend and we plan to do a washing of M2 and look at the result before deciding about a possible aluminisation.

5.4.9 Tracking

In the past few months there were a few, but increasing number of reports about elongated stars in imaging data. This was investigated in detail and it is was found to be a problem with the corrections for the periodic errors in the drive system of the telescope. Specifically, the periodic error in altitude varies as a function of altitude which is corrected with the help of a look-up table. This table is constantly updated as a function of the autoguider corrections applied at a given position of the telescope. It turned out that the values in this look-up table showed some relatively large, sudden variations in altitude which effectively caused the telescope to make occasional jumps while tracking, which mostly effected data when the telescope was predominantly tracking in altitude. Switching off this look-up table has corrected this, and normal round star images are now obtained independent of the position of the telescope. However, it does mean that the periodic errors in the telescope drive are now not properly corrected which means that even for relatively short exposure times one needs to use the autoguider. It is also not really clear why the data in the look-up table contained such deviating values (which were apparently increasing in number with time) and we need to define a proper way to include these corrections again.

5.4.10 Pointing

Contradicting reports have been received about the quality of the pointing for the targets and the guide star. In general, the pointing model for the telescope are made with the guide camera in the rotator, and we plan to make a pointing test with one of the instruments instead to look for possible differences. With the planned automatic guide star detection and centering system we would expect the effective pointing accuracy (only depending on any distortions as a function of position for the guide camera and the accuracy in the position of the guide stars) to improve a lot, largely independent of the intrinsic accuracy of the pointing model used.

5.4.11 Adapter

The cabling and plugs for the power supply around the adapter were reviewed, specifically to reduce the amount of cabling and connect power cords directly to the supply without the need for plugs. Parts for the new wiring have arrived and this work is expected to be finish in the coming months.

5.4.12 Autoguider

We plan to develop and implement an automatic guide star detection and centering system which should improve efficiency of observing and allow a more automated way of observing. It should also improve the capabilities for remote observing with the telescope.

The external USB disk holding the guide star server catalog has been replaced with an external raid box, holding two disks in a mirror configuration. We will therefore always have a working guide star server in case of disk failures.

5.4.13 Control and machine room

With the dismantling of the old TCS and the old cooling system there is more room available in the control room and the machine room. The machine room has already been remodeled, and a large part of the control room has been cleared, mostly by moving things to the machine room. The final set-up of the control room will depend on the precise configuration of terminals we will need for the permanent operation of the TCS, the standby instruments (FIES and StanCam), and the instrument in use at the Cassegrain focus (see below).

5.4.14 Web-cams

The general plan is to install a number of web-cams in the telescope building. This is partly to assist remote working with the telescope (either for tests or truly remote observing) where we want to install some web-cams in the dome, which is mostly a safety issue. However, as we generally have only one person at the telescope at night, who might not be an expert for any problem that might occur, the idea is also to have web-cams in the electronics room, machine room and control room to assist in remote technical support.

5.5 Student teaching

A web-page was set-up which describes the things that a new student should learn. This includes both general operational tasks as well as safety issues.

5.6 Photometric zero-points

A general photometric zero-point data base will be set-up. This will contain all photometric zero-point measurements in the optical and near infra-red taken with the different instruments as part of the calibration plans. This data base will provide a way to better monitor the performance of the telescope and can be used by astronomers in the analysis of their data.

5.7 ALFOSC

5.7.1 Detector

Since the pressure sensor was disconnected from the controller the average noise is at a level comparable to that measured in the lab. However, some different noise has now been reported that has the form of adjacent bright and dark pixels with an interval of approximately every 176 pixels along the readout direction, and can clearly be seen in bias frames. May tests have been done to try and locate the source of this noise but to-date it still persists. It was noted that the cryostat is a relatively old design and the pressure sensor itself is attached to it with an all metal connection. The current idea is that the sensor still picks-up noise that is conducted to the cryostat. The next time ALFOSC will be off the telescope this will be tested by simply removing the part containing the sensor. If this improves things, the sensor could be installed again using a partly plastic connection.

In principle, the remaining problems with using the CCD control card for multi-window photometry program with the normal BIAS CCD control program have been solved. Unfortunately, the main issue seems now to be with using the new data acquisition computer (see below).

5.7.2 Data acquisition

A new, non-IDL version of the instrument user interface for ALFOSC has been developed. This was tested together with the a new BIAS program and the NOT2MEF program (the software that changes data formats into MEF and writes additional FITS headers) on the new data acquisition computer. There were a number of small problems which have been corrected but still should be tested.

Also the multi-window photometry program using its specific CCD control card was tested with the help of Roy Østensen. At first things worked fine, but at a later attempt there were suddenly many problems. This is currently being looked at and needs to be sorted-out before we can fully switch to the new data acquisition computer.

After the switch to the new data acquisition computer, the next step will be the development of the sequencer system for ALFOSC. Many of the basic parts developed for the FIES sequencer can be used, but ALFOSC is a more complex instrument which allows many different configurations and we intend to make a basic version that is slowly expanded.

5.7.3 Spectroscopy

A new, non-IDL version, of the software to align slits and grisms was developed and implemented.

New high-quality slits have been purchased and installed. Some of the old bad ones were discarded and replaced. We now have full sets of horizontal, vertical and offset-vertical slits. The vertical slits allow high time-resolution spectroscopy and tuning of the sampled wavelength region. The vertical 0.5 arcsec slit has been scratched and will be replaced.

ALFOSC spectroscopic quality-control routines were moved to the dedicated reduction computer and grisms #16 and #17 have been added to the exposure time calculator.

Some intermittent problems have been reported with the He calibration lamp which we now believe is due to a problem in the electronics, not the new lamps and starters that were suspected first. A solution is being worked on.

With the new camera there seems to be a increase in the amount of ghosts seen when observing bright sources. This is likely related to the poor efficiency of the coating of the camera in the red, i.e., the large amount of light that is reflected. The amount of ghosting for the different grisms will be mapped.

5.7.4 Polarimetry

We have looked at the suggestion from an astronomer from the Instituto de Astrofísica de Andalucía' of using a Wedged double Wollaston (WeDoWo) to do polarimetry with ALFOSC. Some tests were made with a WeDoWo normally being normally used in an ALFOSC clone called AFOSC at the Asiago observatory in Italy.

The WeDoWo mode was compared with the already existing FAPOL device, and we have also considered a possible upgrade of the existing ALFOSC/FAPOL device which consists of replacing the old calcite plates with a simple Wollaston prism to be put in the ALFOSC parallel beam. In practice, this means the filter wheel since having it in the grism wheel would be unpractical for spectro-polarimetry.

Our basic conclusion is that in general the suggested WeDoWo mode for ALFOSC is not the best polarimetry option, taking into account both accuracy, sensitivity and flexibility (spectro-polarimetry, circular polarimetry, etc.). We believe that an upgrade of the ALFOSC polarimetric mode in the sense exchanging the two old calcite plates (which have low transmittance) in order to gain higher sensitivity, larger FOV and better image quality is in principle the best option. However, in some specific cases of targets with relatively high time-variability in polarization the WeDoWo mode might be better and one could consider having both modes available.

5.7.5 Imaging

One of the new students is now the local contact for the imaging reduction pipeline for ALFOSC that is being developed in Copenhagen. Together with our software staff the student will be responsible for the installation and testing of the pipeline and provide documentation for its use and maintenance. There are still many questions about the requirements for the system, such as data format and naming conventions, the calibration data needed, the hardware needed, the way it will be implemented, the final data products, etc, and the main bottleneck is still the very limited amount of response from Copenhagen.

5.7.6 Focus measurements

A script was installed which saves relevant info (current focus, filter name, zenith distance, telescope temperature, etc) to a data base every time the focus is determined. Up to now we already have close to 1300 individual measurements (where typically a few measurements are made each time the focus is determined) and we will start to analyze the data in the near future.

5.7.7 Seeing measurements

Originally we had intended to develop a similar script used for the focus measurements for seeing measurements but the current plan is to simply analyze all the imaging data and determine the seeing from some weighted/filtered average of the stars detected in an image. The results will be stored in a similar way as the focusing results. The seeing measurements should help us to maintain and further improve the image quality. In principle the same system will be used for all optical imaging data.

5.7.8 Filters

Two new narrow-band filters purchased by the University of Aarhus have just arrived. These filters are 4 nm wide and have central wavelengths of 515.6 and 550.7 nm, respectively, and are custom made to detect Lyα emission at specific redshifts. In the near future, all the filter information will be moved to a proper data-base system.

5.8 NOTCam

5.8.1 Detector

After having performed well since its installation the science array started to malfunction early in the semester when it was found with one of its four quadrants dead. Shortly before that NOTCam had warmed-up, after which it was pumped and re-cooled according to normal procedures. The remaining 3 quadrants performed well and observations were performed with modified dither scripts to keep the targets always inside the three working quadrants. No observing time was lost. After this NOTCam was warmed up and opened for investigation. A number of tests of the various components gave no obvious results and in the warm state none of the quadrants worked well.

Another pump and cool cycle showed that all quadrants were malfunctioning at operating temperature, and it was decided to mount back the engineering grade array and send the science array to Rockwell for further inspection. The Rockwell experts found cracks in the multiplexer in two of the quadrants and some gold bonds lifted. It is not entirely clear what caused the cracks, but neither manufacture errors nor the long-time storage in humid conditions (in the bank deposit box) were excluded by Rockwell.

The Hawaii-I arrays are no longer in production, but Rockwell offered us one of 4 available science grade arrays at a reduced price. We selected the best one according to lab measurements of QE and noise performance. The new array arrived in the beginning of Oct-06 and is currently stored safely and in very dry conditions. It will be mounted in NOTCam after an upgrade of the electronics (see below).

The engineering grade array continues to perform well, but with its limitations in sensitivity, flatness and linearity performance compared to the science array.

5.8.2 Dark current

We are waiting for a modification of the NOTCam electronics wiring which should cure the problem with the high and variable dark current. As we want to limit as much as possible any danger to the science array we plan to install the new array only after the modification of the electronics has been installed (which includes take out the array and reinstalling it) and tested (with the current engineering array). Preben Norregaard in Copenhagen is currently preparing the modification.

5.8.3 Motor Controllers

During the visit of Jens Klougart to the NOT earlier this year he passed on details on how the NOTCam motor controller card software worked. Subsequently, we modified the code to automatically detects when it passes (or not) the init-switch, to detect possible problems.

A test was done with the new code while the instrument was open, but it failed. The reason for that is now believed to be understood and next time NOTCam is opened a revised code will be tested.

5.8.4 Data acquisition

The NOTCam BIAS data acquisition software was upgraded and documented by Jens Klougart. The upgrade includes a new clean-array command which wipes the array with one reset and one read and takes 3.5 sec to perform. The clean-array command is very useful in the case of unavoidable saturations which may otherwise produce persistent effects. It will also be included as an option in the observing script generator.

Since the introduction of the MEF data format all images are flipped in X-axis to conform to fits standard. This caused some confusion for observers, as well as in some of the post-processing scripts.

5.8.5 Imaging calibration plan

A first version of the NOTCam imaging calibration plan was prepare and can be found at:

`http://www.not.iac.es/instruments/notcam/calibrationplan.ps`

This will be implemented and in the near future we will make a review of how it works in practice.

5.8.6 Spectroscopy

A new 'Spectroscopy with NOTCAM' web page was made in the style of the ALFOSC main page. See

`http://www.not.iac.es/instruments/notcam/spectroscopy/`

An option to estimate signal-to-noise for spectroscopy with NOTCAM was added to the exposure time calculator. A 'quick-look' postprocessing option will be added for spectroscopy and an observing guide will be prepared for NOTCAM spectroscopy.

5.8.7 Polarimetry

The cost and installation of a Wedged Double Wollaston for polarimetry with NOTCam should be studied.

5.8.8 Focus measurements

A similar script to the one used for ALFOSC (see above) was installed which saves relevant info (current focus, filter name, zenith distance, telescope temperature, etc) to a data base every time the focus is determined. As NOTCam is not mounted often we have only ~130 measurements up to now.

5.8.9 Masks

Four masks are installed in the stop wheel that allows to reduce the throughput. For very bright targets one can use masks with a 9mm, 7mm, 6mm, or 5mm opening rather than the default 15mm one to get a reduced throughput of 38%, 22%, 15%, or 10%, respectively. Tests should be made with the masks to see if there are any optical effects.

5.8.10 Filters

The use of two narrow-band filters in the beam combined to minimize the flux for observations of very bright targets was tested on Vega for optical effects. No ghosts were found. This test was specifically made for planned observations of Mercury. Also, filters were rearranged inside the filter wheels to enable some additional filter combinations.

5.8.11 Focus pyramid

The focus pyramid was re-calibrated for both the HR and the WF camera. Only minor adjustments to previous values were found. The earlier mentioned inconsistencies between manual focusing and the focus pyramid may be related to variations in seeing which makes it hard to determine the correct value manually. It is currently recommended to focus with the pyramid in the Ks band and then use the pre-determined offsets for the other filters. The filter focus offsets were recently re-determined to a high accuracy in very good seeing.

5.8.12 PTR

Two units in the PTR should be regularly exchanged as part of the maintenance. This is the oil absorber in the compressor and a rotary valve. Both were ordered from Kelvin International/USA in May and arrived from Iwatani/Japan in August. We have exchanged the oil absorber, but the rotary valve model sent us was the wrong type. A correct type rotary valve arrived recently, but did this one did not work properly. An 'sample' unit has been received from the manufacturer to act as spare until a replacement unit arrives. The old unit currently in use has now run more than the double the recommended hours.

5.8.13 Holding time

The modified LN_2 filling procedure has solved the vacuum loss problems experienced when filling and spilling LN_2. Also, the procedures of baking and mounting the getter have been improved, such that the pumping can start with a very hot getter inside the cryostat. The latest closing showed very good vacuum results during the pumping, but an unfortunate event of total loss of power turned off the vacuum pump and caused a sudden loss of vacuum which rapidly recovered probably at the cost of saturating the getter. The conclusive test of the cryostat behavior when stored with PTR cooling only is therefore still pending the next opening of NOTCam.

5.8.14 Shutter

The shutter accuracy has been calibrated, and a shutter delay of 0.07 sec was found. The calibration data was re-obtained several times as there were difficulties with jumps in the dark levels and possible variations in the calibration lamp. The estimated shutter delay will be implemented in the NOTCam BIAS. The accuracy should then be 1% down to 0.6 sec exposure time. Shorter exposure times are not reliable. Currently, the accuracy is ~3% for exposure times of 2 sec and ~1% for exposure times greater than 3 sec. In general, exposure times are greater than 3.6 sec.

5.8.15 Calibration lamp

A permanent set-up with a stable dome illumination (not too bright) for NOTCam tests will be arranged. The lamp will be operated from the control room.

5.8.16 Overheads

The overheads should be remeasured. Improvements in dither overheads were found with the new TCS.

5.9 MOSCA

5.9.1 Detector

Early in the semester one of the MOSCA CCDs (CCD #19) produced an intermittent fault, where on the telescope it would only work at certain rotator angle positions. After a full check of the controller and all external cables it was decided to open the cryostat to make a inspection of a suspected wiring fault to the detector, but nothing was found. After mounting the instrument back on the telescope to check if the fault persisted it was found that CCD #19 worked but now CCD #15 did not work at all. Investigating this on La Palma and later in Copenhagen, it was found that both amplifiers on CCD #15 did not work and the CCD is effectively dead.

Fortunately, there is a possible direct solution to this by using the old ALFOSC CCD #7 as replacement. We already have permission from the 'Instituto de Astrofísica de Andalucía', who are the owners of this CCD, to use it and Anton Nurop Sørensen has agreed to replace the CCD in the near future and we hope to have the instrument back at the telescope in the second half of December. There are two observing runs scheduled with MOSCA before that time, but both these programs can basically just as well be executed with ALFOSC and the PIs have agreed to the proposed change of instrument.

5.10 StanCam

5.10.1 Data acquisition

StanCam has now been commissioned with a new BIAS on the new data acquisition computer. The new BIAS uses 'DS9' instead of 'SAOIMAGE' and provides updated FITS headers and the postprocessing system now provides proper fits extension data format.

5.10.2 Efficiency

New zero-points have been defined for StanCam with the new, aluminized pick-off mirror and StanCam has now also been added as option to the exposure time calculator.

5.10.3 Filter

Since the last extensive check of the filter mechanism no more problems have occurred.

A SDSS-z filter has been was added to the permanent StanCam filter set which now contains $UBVRIzH\alpha$. Also, a clear (WG280) filter was installed to allow imaging the FIES fiber head with either a specific filter or in 'white light' (using the 'clear' filter) which otherwise would be impossible as this would require a different focus distance.

5.11 TurPol

There were some hardware problems encountered with setting-up a spare MSDOS computer for TurPol. As there is no TurPol run at least until March next year this has been given relatively low priority and is delayed until the end of this year.

5.12 FIES

5.12.1 Building

An analysis of the temperature from the FIES building has shown that during the hottest days the temperature inside the building is actually affected. Some test ventilation system was installed in the front room, but a larger fan will be needed before next summer. However, for days with 'calima' (Sahara dust) we might not want to use this ventilation and should consider an air-conditioning system for the front room. For a more accurate temperature control we need a better sensor system.

The stability of the spectrograph (as a function of temperature) is measured from shifts of the Echellogram. This system will be automated and a data base will be set-up to record and analyze the results.

5.12.2 Instrument

The re-coated adapter pick-off and FIES mirrors were installed and aligned, the Echelle grating was aligned and a new shutter was installed and tested.

The new fiber unit was installed and aligned. Both the low- (R$\sim$25000) and medium-resolution (R$\sim$45000) fibers have a good throughput of 8–9%, but the high-resolution (R$\sim$65000) fiber has only an efficiency of $\sim$2.5% which is a factor 2 lower than expected. FIES has now been incorporated in the exposure time calculator.

Various on-sky throughput measurements were done with different wavelength settings, and ranges. A final wavelength range of 364–726 nm was selected. More details can be found at

`http://www.not.iac.es/instruments/fies/fies-comm.html`

This page contains the latest on commissioning results.

Plans have been made to make a new fiber bundle with a better high-resolution fiber, but this is only expected to arrive in period 35. After its installation the current fiber bundle would act as spare.

As further improvements an exposure meter inside the spectrograph is being considered to allow as much as possible good data to be obtained under different weather conditions. For high-accuracy studies of radial velocity variation also an iodine cell is considered, but it should be checked if the required accuracy can also be obtained taking simultaneous ThAr spectra with the source spectra.

5.12.3 Target acquisition

One major issue in the use of FIES is the target acquisition which is done with the help of StanCam. An accurate positioning of the adapter pick-off mirror was made using the TCS needed to properly position the target on the fibers. A new clear filter was mounted in StanCam, for FIES target acquisition. This required the fiber head to be refocused on StanCam. The reason for installing the filter is that the refocusing currently needs to be done manually with the Cassegrain instrument dismounted, and in this way either a filter or 'white-light' can be selected without the need to refocus. However, the focus will likely vary depending on things like the temperature which will still cause specifically the fiber entrance hole to be fuzzy and hard to see (in general, the fiber entrance holes are hard to see if the night sky is dark). Also, the fiber-aperture positions were measured on StanCam. These are needed for the software used to position stars in the fibers, and new 'fiber viewing' script were made for the different fibers.

Two main things to consider are a system to allow remote focusing of the fiber head on StanCam and to further streamline/automate the whole target acquisition system.

5.12.4 Data acquisition

There is now full control in sequencer mode of the calibration units in the adapter and in the FIES building, as well as full control of the instrument and the target acquisition mechanisms. User scripts will be made for the sequencer to streamline ease of use, e.g., a script to make arc spectra which includes moving the calibration arm, switching on the calibration lamp, etc.

Also, a new observing log program has been developed for the FIES data and a postprocessing environment has been set-up.

5.12.5 FIESTA

A new instrument status display program FIESTA was developed and installed which shows the instrument configuration, including the fiber selector position and calibration lamp status, and tracing the light path in a graphically way which gives a good overview of the configuration.

5.12.6 Calibration units

For the calibration unit in the adapter a new bifurcated fiber and new optics were installed which removes the problem with interference fringes that occurred with the old system. The positions of the arm of the calibration unit were calibrated.

Filters were installed in both the calibration units in the adapter and in the instrument to suppress the abundant red light from halogen and ThAr lamps. The power of the halogen lamps was adjusted.

5.12.7 Reduction software

The FIES-tool reduction pipeline was installed and the software is now available for users for reduction 'at home' and can be downloaded from:

`http://www.not.iac.es/instruments/fies/fiestool/FIEStool.html`

An automated calibration scheme will be set-up for the pipeline. The software will also be improved regarding wavelength solution, allowing for multiple ThAr frames to be used automatically.

5.12.8 Detector

First on-sky tests were made with skew readout mode which allows to 'select' the resolution. The CCD control board which is needed for this mode of operation is currently installed.

An automated detector quality control system similar to that for the other detectors will be installed and the associated web pages will be made.

5.12.9 ADC

The ADC has been prepared in Aarhus and will be installed and tested in the coming period.

5.12.10 Spectro-polarimetry

The issue of doing spectro-polarimetry with FIES is rather unclear. N. Piskunov reports that there is actual a polarimeter build and qualified for the use in collimated beam. However, there is no real space in the rotator to install a collimator and it is not clear if it works in a convergent beam. Also, it is not clear if any other solutions are possible.

5.12.11 Documentation

New observing manuals have been provide for observing with FIES directly

`http://www.not.iac.es/instruments/fies/fies-obs.html`

or in sequencer mode

`http://www.not.iac.es/instruments/fies/fies-seq-obs-new.html`

FIES has now also been included in the general observing 'cookbook' and web pages have been prepared for the staff and for technical monitoring tasks.

5.12.12 Standby requirements

Having FIES now available permanently actually raise some practically issues. In general, there are two main issues:

- the data acquisition system needs to be available at all times. This actually implies that both the system for FIES and StanCam are running as the latter is needed for the target acquisition. These systems need their own terminals to operate the data acquisition systems. Independent if FIES is used or not, there will be an instrument mounted at Cassegrain with its own data acquisition system. A general set-up for this will be defined and implemented
- as FIES should be at all times available for ToO and/or monitoring programs this requires proper instructions for the night time observers. As it is impractical and inefficient having to instruct all observers, the system will be automated as much as possible and the instructions on the web will be improved where necessary. This is also an issue that should be discussed with the PIs of those programs requesting ToO or monitoring observations with FIES

5.13 SOFIN

5.13.1 Data acquisition

Work will be concentrated on improving the new control program, and on developing pipeline data reduction for the spectro-polarimetry data.

Discussion are also under way to incorporate SOFIN data in our observing log and archive system.

5.14 PolCor

An experimental polarimeter including a corona-graph (PolCor) developed by Göran Olofsson from Stockholm observatory was installed on the telescope during 2 nights as part of the Stockholm course in May and during 2 technical nights in October.

During the technical nights a limited evaluation was made of its possible suitability as a StanCam replacement. The data still needs to be fully analyzed but a report with a first technical assessment has been prepared. In general there are still many small issues concerning the precise operations of the camera, and clearly a proper data acquisition needs to be written. There is the usual spurious (clock induced) charge problem from the L3CCD, and a better understanding of the operation of the camera is required before a clear conclusion can be made of its usefulness.

5.15 Detectors

There is an issue of maintaining vacuum in the StanCam and FIES cryostats that are cooled with a cryotiger. As these are stand-by instruments, one would like to avoid having sudden problems with the vacuum, but at the same time one wants to have the instruments available at all times. Basically one wants to define a period within which we are fairly sure no loss of vacuum will occur and schedule the pumping of the cryostat when most convenient (e.g., during an ALFOSC run for StanCam or a SOFIN run for FIES, or maybe during a time of year when the days are sufficiently long to do the whole operations before the start of the next night).

5.16 Observing scripts

The NOT observing script generator has been improved to include more detailed checks of the parameters entered in the scripts to avoid incorrect user input. There are now separate versions for different instruments (ALFOSC, NOTCam, etc.) and observing modes (imaging, spectroscopy). The script will be further developed to include windowing and binning (where appropriate). In the long run this will be integrated in sequencer scripts generators.

5.17 Computers and software

5.17.1 Network

As part of the common service, the IAC has promised to install wireless access to the network in all the rooms in the residencia in November.

A further increase in the bandwidth of the network link from the observatory to Tenerife are being discussed. However, this does not include a connection to our sea-level office and possible options should be investigated.

5.17.2 Telephone system

A new telephone system was installed in the sea-level offices. This is a VoIP system (voice over IP), which in principle allows phoning using the computer network.

5.17.3 DVD Jukebox

All the hardware has been tested on the mountain and everything now works properly. Some software has been written as an interface to let the users schedule the burning DVDs but this needs to be improved and the software needs to be extended to allow the scheduling of automatic burning (i.e., every night's data). This will be implemented in the near future.

5.17.4 Web server & data-base server

Some hardware problems were encountered setting-up the new web server which has delayed its implementation. In the mean time we have started work on the new data-base server, where we are waiting for some new hardware, and the plan is to combine the work and do the changeover at the same time. At the same time parts of the program of the telescope Thermal Monitoring System (TMS) related to the data-base will be optimized.

5.17.5 Firewalls

A new firewall was setup for both the ORM and SLO, also taking into account the new high speed connection to the network. Due to our network set-up the current system is somewhat complicated and we are thinking about looking for a simpler solution in the future.

5.17.6 Spam filter

A new, more modern spam filter has been installed which works relatively well but continuous upgrades are needed.

5.17.7 General computer system

A solution for the backup system has been defined and the hardware is being purchased. Also, some new desktop machines will be bought as part of the gradual hardware upgrade and to act as a small pool of 'spare' computers' for the gradual influx of new students.

5.17.8 Standard 'health' checks

To avoid problems the plan is to define some standard procedures/checklists that should be done after any work on a system is made (e.g., day time test or maintenance) to make sure that everything works (again).