Period 34
AiC Report to the NOT Council and STC

46^{th} STC meeting, April 26, 2007
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Contents

1 Introduction

This report covers the operations of the Nordic Optical Telescope for period 34: 2006-10-01 to 2007-04-01.

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 34.

A total of 117 fault reports were submitted, with an average time lost of 7 min per fault, for a total down time of 0.7% (0.8% on scheduled observing nights). Of these, 82 reported no time lost, 35 reported < 2 hrs lost, and none reported 2 or more hrs lost.

Table 1: Technical down time statistic period 34: 2006-10-01 to 2007-04-01

Night included	Time lost	Nights	Percentage[a]	Last period
All nights	850 min	182	0.7%	0.9%
Scheduled observing nights[b]	800 min	142.5	0.8%	1.2%
Technical nights	50 min	29.5	0.3%	0.4%
Service nights[c]	50 min	11.5	0.6%	0.3%
Visitor instruments	0 min	10	0.0%	0.2%

[a] Taking the average length of time within nautical twilight. Exact numbers for each night are used when looking at 'All nights'
[b] Excluding technical nights and visitor instruments
[c] Excluding service nights with SOFIN

This compares to a down time of 0.9% over all nights (1.2% on scheduled observing nights) in period 33. For that period 95 faults reports were submitted with an average time lost of 10 min per fault. Of these, 66 reported no time lost, 23 reported < 2 hr lost, and 2 reported 2 or more hrs lost.

The most important thing to note is the continuing low down time, with the down time basically the same as in the last two periods. Compared to period 33 there were less problems causing a large ($\geq$2 hr) amount of down time, but there were slightly more faults causing small amount ($<$2 hr) down time.

2.1 Weather

With the integration of End-Of-Night & End-Of-Run reports in our data base system we can now also define our own weather statistics. For period 34 a total of 752hr 3min was lost due to bad weather which corresponds to 36.9% of all the dark time as compared to 11.9% of all dark time in period 33. The total amount of clear dark time was 1284hr 53min in period 34 as compared to 1461hr 39min in period 33.

2.2 Main problems

During period 34 there was no single fault which caused 2 or more hours down time. The one think to note are the relatively many small problems due to the various changes (new TCS, new data acquisition computers, new data acquisition programs, etc) that were implemented recently.

The one thing that caused the larger number of faults and down time is a problem with the communication between the data acquisition programs and the new TCS. This is a fundamental problem with the operating system in the new TCS which can not be simply corrected. For most problems a workaround has been made and work on a permanent solution using a different way of communicating is being worked on.

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 (33). Note that at the start of period 34 'FIES' has been added as option.

Table 2: Down-time statistics for period 34[a]

Syst/Type	Soft		Elec		Optics		Mech		Others		Total		P33	
Telescope	20	01:55	3	00:05	0	–	2	00:00	4	01:10	29	03:10	22	05:30
Building	0	–	3	00:00	0	–	1	00:00	1	00:00	5	00:00	8	02:00
Computers	14	03:55	2	00:00	0	–	0	–	2	00:00	18	03:55	22	01:30
ALFOSC	15	02:45	3	00:25	1	00:00	3	00:00	2	00:30	24	03:40	23	06:10
MOSCA	2	00:15	1	00:15	0	–	2	00:30	0	–	5	01:00	4	00:00
NOTCam	9	00:10	0	–	0	–	0	–	0	–	9	00:10	5	00:05
StanCam	5	00:15	0	–	0	–	1	00:00	1	00:30	7	00:45	1	00:20
FIES	3	00:55	1	00:30	0	–	0	–	0	–	4	01:25	–	–
Others	1	00:00	5	00:00	1	00:00	1	00:00	8	00:05	16	00:05	10	00:00
Total	69	10:10	18	01:15	2	00:00	10	00:30	18	02:15	117	14:10	95	15:35
P33	50	07:30	26	05:55	4	00:00	11	02:05	4	00:05	95	15:35		

[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	78.5	16.5	26[a]	2.6
NOTCam	25	2	9[b]	2.6
MOSCA	20	3	7	2.9
FIES	19[c]	5	4	4.8
SOFIN	8	1	2	4.0
PolCor	–	2	–	–

[a] Excluding 10 service nights
[b] Excluding 1.5 service nights
[c] Including 5 nights guaranteed time

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

As before, most comments written in the reports during period 34 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 various positive comments about th new TCS, including from observers that have often observed with the NOT in the past. For FIES there was a request to have the option to pause and resume an integration which would be useful under poor weather conditions. This will be corrected. It was also suggested to make the catalogue facility less sensitive to the precise format of the entries. It was also noted that it is not simple to copy observing scripts that are prepared at home to the data acquisition computers for execution. This is somewhat of a security issue but a solution is being worked on. There recently were also various positive comments about the food at the residencia.

Surprisingly, this 'winter' semester there was only one request for a Sauna compared to two such requests in the previous 'summer' semester.

5 Operations

5.1 Additional services

5.1.1 Service observing

A total of 11 and a half nights of service observing were made, excluding the 8 SOFIN nights done in service mode by Dr. Ilya Ilyin. This also does not include the increasing 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.

To stimulate the request for service observing the proposal form has been changed such that applicants are now requested to argue why the proposal can not be executed in service/queue mode.

5.1.2 'Fast-Track' Service Program

A total of 8 and a half nights for the 'Fast-Track' service program were spread-out over period 34.

During the semester a total of 8 proposals were accepted for execution and one rejected. Of the 8 accepted proposals, 6 requested observations with ALFOSC, one request observations with both ALFOSC and NOTCam, and one requested observations with NOTCam. Up to now, there have been a total of 17 grade 1 proposals of which 13 have been completed and 4 have been have completed; there are 8 grade 2 proposal of which 6 have been completed, and; there are 4 grade 3 proposals of which 3 have been completed.

During the semester FIES was included in the Fast-track service program. This required some extensions to the OB and observing scripts systems and updates of the web-pages.

5.2 Observing conditions

5.2.1 Weather station

A new 'Vaisala' weather station was bought. 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.

The station still needs to be mounted outside, but it was already tested with the new TCS.

5.2.2 Dust meter

The main bottleneck with the dust meter is getting the data saved to the computer so we can access it. The software company responsible for the program was contacted by the IAC but the solution they provided is not workable in practise.

5.2.3 Storm

There was a lightning storm in March which caused several problems. The lightning protection of the telescope and the service building worked fine (with the possible exception of the fuses in the controller for the lower hatch) but the phone lines where affected, which caused the destruction of a fax machine. For these lines the lightning protection was provided by the phone company but we will reinstall our own protection to avoid future problems.

However, the main problems were in the new FIES building, which shares its grounding with the telescope building. It is thought that the poor conductivity of the ground around the building combined with the relatively large distance to the grounding in the telescope building caused the discharges to not properly being diverted and affecting many parts in the FIES building (see below).

5.3 Building

5.3.1 Safety system

We plan to add an audible alarm outside that sounds when the alarm system is triggered. Currently there is only an audible alarm inside the building.

A long term plan is to move the whole system of status indicators and reset buttons to the control room to provide a better control and overview of the whole system.

5.3.2 Cooling system

Further fine tuning of the system was done during the winter. A check of the various cooling fans around the telescope building found various in need of replacement and some new units including spares were ordered.

5.3.3 Drive System

Installing the new drive system will include changing the four motors, amplifiers, servo control electronics and cabling, and some tuning of the system and the TCS. This will also include some down-time of the telescope and will require a careful planning.

5.3.4 Rain sensor

A solution for the occasionally spurious alarms from the rain sensor has been defined but needs to be installed and tested.

5.4 Telescope

5.4.1 New TCS

The old TCS was dismantled at the start of the semester. The new TCS has been used throughout the semester and only positive comments have been received. However, there is a fundamental problem with the communication (from the data acquisition programs) to the TCS. This turned out to be a flaw in the operating system on which the new TCS runs and the only solution is to go to a new system which would require a significant effort plus extra costs. A different method using sockets (which functions at a more basic level that the current RPC communication system) has been developed for the TCS command server but needs to be verified with the instrument computers.

Some minor upgrades identified during the semester are still waiting to be implemented, and work is progressing on the documentation and the logging system.

5.4.2 Tracking

The old method to compensate for residual periodic encoder errors using raw autoguider data caused too much noise resulting in sudden variations in tracking rates. A new method was developed which fits a periodic signal to the autoguider data to smooth its contribution and avoid sudden variations in tracking. Currently data is being collected which will be used to verify if the new method works and we will have to decide on how the corrections will be applied precisely.

5.4.3 Counter weight

The problem with the installation of the counter weight was found and corrected, and the counter weight is now under complete computer control in the new TCS.

5.4.4 Amplifiers

We have had several failures of the old altitude and azimuth amplifiers, with some been sent back for repair. The causes of all the problems has been attributed to their age. New units have been identified and purchased and are waiting installation.

5.4.5 Remote observing

Some dedicated tests of operating the telescope with the new TCS from a remote terminal still need to be done.

5.4.6 Wavefront sensing

A summary report of the tests made over the past few years using the ALFOSC wavefront sensor (WFS) was made. The most significant aberration of the telescope is astigmatism that has an altitude dependence. From the WFS data a fit to the amplitude variation has been made but consistent measurements of the angle have proven difficult.

The new seeing data-base was used to look at the possible effect of the aberration by making a fit of the variation of ellipticity as a function of altitude, principly to look for the variations in angle but also to see if the amplitude varies. From the analysis it seems that the dominate angle is 10 degrees off vertical with respect to the altitude motion. This is actually the angle of the currently applied correction suggesting we are applying too large a correction. Measurements have been made to check if the applied zernike terms are too large, but the data has not been looked at yet.

5.4.7 Mirror cleaning

Originally we were thinking of aluminizing the secondary mirror as its efficiency had decreased somewhat. As the cost of letting only the secondary mirror be aluminized would be very high, the only reasonable way is to do this together with the aluminization of one of the primary mirrors of an other telescope. However, there is no such opportunity in the near future so this is not an option at the moment.

Currently the main mirror is also rather dirty since a period with dust during the winter and we are planning a washing of the main mirror in the near future, which will also include washing the secondary mirror. Measurements of the reflectivity and scatter of the mirrors afterward should give us a better idea of the state of the mirrors.

5.4.8 Adapter

Some work has been done on a system to reduce the amount of cabling and connect power cords around the adapter. This will be finished in the coming months.

5.4.9 Web-cams

As a long term objective we want to install a number of web-cams around the telescope building to increase safety and allow remote control of the telescope and provide technical assistance.

5.5 Imaging Quality Control

As from February, every image taken in optical imaging mode is being analyzed on the fly through an automatic post-processing task based on the Sextractor routine. As output, we store FWHM and Ellipticity measurements for every single source found in the images, after some appropriate filtering has taken place. Subsequent analysis of this dataset allows for a very powerful tool to monitor the performance of the telescope. To aid the analysis, we log simultaneous FWHM measurements from the Robotic DIMM station at the ING. A start has been made with analyzing the data.

NOTCAM data are planned to be included in the processing over the coming months, and a study of extending the analysis to include an astrometric solution is being carried out.

As a longer term goal we plan to develop an automatic warning system that will inform the observer when the optical quality of the data does not seem to be optimal (e.g., because the telescope is out of focus).

5.6 Photometric zero-points

A general photometric zero-point data base is being 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 Filters

Also, a filter data base is being set-up. This is will replace the current files with tables in the near future.

5.8 Observing

5.8.1 Observing set-up

Having FIES now available permanently raise some practically issues. For the regular observing runs this actually means a fundamental change as with the various monitoring and ToO programs the observers should be able to operate both the Cassegrain instrument (ALFOSC or NOTCam) and the standby instruments (FIES and StanCam). In the past StanCam was really only used for simple imaging observations for NOTCam or visitor instruments (SOFIN, TurPol, etc.). Now, e.g., NOTCam observers might need to do observations with FIES, or FIES observers might need to do spectroscopy or polarimetry with ALFOSC. As it is impossible to fully train observers, the best way is to limit the actions needed by the observer by automating things and to provide detailed (very specific, not extensive) instructions. The objective is to provide a set-up which gives sufficient information and allows the observer to do very specific observations without the need for extensive instructions which might not even be needed.

As a first step a 'flow chart' was made of the various steps that are needed when switching between the different instruments (including things like moving the pick-off mirror to re-direct the light, changing the telescope focus, etc) and we are now working on (automated) procedures and instructions to make this easier.

5.8.2 Observing account

With all the data acquisition programs now working on the new computers the computer accounts for the different instruments have been united in one 'obs' account. However, it was noted that this account has a lot of files which are not necessary and it really needs a clean-up. For this, we are developing a clean-up script that will remove all the files which are not necessary and restore things to a standard set-up. This script will in principle be run at the start of each observing run.

5.8.3 Monitoring programs

To improve the execution of the monitoring programs, a system was set-up to send an automatic email to the observer for the night as a reminded to do the observations.

5.9 Data acquisition

5.9.1 Communication with TCS

To avoid the problems with communication with the TCS a new C library was made in order for programs to get TCS status information from a database instead of via the RPC communication system. This improves performance and avoids the severe software fault in the new TCS. Implementation of its use in programs has started and is successful. Also, new sequencer commands for the TCS are developed to substitute the current RPC commands that are not performing well.

5.9.2 System set-up

As we now at all times will have more than one data acquisition systems running we needed to define a proper set-up to be able to view and operated these systems at the same time. For this we decided to change the monitors to a set of two 24" 1200x1600 pixels monitors in a dual screen configuration with two possible views (either showing the data acquisition system for the primary Cassegrain instrument, or showing FIES and StanCam) between which one can switch easily using a simple combination of keystrokes.

The screens have been installed recently, and we need to see if this system works satisfactory in practise.

5.9.3 Instructions to observers

A different issue is the ability to provide at all times proper instructions to the observers. This could be difficult either because the weather does not allow certain parts to be demonstrated, or because the observers (have to) use very different instruments. To allow for proper instructions also in these cases we plan to select a set of 'example' images for each instrument that allows at all times to show how different procedures (how to define the proper focus, how to place a target on the slit or fiber, etc) work.

5.9.4 Observing scripts

It was noted that when defining observing scripts using our script generator provided on our web that there was no simple way to get these scripts to the instrument computer from an outside computer (e.g., a laptop connected to our network). For this, an option will be added to the script generator to save a script on our local system.

5.9.5 Script generator

With the development of the sequencer and its ability to talk to various subsystems a significant expansion of our current observing script generator is required. In the longer-term, sequencer enabled observing scripts will simplify operations at the telescope and make the creation of Observing Blocks for our Service program more easy and transparent.

5.10 ALFOSC

5.10.1 Detector

After the removal of noise caused by the ALFOSC pressure sensor in August 2006 a lower level noise has been noticed which manifests it self as spike of up to 40 units and with a fixed period. The Frequency of the unwanted signal has been measured to be 300Hz, and tracing back through the archive was first seen after the dewar window optics were replaced in November 2005. The noise can be eliminated by isolating the dewar from ground, but that is not a practical solution. Neither the source of the noise or a solution for removing the noise, other than isolating the dewar, has been found but further tests are being done.

With the change of the data acquisition system (see below), we have also changed the clamp & sample times for the CCD which has reduced the readout time from $\sim$90 sec to $\sim$80 sec.

5.10.2 Data acquisition

With the commissioning of the new instrument computer for ALFOSC & STANCAM the upgrade of instrument control computers for all core instruments as well as major upgrades for some control software systems have concluded. For ALFOSC this included upgrades to the regular BIAS data acquisition program and the Fast Photometry program, the substitution of the old IDL based User Interface to a new version in Tcl/Tk, and the implementation of multi-extension FITS format for the data. The new user interface now sets all the wheels to the 'open' at start-up, and initializing now also includes setting the FASU filter wheels to specific positions (which is effectively initializing these wheels).

Also, a start has been made with the development of the sequencer for ALFOSC.

5.10.3 Spectroscopy

The problems with the He lamps was found to be caused by the power supply which were replaced.

A set of spare 'high-quality' slits and spare ThAr lamps were purchased. A replacement slit should be purchased for the vertical 0.5 arcsec slit as it was scratched.

The flux-standard monitoring data-reduction pipe-line has been upgraded to support the new multi-extension FITS format and the new FITS header keywords. The quality control reduction script for the ALFOSC spectroscopy flux-standard has been further developed and the monitoring page for the internal focus has been updated. The procedure to calculate the rotation required to align the slit with features in an image needs to be added to the post-processing system.

The information about the efficiencies and fringing with CCD#8 will be updated.

5.10.4 Polarimetry

A quick-look post-processing system to reduce linear polarimetry data was developed and will be implemented in the near future. This will include a dedicated web page with instructions. Also, a data base was created with a set of linear polarimetry standard stars.

We will look at the possibility to upgrade the calcite plates with larger and more efficient ones.

5.10.5 Imaging

Unfortunately we still have not received the imaging reduction pipeline for ALFOSC that is being developed in Copenhagen.

Instruction on how to reduce imaging data taken with the dual amplifier readout mode using Iraf have been added to the web pages.

5.10.6 Focus measurements

The data base with the focus measurements is continued to be populated and we have started to analyze the ALFOSC data obtained so far.

5.11 NOTCam

5.11.1 Detector

We have been running smoothly with the engineering grade array since May 2006. The new science array arrived in October and is still in storage (in dry conditions), waiting for the upgrade of the electronics before installation and commissioning. This should happen as soon as possible since we expect it to be more sensitive and flatter than the engineering grade array.

Bad pixel maps for the engineering grade and the failed science grade array are available on the web.

Data has been taken to determine the plate-scale for the high-resolution camera but the data still needs to be analyzed.

5.11.2 Dark current

We await the assistance of Preben Nrregaard at CUO for the electronic upgrade which should be tested on the Engineering Grade Array. It is expected that the planned upgrade will cure the dark-current problem.

5.11.3 Data acquisition

The communication problems with the TCS especially caused problems for NOTCam due to the extended use of teloffset commands inside scripts and to the high frequency of image storage, but proper workarounds for these problems were made.

One of the advantages of the new TCS are smaller data acquisition overheads. However, the workarounds for the TCS communication problems may have increased them a bit and they must be re-measured.

Because of the X-flip in the multi-extension FITS data format, there must be modifications of the teloffset directions used with NOTCam in order that the convention is the same for all instruments.

5.11.4 Motor Controllers

During the visit of Jens Klougart to the NOT last 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.

5.11.5 Imaging calibration plan

An imaging calibration plan has been defined been is still being reviewed and some updates will need to be implemented. The reduction of the imaging quality control data are still performed in a semi-manual way. A more automated system will be developed that will also provide results in a proper format to enter in the standard star measurement database.

5.11.6 Quick look reduction

A set of IRAF scripts for NOTCam imaging reductions have been made and tested. The purpose of these scripts is to allow a quick look at the data to help observers understand the data quality obtained during observations. This include scripts to: make bad-pixel masks, make differential master flats, do sky-subtraction and flat-fielding of a set of images, shift and add a set of images. Two special scripts were made that fully reduce a 5-point dither or a 3x3 grid dither made using the observing script generator to output one final image per script. The NOTCam User's Guide has been updated with a description of how these scripts work and how to use them. See

`http://www.not.iac.es/instruments/notcam/guide/observe.html#reductions`

The documentation and help pages for the package is still quite limited.

5.11.7 Photometric stability

Some work has been put into characterizing the photometric precision on the shifted, aligned and combined (median or average combine) images obtained with the Iraf scripts mentioned above. For these tests we used the science array data in order to demonstrate what we also expect for the new science array. The Engineering Grade Array has a somewhat lower quality and basically the flat-field correction is the limiting factor. The results of this characterization is currently being documented.

JHKs photometry of an open cluster has been used and the positional accuracy with the Wide Field camera was found to be ±0.15" in both RA and DEC on the average, while it amounts to max 0.4" in the corners due to distortions. The measured magnitudes compare well with 2MASS with median differences of ΔJ = -0.004, ΔH = 0.04, and ΔKs = 0.006 mag. The scatter around these values is 0.06 mag in J and H and somewhat larger in Ks. No distortion correction had been performed on these images before combining them.

Improper alignment of individual images may lead to substantial flux losses in the combined image. In the corners of the FOV the alignment will always be poor due to the distortions by the camera. The distortion must be well corrected for in order to have good photometric accuracy all over the FOV in the combined image. Strong seeing variations will have the same effect, but these are less of a problem in general.

The photometric scatter across the field-of-view during a dither observation is of the order of 0.01 - 0.02 mag for good S/N ratios and small dithering steps (10-20") for the Science Array.

5.11.8 Spectroscopy

Detailed instructions on spectroscopic observations have been added to the observing guide. A 'quick-look' post-processing option will be added for spectroscopy.

5.11.9 Polarimetry

Although there is a polarimetry option with NOTCam, this has never been tested in any detail and we planned to do this in the near future.

5.11.10 Cooling

The oil absorber in the PTR compressor and the rotary valve for Helium flow are supposed to be exchanged every 15000 hours running as a part of the PTR maintenance. Replacement units were ordered. The oil absorber was replaced, but the rotary valve was the wrong model. The correct rotary valve model arrived in the beginning of November, but turned out not to work properly. A second rotary valve came, but this one failed as well. We are still waiting for a functioning unit. The old unit is still running as a clock after nearly 30000 hours running.

5.11.11 Holding time

After a lot of efforts the work to improve the vacuum behavior finally gave fruit. The vessel had suffered from micro-leaks for a long time. It is clear that most of these came from temperature stresses on o-rings during LN2 filling and spilling. But also the large vessel o-ring needed to be taken out and be thoroughly cleaned. It was found to be contaminated with metallic dust, probably coming from the bolts holding the vessel lid to the cold table. After the last opening in January 2007 the cryostat has shown to behave very well. NOTCam can now be stored cold relying only on the PTR cooling. No vacuum leak has been seen. This has not been the case since beginning of 2002. Furthermore, the causes of the previous micro-leaks have been fully understood and both procedures and materials used have been changed accordingly.

The pressure sensor should be replaced or looked at since it sometimes jumps between modes and show values that are wrong by a factor of 100.

5.12 MOSCA

5.12.1 Detector

Following the failure of CCD #15 it was replaced in Copenhagen with the old ALFOSC CCD #7 as replacement. This CCD is owned by the 'Instituto de Astrofísica de Andalucía' and they very kindly granted permission to use it. It was successfully tested both warm and cold, and it has been used at the telescope without any problem. The main worry was the alignment of the CCDs in the mosaic. Preliminary tests show that the alignment is fairly good, but we have not been able to obtain any test data with very good seeing yet.

There were two observing runs that were scheduled during the time that MOSCA was not available. They were offered ALFOSC, to which the PIs agreed. Neither of these observing programs were very seriously affected by the change.

5.13 StanCam

5.13.1 Detector

An automatic monitoring script to log and check the StanCam CCD temperature was made to ensure that StanCam is ready and operational, which is also essential to be able to observe with FIES.

5.13.2 CryoTiger

There has been a failure of the StanCam cooling system which was found to be caused by a lose of gas pressure in the system. With some help and advice from the Liverpool Telescope, who use similar cooling systems, a search discovered two leaks in the flexible hoses between the CryoTiger and the cold head. An immediate solution was to replace the hoses with the ones from the identical system used in FIES and to refill the hoses with gas given to us by the Liverpool Telescope.

5.14 FIES

5.14.1 Lightning storm

As a result of the lightning strikes in March 2007 FIES suffered several failures including on the network connection, the new temperature monitoring system, two power supplies failed and the encoders for the internal calibration lamps and the focus mechanism give incorrect readings. The two problems with the encoders are still been investigated.

One thing that became clear was that there is not a full set of spares and that in many cases we do not have sufficient documentation (in many cases only in Danish) to do a proper trouble shooting of the instrument. Together with Aarhus we plan to make a proper inventory to determine which spares we need and a proper set of documentation should be defined.

The lightning protection of the FIES building should be reviewed in detail, but likely we will need to make an artificial grounding close to the building.

5.14.2 CryoTiger

The tubes for the CryoTiger were been moved to StanCam to replace the ones that were leaking. By now the original tubes from StanCam have been repaired and were installed on the FIES CryoTiger which is now cold again.

Considering this failure and the need to have both StanCam and FIES in principle available at all times we should review the need for some proper spares. We definitely should get some spare tubes, but this would this still imply the need to swap and refill the tubes and likely the best option is to have a complete spare CryoTiger ready at all times.

5.14.3 Building

To improve the temperature stability an extra heater was installed in front room to minimize the temperature gradient between the spectrograph room and the front room. To get a better temperature control a total of 12 temperature sensors (with 0.01 degree accuracy/precision) were placed in and around the spectrograph. These are necessary to relate any Echellogram shift to physical phenomena on the spectrograph table, and for further improving the temperature stability. Unfortunately all these new units were damaged in the lightning storm and will have to be replaced. The measurements from these sensors will also be integrated in our data base and a graphical interface will be provided.

From the measurements during last summer it is clear that on the hottest days, which typically coinciding with days with ‘calima’ (Sahara dust), the temperature in the building is affected and some solution should be found before the coming summer. This likely will mean painting things white and/or adding small (white) peddles to the roof and the area in front of the main door where the ventilation is located. There might also be a need for forced cooling using an air-condition either in the front room or above the false ceiling.

To analyze the temperature stability of the spectrograph a automated analysis tool will be developed.

5.14.4 Instrument

Currently, a new fiber bundle is being prepared by the people in Aarhus with the help of Gerardo Avila from ESO. The installation, testing and commissioning on the new unit is planned for the second half of June.

The new unit should have a much more efficient high-resolution fiber, and it should make the medium resolution simultaneous-ThAr mode possible.

Currently a design is being made for an exposure meter to be placed inside FIES. The plan is to test and install the meter during this semester.

Various parts of the electronics were affected by the storm and are being repaired.

5.14.5 Target acquisition

One of the problems with target acquisition is to locate the position of the fibers as they are very difficult to see with a star close to them or when the sky is dark. A script was made to make this easier. The target acquisition will be streamlined further using sequencer scripts.

5.14.6 Focussing

The proper telescope focus to be used with FIES will need to be investigated. It seems that the optimal focus might be different for different fibers and it also seems to be different from that for the star image reflected by the mirror around the holes leading to the fibers. Depending on the results, a script will be developed to simplify the focussing.

5.14.7 Reduction software

An automated calibration procedure will be made that ensures that basic calibration frames that are used by the FIEStool quick-look/reduction program are taken.

Improvements will be made to FIES-tool regarding wavelength solution, allowing for new ThAr frames to be used automatically allowing to use the ThAr frame obtained closest in time to the target spectrum. This may be less important when the simultaneous ThAr mode becomes available for the medium-resolution fiber.

5.14.8 Quality control

An automated procedure was made that obtains detector quality control measurements every Sunday afternoon. The results of this are now automatically updated on the web

`http://geena.not.iac.es/instruments/fies/staff/#quality`

both graphically and in table form. Graphs are provided for all supported amplifier, gain and binning modes (18 modes in total).

A sequencer script (with inbuilt tutorial) was made to obtain FIES flux-standard star observations for quality control. An automatic reduction pipeline to analyze these observations was made and the reduced standard-star efficiencies are now available at

`http://geena.not.iac.es/instruments/qc/FIESphotometry`

which lists the average BVR efficiencies.

In the future all the results of the quality control scripts will be added to the main data base.

5.14.9 Instrument set-up

Sequencer scripts were made to simplify the instrument-setup. The setup scripts make it easy to setup FIES in a fast and reliable way. The scripts themselves are scriptable and could, for instance, be very useful for a second-generation observing script editor (service mode observations).

Also a set of 'exposure scripts' were made for specific observations, e.g., there is a script to make a ThAr exposure, which make it less likely that mistakes are made.

5.14.10 ADC

The ADC has been prepared in Aarhus and was send to us. It will need to be tested in the lab first and it will have to be integrated in the TCS before it can be installed and tested at the telescope.

5.14.11 Spectro-polarimetry

N. Piskunov was contacted about the issue of doing spectro-polarimetry with FIES but no further news has been received.

5.14.12 Documentation

Some updates were made to the FIES documentation and instruction were prepared for the monitoring programs.

A main part missing is still a maintenance manual.

5.15 SOFIN

The user interface is being developed further with a more modular approach to simplify the design and enable the real-time data reduction facility. The latter is still under current development.

Also, a more detailed approach to the calibration of the spectropolarimetric data is being made. A more refined model has been developed and is being implemented to measure and derive polarimetric errors which have to be used for the proper and self-consistent data reduction of all four Stokes parameters in spectral lines. A science verification program for the detection of weak linear polarization in spectral lines is planned.

5.16 Computers and software

5.16.1 Network

We had planned to install our own wireless system at the observatory, but this was not allowed as the IAC is in the process of providing their own for common use in all the rooms. This was promised to be ready in November but for unknown reasons this has not happened yet.

A further increase in the bandwidth of the network link from the observatory to Tenerife have being implement. Even a further upgrade to a 1Gb network is planned, but this does not include a connection to our sea-level office. However, solutions are being looked at together with the ING.

5.16.2 New database servers

To accommodate for the increasing amount of data that are being stored in databases, two new database servers have been purchased and are gradually being put in operation. With the new system we are now capable of keeping a log of every TCS parameter with a time resolution of twice per second, which can be a very valuable tool for fault tracing.

5.16.3 DVD Jukebox

The software for the jukebox has been written and tested. It was needed to provide more software than anticipated, as the one included in the jukebox showed up a number of limitations. There are still some more enhancements being worked on.

The jukebox also been upgraded with a more modern, faster DVD writer, which is being tested at the moment to check that everything is OK with it and that it can work reliably with the software that is part of the jukebox.

One of the reason for the system not being implemented yet is the need to acquire a large number of DVDs to allow the system to operate continuous without interruptions.

5.16.4 General computer system

A plan for the implementation of a general backup & archive server has been made and will be implemented in the near future.

The computer room in the SLO was refurbished. A new rack was bought for the servers, along with a more powerful UPS.

Current a monitoring system for the UPS is being developed that in case of problems automatically sends an alarm and stops every critical computer at the NOT. This will also be extended to a general alarm system for other services (e.g., warnings about hard disks filling-up).