Period 45
Report to the NOT Council and STC

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Contents

1 Introduction

This report covers the operations of the Nordic Optical Telescope over the period 45: 2012-04-01 to 2012-10-01.

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 45.

A total of 86 fault reports were submitted, with an average time lost of 3 min per fault, for a total down time of 0.3% (0.3% on scheduled observing nights). Of these, 69 reported no time lost, 17 reported < 2 hrs lost, and none reported 2 or more hrs lost.

This compares to a down time of 0.9% over all nights (1.1% on scheduled observing nights) in period 44, and 1.2% over all nights (1.3% on scheduled observing nights) in period 43. Of the 130 fault report in period 44, 95 reported no time lost, 33 reported < 2 hrs lost, and 2 reported 2 or more hrs lost. Of the 144 fault reports reported in period 43, 96 reported no time lost, 47 reported < 2 hrs lost, and one reported 2 or more hrs lost.

Table 1: Technical down time statistic period 45: 2012-04-01 to 2012-10-01

Night included	Time lost	Nights	Percentage[a]	Last semester	Last Summer
All nights	287 min	183	0.3%	0.9%	1.2%
Scheduled observing nights[b]	247 min	153.5	0.3%	1.1%	1.3%
Technical nights	40 min	21	0.4%	0.3%	0.8%
Service nights[c]	197 min	54	0.7%	1.7%	1.5%
Visitor instruments	0 min	9.5	0.0%	0.3%	0.0%

[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

Both the numbers of fault reports and the total time lost in the semester are at an all time low, and no fault occurred that lost a large amount of time. Compared to the previous semesters this is, beyond the lack of any major problem, mostly due to the teething problems with the new detector controller for the ALFOSC CCD being under control.

In general, one can expect variations from semester to semester which can be due to a significant change such as the new CCD controller or a single major problem (which is bound to occur at some point), or simply because the weather is very bad so the telescope is used little (though this was not the case in the past summer semester). We keep track of the fault reports in a data-base system since October 2006 so we can give a more general indication of the long-term reliability of the telescope. Over the full 6 year period the total downtime over all nights has been 0.76%, varying on a yearly basis between 0.43% and 1.28%

2.1 Weather

For period 45 a total of 229hr 4min was lost due to bad weather which corresponds to 14.1% of all the dark time, as compared to 22.2% in period 44 and 11.2% in period 43. The total amount of clear dark time was 1394hr in period 45, as compared to 1592hr in period 44 and 1442hr in period 43. Also the weather downtime is recorded in the data base since October 2006, and over the full 6 year period the total downtime due to weather has been 25.1%, varying on a yearly basis between 18.7% and 28.9%

2.2 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 two periods (43 and 44).

Table 2: Down-time statistics for period 45[a]

Syst/Type	Soft		Elec		Optics		Mech		Others		Total		P44/P43	
Telescope	10	00:40	4	00:25	0		4	00:05	0		18	01:10	22/11	09:15/03:55
Building	1	00:00	1	00:05	0		3	00:00	0		5	00:05	3/5	00:00/00:00
Computers	19	00:47	1	00:00	0		0		1	00:00	21	00:47	23/26	00:15/03:15
ALFOSC	14	00:15	3	01:45	0		0		0		17	02:00	45/60	06:10/05:30
MOSCA	0		0		0		2	00:00	0		2	00:00	2/8	00:10/03:05
NOTCam	4	00:05	0		0		0		1	00:05	5	00:10	14/13	00:15/01:40
StanCam	3	00:05	0		0		1	00:00	0		4	00:05	4/8	00:35/00:50
FIES	4	00:00	4	00:30	0		0		0		8	00:30	7/7	00:20/01:00
Others	1	00:00	1	00:00	0		3	00:00	1	00:00	6	00:00	10/6	01:20/00:10
Total	56	01:52	14	02:45	0		13	00:05	3	00:05	86	04:47	130/144	18:20/19:25
P44	92	08:55	19	02:00	1	00:00	8	06:05	10	01:20	130	18:20		
P43	90	11:25	28	05:05	3	00:00	11	02:15	12	00:40	144	19:25		

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

2.3 Main problems

There were no faults that caused more than 2 hours downtime during period 45, but there was one more persistent problem that caused overall the most downtime in the semester so I discuss it here.

- **2012-05-28&2012-08-19: FASU filter wheel movement**: 1hr 50m

  On separate occasions one of the filter wheels in FASU (Filter And Shutter Unit) mounted above ALFOSC moved though it was not commanded to do so. The problem occurred on a few occasions (in fact probably also in the previous semester) but it could not be reproduced. It was noted that apart from specific commands, the only way that the FASU filter wheel can be moved is by pressing buttons that are mounted on the unit itself. After the last occurrence the buttons on both filter wheels in FASU have been replaced but it remains to be seen if this solved the problem.

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, OPTICON and guaranteed time. In this table I have also included the number of observing runs, and the number of nights per observing run in visitor mode for each instrument.

Table 3: Instrument use

Instrument	No. of nights		No. of runs	Nights/run
	Scheduled	Technical		
ALFOSC	66	10	16[a]	2.2
FIES	42.5	4	10[b]	3.1
NOTCam	28	5	4[c]	4.3
MOSCA	17	1	3	5.7
SOFIN	6.5	1	1	6.5
Own	2	–	1	2

[a] Excluding 31 service nights [b] Excluding 12 service nights
[c] Excluding 11 service night

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

As before, most comments written in the reports during period 45 were very positive, both about the observing system and the support from the staff.

Beyond some comments referring to faults that were also reported through the fault data base, there were various comments about the Sahara dust ("calima") which was particularly bad this summer. In effect, there were only 2 specific comments. One comment was about the procedure to position a slit with ALFOSC across 2 objects to be complicated and time consuming. In general there does not seem to be any problem with the process itself, but it does require several images to first calculate the correct angle, and then center the targets in the slit. In this specific case the targets were very faint, making the process slow and more difficult. A second comment was by one of the remote observing courses noting that when using "imexam" (an IRAF task to examine an image) on an image display the cursor reacts very slowly. This is just a bandwidth issue and intrinsic to the large distance between the observer and the telescope. The only possible workaround is transferring the image first to the remote location and using "imexam" locally. In fact, we use this method in some cases where this is a more limiting issue for observing (e.g., acquiring a target on a slit or fiber).

5 General

5.1 Staff research

A web-page was set-up with information about the research interest and instrumental expertise of the astronomy staff and the students, and some of the technical staff. One objective is to provide some background information for people that are interested to apply for a studentship position.

5.2 Publications

To reflect the scientific return of the NOT we maintain a continually updated inventory of all publications based wholly or in part on data from the NOT. For an up-to-date list see

`http://www.not.iac.es/news/publications/`

Users of NOT data are requested to help us keep this inventory complete by informing us of any such papers as soon as they are published. However, we also actively search the main journals. We list refereed journal publications in A&A, MNRAS, PASP, ApJ, ApJL, ApJS, Astronomische Nachrichten, Planetary and Space Science, Icarus, Nature, and Science. Recently we added about 50 more publications for early NOT years. These were found using new all-text search methods now available for scanned-in articles, mostly published in the period 1990-1998.

We also maintain lists of MSc and PhD theses based wholly or in part on data from the NOT. Recently we have added 3 new MSc and 3 new PhD theses published in 2012, 5 of which were from current or former NOT students. These lists are very likely not complete (especially on the Spanish side) as there is no simple way to search for them and we mostly depend on being specifically informed.

5.3 Educational activities

5.3.1 Observing courses

During the semester we had the annual observing course for the Stockholm University (5 nights in May), which this year was held remotely. We were especially involved in the preparations and execution of the Nordic-Baltic Research Training Course "Observational cosmology and the formation and evolution of galaxies" that took place at Onsala, Sweden, in the period 11-20 June, 2012. The course was organised jointly by the Onsala Space Observatory (OSO, Sweden), the Nordic Optical Telescope (NOT, Spain), the Finnish Centre for Astronomy with ESO (FINCA, Finland), and the Institute of Theoretical Astrophysics (University of Oslo, Norway). As during the previous joint training courses, the NOT was used in remote mode (5 half nights in June). See for details about the course

`http://www.not.iac.es/Onsala2012/` .

There was also the NordForsk "Observational Stellar Astrophysics in the Era of Gaia and Kepler Space Missions" held at Moltai Observatory in Lithuania in the period 28 July-11 August, 2012, which used the NOT in remote mode (5 nights at the end of July and the start of August), and we had the regular on-site master school in CUO/NBI guaranteed time (3 nights in August).

As part of the support to the various observing courses, some small upgrades were made to the remote observing system and the instruction pages. It was also noted that there were a number of returning issues (e.g., problems with external access to the EON report form) that occur every time there is a new remote observing run. A checklist with the steps to be taken by the local technical support to ensure that everything is tested before a remote observing session starts has been prepared.

There is a Finnish initiative called the "NOT Science School" which aims at having selected secondary school kids come to La Palma and participate in observations with the NOT. The development of the program is being funded by the Finnish technology and National Board of Education. In the current semester there are 2 half nights in which separate groups of pupils will come to the telescope accompanied by some teachers.

5.3.2 NOT Students

Some more in-depth courses were provided to the students at the NOT, both about general astronomical subjects (e.g., "How to use IRAF", "CCD data reduction", and "Spectroscopic data reduction"), but also things related to operations (e.g., "The NOT Observing System and its Sequencer Commands" and "Introduction to CCDs"). We are discussing to what extent there are things related to the operations of the telescope that beyond the training at the telescope would be good to be taught through specific presentations/courses. We also started to collect the material presented in the different courses on our internal web for future reference.

We have a general web page with guide lines for new students outlining what they need to know and what there normal tasks are. With input from the staff and students these pages have been improved and updated.

5.4 Service observing

During period 45 a total of 54 nights of service observing were done, excluding the 6 and a half SOFIN nights done in service mode by Dr. Ilya Ilyin (Potsdam). Nordic service nights consisted of various more or less isolated observing nights spread throughout the semester. In addition, also in this semester there was a large number of observations that were done by the staff for the ToO and monitoring programs during technical and Nordic service nights.

5.5 "Fast-Track" program

5.5.1 Proposals

In period 41 there were 21 proposals accepted. Of these there were 17 'grade 1' proposals, 3 'grade 2' proposals, and 1 'grade 3' proposal. All the proposals have been completed. They normally would have expired at the end of period 45.

In period 42 there were 26 proposals accepted. Of these there were 18 'grade 1' proposals, 7 'grade 2' proposals, and 1 'grade 3' proposal. Of the 'grade 1' proposals, 15 have been completed. Of the 'grade 2' proposals, 6 have been completed.

In period 43 there were 15 proposals accepted. Of these there were 9 'grade 1' proposals, 3 'grade 2' proposals, and 3 'grade 3' proposal. Of the 'grade 1' proposals, 8 have been completed. All the 'grade 2' proposals have been completed. Of the 'grade 3' proposals, 1 has been completed.

In period 44 there were 18 proposals accepted. Of these there were 11 'grade 1' proposals, 6 'grade 2' proposals, and 1 'grade 3' proposal. Of the 'grade 1' proposals, 8 have been completed and 2 have been nearly completed. Of the 'grade 2', 4 have been completed. The 'grade 3' proposal has been completed.

In period 45 there were 12 proposals accepted. Of these there were 8 'grade 1' proposals, 3 'grade 2' proposals, and 1 'grade 3' proposal. Of the 'grade 1' proposals, 6 have been completed and 1 has nearly been completed. Of the 'grade 2', 2 have been completed. The 'grade 3' proposal has been completed.

In the on-going period 46 there are up to now 8 proposals accepted. Of these there were 5 'grade 1' proposals, 3 'grade 2' proposals, and no 'grade 3' proposals. Of the 'grade 1' proposals, 3 have been partly completed. Of the 'grade 2', 1 has been completed and one has been partly completed.

5.5.2 Processing and execution system

Various upgrades were made to the proposal processing and execution system. The email notification system now informs the PIs of the grading of the proposal, and a separate email provides instructions how to proceed for the execution phase. The on-line documentation about the creation of Observing Blocks was updated to allow the use of standard sequencer scripts for ALFOSC, FIES or NOTCAM calibrations. The transparency to the observers of the web interface used to plan and execute observations was improved.

5.6 General

5.6.1 New office

We encountered some delays in formalising a rental contact for our new office next to the office of the Telescopio Nazionale Galileo (TNG), but in the end we signed a contract starting the 1^{st} of October, which implied a 2 months longer stay in our old office. There were some delays in getting the proper permissions and get the work to prepare the new offices done in time, where in the end we moved to the new office towards the end of October, and we terminated the rental contract for the old office by the end of October. We are now permanently installed in the new office, but there is still some official paperwork pending. The main effect is that we have not yet installed a door physically connecting our office to that of the TNG, and the common coffee area in the TNG office has not been constructed yet. A significant effort was made in the physical move to the new office, and the arrangements needed to make the new office habitable. Some of our stuff remains in boxes and we are getting some new furniture to properly settle-in, but these are mostly cosmetic improvements.

As part of the move to the new office we have installed our computer servers in an air-conditioned area in the TNG office, while we also use the UPS of the TNG for our computers and have access to the internet through their office. An official agreement was signed with the TNG that covers these services, and includes having access to laboratories and storage space at the TNG, and have access to scientific journals. This agreement also includes the installation of the door physically connecting our offices, and the construction of the common coffee area.

5.7 Telescope Building

5.7.1 Safety

A new horn has been installed on the outside of the telescope building which is activated when the safety system at the bottom of the stairs providing access to the building is activated. This is mostly intended to inform observers or visitors if they by accident activated the system.

5.7.2 Control room

Because of a leak in the control room the temperature control system had been switched-off during the last winter. A servo valve controlling the cooling was changed and the system is working again.

An overhaul was made of the general observing system information whiteboard in the control room. Although a lot has changed in the system, the lay-out and information had not changed much in 10 years. All the out-of-date information was removed and the lay-out accommodated to the current system as for passwords, computer names, telephone numbers, etc.

5.7.3 Dome

One of the hydraulic pistons of the lower hatch has been changed as it occasionally was leaking strongly. The spare piston turned-out to miss an important part which had to be built by an outside company. This company also mounted the piston in its packing and made pressure tests. The old piston got new packing and can be used as a spare.

5.7.4 Thermal Monitoring System

A new board is being developed for the Thermal Monitoring System (TMS) for which there is no spare and which provides various temperatures around the telescope including those used for the telescope focus correction and the water temperature of the cooler for NOTCam. A design was made but still needs some refinements before it can be manufactured and the software needs writing for the control.

5.8 Telescope

5.8.1 Telescope drive

Similar to last summer we had some errors in the azimuth tracking. It is thought that the temperature difference between the cooling water of the cooling system, which goes through the center of the telescope fork, and the ambient temperature has some detrimental effect on the azimuth encoder system. Increasing the temperature of the cooling water of the cooling system remedies this. However, this has to be done manually and typically is only done after we detect some problems. To avoid this we want to make a system that sets the temperature of the cooling water at a value (a fixed offset) depending on the ambient temperature.

There were some problems with the altitude tracking where we had to replace some motor brushes, while we also have some issue with the azimuth tracking where as a precaution the brushes were replaced in one of the motors. The brushes have recently been checked and found to still be OK. Because of the changes we did not have any new brushes left and twenty new brushes were purchased. However, many of the brushes that we have changed in the past show little or no ware and can in principle be used.

We were informed by the manufactures of the altitude and azimuth motor amplifiers that they will be discontinued. We already have two spare units, but it was considered prudent to purchase two more amplifiers. These devices have been configured and are ready for use.

Some detailed monitoring and analysis has been made of stretches of tracking data to analysis the periodic errors in the tracking. The variations seem to be stable. When more data has been processed it should be possible to provide a simple array with a set of correction parameters as a function of position with sufficient resolution to correct for the variations while minimising the CPU load on the TCS.

5.8.2 Adapter

As part of looking for a possible location of the polarimeter being designed for FIES (see below) several pictures and movies were made of the inside of the adapter, for the first time including the ADC. The movies show all moving mechanisms in the adapter. See for details

`http://www.not.iac.es/instruments/adapter/`

A returning issue with mounting instruments at the Cassegrain focus at the bottom of the adapter has been that of the screw holes used to mount the different instruments losing their thread so they can no longer be used. In the long run this might become an issue when too many holes are effected. We are checking if the existing holes can be repaired/modified, and/or if new holes should be made.

5.8.3 Rotator

The calculation of the rotator position of the adapter at high altitudes (close to zenith) has been further improved. Especially any affect when passing the meridian at high altitude should now be very low. Formally we have a 5 degree limit around zenith where observations can be affected by tracking errors. In practise we normally quote 3 degrees, but even up to 1 degree there should not be any noticeable effect.

5.8.4 Mirror support system

The main mirror support system air compressor was damaged and the system is running on the spare. The damaged unit was opened and some parts (packing and bearings) will be ordered to fix the unit. We got a third old unit that was broken, which was also opened to check how big the problem was. This unit could also be repaired and serve as an additional spare.

5.8.5 Reflectivity

The main mirror was twice wet cleaned. It first was cleaned in June, but only a few weeks later the mirror got dirty again (spots) when the telescope was not closed in time during rain (the humidity was low and the rain was at the beginning mostly sporadic big drops which did not trigger the rain alarm), and the mirror was washed again in mid-September. In addition, the mirror was cleaned with CO_2 three times between the washing.

A more effective procedure was developed to dry the mirror. We do not dry the mirror any more with air from the mirror compressor, but paper is carefully place on the mirror and we use a soft painting roll to press it on the mirror and absorb the water. This procedure is much faster and leaves less water drop marks on the surface.

Some reflectivity measurements were made using a device from the TNG which do not show strong changes from previous measurements but those were made with a different device (which is now broken). Observations of standard stars show scatter of a few percent, but the average zero points in different filters are basically the same as a year ago, and at most a few percent lower than just after the last aluminsation and there does not seem a strong need for a re-aluminisation. A more careful monitoring of the reflectivity will be made using the device from the TNG to get a better feeling of the average value and any change with time.

5.8.6 Guiding system

The old method to calculate the guide corrections used the intensities in the 4 quadrants of the guide star box. This only gives a rough measure of any displacement, not a specific distance of the star to the center of the guide box. A new method was implemented that calculates the position of the star in fractions of a pixel and a gain is applied to this distance to calculate the correction. This gives considerably faster centering of the guide star and follows the precise movements of the guide star slightly better (but at a level that does not affect the image quality). An advantage of this method is that the width (FWHM) of the star image is also computed.

There were some problems with the TCS apparently loosing contact with the guide star server causing a time-out. No specific errors were found in the logs, but it is also not clear how much time the guide star server takes. At least in one case the telescope was pointing in the galactic plane fairly close to the galactic center where there are many targets but also many targets that need to be excluded because they are too bright which might cause the program simply to take a long time to react. The response by the guide star server will be monitored so we can see what it is doing when a time-out occurs in the TCS when querying the guide star server.

The TCS occasionally looses count of the number of turns the guide-probe motors make and to minimise this problem the speed of the probe is limited. To not overload the TCS with this task a hardware solution has been designed to do the turn counting. It has been made such that it can operate in parallel with the existing hardware so the TCS still has access to the encoder counts. A board has been designed and preliminary software written, but manufacturing, testing and installation still has to be done.

5.8.7 Weather information

In the current situation the dust flag in the TCS is set to "high" in the case the staff on duty considers the weather to be dusty. Specifically, setting the flag to high lowers the wind levels to close the side-ports and lower hatch, and to close the telescope completely. This visual determination is of course not a very objective measure, but there is also no well established level that defines which level is too high. It was considered to be better to have at least a specific level which is formally considered to be dusty, where a value of 20 $\mu gr/m^3$ as provided by the TNG aerosol measurements was noted to be a rather conservative indication of the weather being dusty. This was implemented such that the weather page, in line with other weather parameters such as wind and humidity, provides a warning message in case this value is exceeded. This still leaves the responsibility with the staff on duty to define if the weather is truly dusty and set the flag in the TCS.

5.9 Observing system

5.9.1 Observing Blocks

The high level layer of the new Observing Block (OB) generator has now been completed for ALFOSC, FIES, MOSCA and StanCam in all supported observing modes (Imaging, Spectroscopy, Polarimetry). With this facility, users can define a complete and consistent set of observations across various instruments and modes, being part of a (fast-track) service program or a regular observing run. Requirements for the software layer responsible for translating the OB description into a set of existing sequencer commands and scripts are being developed, as well as the requirements of a (graphical) interface that allows to control the execution of the OB in a verbose mode.

5.9.2 Instrument computers

A new computer rack has been designed and ordered to be built for the new observing system computers which are longer (deeper) than the current rack permits. The rack will replace the current rack, and all the computers and network equipment currently used as part of the observing system will be moved to the new rack. The new instrument computers will also be installed in the new rack, and at a later date the control for specific instruments will be switched to the new computers. In the new system each detector controller will be operated through a dedicated computer, while the control of all instruments will be done from one common instrument control computer. ALFOSC will be the first instrument to use this new setup and it is foreseen to solve some specific software problems seen in the current setup with the new controller.

The hardware used at ORM to write the DVDs have been substituted by more modern equipment which also speeds up the process. The plan is still to come to an automated system that would need little or no human intervention, and would use the media used to save the data more efficiently.

One issue when using the observing system remotely is that observing scripts used in remote mode suffer from time-outs. This is an effect of the way in which the instrument control software works. In particular, this software both manages the commanding of the instrument itself and the status display. When operated locally, the latter is not an issue, but when operated remotely the delay in updating the status display can cause a command to time-out though there is no problem with executing the command itself. When using the graphical user interface to operate the instrument this problem does not arise and one can operate the instrument in this way remotely (in fact, operating the instrument in this way is more instructive than using commands or scripts, so in that sense this is not an issue). However, from a general point of view the displaying of the instrument status should be something which is separate from the operation of an instrument. Beyond remote observing course, this can also be a practical issue if one thinks of possible future operations where we operate the (telescope and) instrument from a control room somewhere else on the mountain, or even from sea level. A potential problem is that the updating of the status display is embedded in the software which would make it relatively hard to change, but it is not entirely clear how much time this would take. An estimate is being made of the amount of work involved before we decide if this is worth the effort.

5.9.3 Instrument set-up

The optical element database describes the existing relations between mechanisms (wheels, slides, etc.), elements (slits, filters, etc.) and orientations (with respect to the instrument or detector). The web application allowing to view and modify the optical element database content has now also been implemented for NOTCam and MOSCA.

5.9.4 Web-pages

To accommodate the ever growing number of visitors of our homepage using a mobile phone or similar, a subset of our pages have been optimised to small displays. Probably of most interest is the mobile version of our weather page. Mobile pages are available from

`http://m.not.iac.es/`

5.10 Detectors

5.10.1 New CCDs

Two CCD231-42 detectors with Deep-Depletion silicon and a broad-band Multi-2 AR coating and with the added E2V fringe suppression process were ordered for use with ALFOSC and FIES and are due to be delivered at the end of March 2013. The planning of the development of the controller for FIES will be coordinated in a way that it can be delivered with the new high-speed fiber transfer PCI express card in the controller.

5.10.2 New detector controller

Our user requirements for the new detector controller (and related data acquisition system) for NOTCam were sent to the development team at Copenhagen University. Before specific development of software for the control of the NOTCam detector controller can start a version of the controller for IR detectors needs to be developed. This development can only begin when the implementation of the PCI express card in the design of the controller has been completed.

5.10.3 Vacuum pumps

One of the vacuum pumps got its turbo damaged, the bearings being noisy and it could not reach low pressure, also showing an alarm about turbo temperature. The turbo was exchanged with a refurbish unit under guarantee from the supplier.

5.11 ALFOSC

5.11.1 Detector

The new CCD controller for ALFOSC always gave an intermittent noise which was identified to be at ∼13.8KHz. The source of this noise was believed to be from the internal switch mode power supply (PSU). The occurrence of this noise seemed to becoming more persistent and replacement PSUs were requested from Copenhagen. Three new PSUs were brought down from Denmark, two identical versions and one other, but all three different to what we had. Installing one of the two identical PSUs resulted in a lot of random low level noise. The other variant of the PSU was tried and it was found to give no additional noise, and we now achieve the specified noise performance for the ALFOSC CCD.

The new CCD controller for ALFOSC came with a temporary external temperature controller which plugs to the side of the controller. This connector lacked a proper fixing device and came loose a couple of times. The connector has now been fitted with a proper cover and clamping system.

It has been noticed that the bias level with the new CCD controller changes from the typical 10 000 ADU level to 12 000 ADU or 14 000 ADU as well as occasionally an apparent arbitrary level around 23 456 ADU. It was noted that a specific sequence of low-level commands would restore the level to the nominal 10 000 ADU and this was added to the sequencer command to reset the CCD to full frame and no binning.

During the Copenhagen summer school one frame was accidentally heavily overexposed and the subsequent frames had clearly visible excess flux in some parts of the detector. The excess flux disappeared after some time. The tests indicate that after heavy overexposing there is some excess flux in some parts of the detector. The shape of the pattern and the dependence on the readout speed indicates that the "light source" is inside the dewar. As the heavy overexposing during the night is rare, this should not be a big concern for a regular user.

Quality control of the ALFOSC detector indicates that with the current controller there is less readout noise when using Amplifier B than Amplifier A. The plan is to change to Amplifier B being default. However, there are some issues when windowing the CCD with Amplifier B that needs to be clarified before this change in default can be implemented.

A known feature with the ALFOSC CCD camera is that there is a delay (of 0.085 sec) in the shutter which causes the exposure time to be shorter then requested. The detector controller software does not allow for such an error, and this needs to be changed (i.e., the effective exposure time should be equal to the requested exposure time, while the image header should provide the proper headers as for the different timing parameters. Now the header only reflects what is requested which is different from the effective exposure time). A separate issue is that due to the design of the shutter an exposure will take at least 0.3 sec. I.e., if you request a shorter exposure time you still get a 0.3 sec exposure. The exposure command will be changed to warn for these features.

5.11.2 Observing system

To allow for scripting of imaging flat fielding (e.g., taking a series sky flats in different filters) a new option was added which allows to change the instrument setup while the last of the requested number of flat field exposures (for a given filter) is taken.

The automatic focusing script was further optimised to setup the instrument and point the telescope at the same time, and necessary delays in the script have been tweaked to be as short as possible.

5.11.3 Spectroscopy

A new script was made to allow making automatic ALFOSC spectroscopy calibration scripts. The script has a hard-coded version of the table we provide with standard exposure times for different combinations of grism and calibration lamp(s). The new script returns the exposure time that can be fed to an exposure command or script. The script can optionally account for binning and the slit width. The latter only for Halogen lamp (flat field) exposures, as line strengths from wavelength calibration lamps are in general not affected by the slit width. We are still working on a more sophisticated script that will take a test exposure for any combination of grism, lamp(s) and slit width, and based on the result subsequently take a properly exposed calibration exposure.

When acquiring a target with the slit acquisition script using the slit view option, one sometimes want to do a small telescope offset to center the star better, but then you would like to take an other through slit image to check. This latter option was added to the script. The acquisition script was also streamlined for the (spectro)polarimetry mode using FAPOL. In this mode no automatic rotation of the displayed acquisition image to have North up is made, as this complicates the recognition of the ordinary and extraordinary components. We are investigating how to further streamline the target-acquisition process by analysing the typical offset done after the initial pointing of the telescope to the target, possibly making a first automated telescope offset before doing a more time-consuming interactive on-slit acquisition.

In relation to the fixed set-up requested by the different Target-of-Opportunity programs that can use the NOT at any time, it was mentioned that the 10 arcsec slit is part of the fixed set-up (for use with the Wedged-Double-Wollaston to do imaging polarimetry) while regular programs often request the 5 arcsec slit, which sometimes generates conflicts. There seems no specific difference or advantage for spectroscopic observations in using the 5 arcsec slit instead of the 10 arcsec slit, and it was suggested to decommission the 5 arcsec slit. It will be checked if there is any reason not to do so, and if not, the 5 arcsec slit will be removed from the available set-up.

5.11.4 Multi-Object Spectroscopy

It was noted that the documentation on our web pages for both the staff and observers about the Multi-Object Spectroscopy (MOS) mode were rather out of date and inconsistent. An overhaul of the web pages were made, and a new document was generated about staff support to a MOS-mode observing run.

5.11.5 Polarimetry

Focus offsets for all optical elements used with polarimetry have now been measured and entered in the data-base. Tests with focus and target acquisition scripts have been made to verify the performance with FAPOL. The ALFOSC observing Cookbook has been updated for FAPOL imaging and a new section was added on FAPOL spectro-polarimetry. This document is now the main reference for the observer also for the polarimetric modes.

5.11.6 Instrument focus

In principle, filters mounted in ALFOSC require different instrumental focus values, but we commonly use the telescope focus to correct for this. To (also) allow for differences in instrument focus to be applied for different instrument set-ups, this parameters has been added to the optical elements data base. We need to measure the proper instrument focus for each filter such that we can start to apply the correct focus offsets to the instrument (and not only to the telescope focus).

5.12 FIES

5.12.1 Instrument

We had some problem with the calibration unit for FIES in the adapter, which in the end was traced to a loose wire.

5.12.2 Detector

A new CCD has been ordered. This CCD has 15-micron pixels, and is physically 10% bigger then the current CCD which allows to sample the wavelength range of 370-830nm instead of the current 370-730nm. The CCD is a low-fringing device and has high QE in the wavelength covered. There is a minor reduction in the resolution when using the high-resolution fiber.

We will get a new controller with the new CCD, and a new dewar is also required. One of the issues to consider with the system is to have the possibility to switch-off all indicator lights as any stray light in the spectrograph can be seen on long integrations of faint targets.

5.12.3 Observing system

To assist users that observe with an instrument at the Cassegrain focus but who need to do observations with FIES (for monitoring programs or ToO observations) web pages with specific instruction were provided for 'FIES for ALFOSC users', 'FIES for MOSCA users' and 'FIES for NOTCam users'. All these pages were also linked from the main FIES page.

5.12.4 Polarimeter

One of the issues with the new polarimeter is where to place it. Having it in the beam is not a problem but to get it into and out of the beam mechanically, and more importantly to park it outside the beam when it is not in use without causing significant vignetting of the telescope beam.

Possible parking positions were defined using a LEGO model of the polarising unit based on projected sized defined by Prof. Nikolai Piskunov (Uppsala University). Results of the tests can be seen at

`http://www.not.iac.es/instruments/fies/images+drawings/legopol/`

We hope to receive, install and commission the polarimeter in the near future.

5.12.5 Target acquisition

To allow observing (bright targets) in twilight we need to make the process of acquiring a target and maintaining a target on the fiber independent of guiding. Target acquisition can now be done without autoguiding, while an alternative method using telescope offsets in stead of movements of the guide probe is under development to keep the target on the fiber.

5.12.6 Radial velocity stability

The results from previous tests, including the use of the experimental fiber shaker, have now been added to the documentation on the web. The shaker was improved such that you can determine what state the machine is in and see if it is running or not. Still, a way to use this in the sequencer needs to implemented such that it will be possible to make observing scripts using the shaker.

To monitor the stability and be able to assess possible improvements a proper test and monitoring program is being set-up. Radial-velocity standard star measurements will be obtained on Nordic service nights to study the long-term and short-term stability of the instrument. Incoming data are automatically reduced with FIESTool, and a dedicated analysis tool will be setup.

Some more detailed results of observations of a specific standard star in previous observing runs over the period 2009–2011 were provided by Lars Buchhave (NBI Copenhagen). There are clear offsets (at the 20-30 m/s level) in the average measured radial velocity between observing runs in different years, most probably related to external effects (mostly human interventions in the spectrograph and detector, e.g., pumping). Standard-star measurements should be able to correct for these offsets. From the data it is found that for the high-resolution fiber the intra-run stability (as given by the standard deviation of the standard star measurements) is always below 10 m/s, while for the medium-resolution fiber the results are consistent with our tests, showing a stability of $\sim$10m/s with the old bundle, and $\sim$25m/s with the new bundle.

5.12.7 FIESTool

We still are working on our plan to make the start-up of FIESTool fully automatic as part of the start-up of the FIES observing system. In this way we can also ensure that all the observations are reduced on the fly. As a service the automatically reduced data of the observations will be provided to the observers. A dedicated graphical client has been written to be run on the computers the observer can access. This client will cover the plotting functionality that the users get from FIESTool, with the added benefit of plotting multiple images at once, allowing easy comparison and there is no need to run a separate session of FIESTool. The only step remaining is implementing the system.

5.12.8 FIES building

The summer of 2012 showed many long periods of time with too warm temperature in the FIES room. This summer clearly was the warmest since FIES was placed in its dedicated building. The deviations in temperature are long term, and it takes a few days for the building to cool after the outside air has dropped. This indicates that it is the whole building, and likely also the part of the mountain that the building is dug-in to, that is heating up in these hot periods. Airing the FIES room by opening the door to the actively cooled front-room helps but is insufficient to cool back to normal levels. We cannot circulate outside air as it is very dusty during these hot spells, and we may need active cooling. Painting the mountain and building white will prevent a warm-up but might not be allowed.

To limit the heating of the FIES room we decided to remove the need to place the vacuum pump in the FIES room. A remotely controlled system was designed to operate the vacuum valve of the dewar of the FIES detector. The valve will be connected to a long tube that goes to the front room where the pump will be installed. To install the tube a 10cm diameter whole will have to drilled through the 25cm armed-concrete wall of the FIES room.

5.13 NOTCam

5.13.1 Detector

A new, fixed data transmission fiber for the NOTCam detector controller was installed. This makes mounting and dismounting the instrument easier, faster and safer for the fiber. Additionally, NOTCam data can be obtained while the instrument is not mounted, which makes fault finding and offline diagnostics and testing easier.

5.13.2 Detector controller

Since NOTCam's arrival in 2001 we have been waiting for the new controller. For many applications NOTCam has given useful data, but because of the large overheads, the typical IR observing modes for broad band imaging are still not feasible. In addition, the measured dark current is too high and also variable. A dead column in the centre of the array, introduced by the controller, is a disturbing feature. The dc-gradient (or “bias tilt”) across each quadrant is not a smooth gradient, but has several jumps that are not always subtracting out well, producing stripes or bands in the images. And finally, it is not possible to abort an ongoing integration. None of these problems were fixed while waiting for the new controller.

It was discovered that there is a well defined relation between the detector temperature and the reset level. This explains the observe variation in this value which sometimes requires the voltage levels to be adjusted to avoid the count rates getting below zero. The reset level voltages were set such that negative values are not expected to occur independent of detector temperature. The values will still be monitored.

On a few occasions the *actual* exposure time provided by the array controller were found to be only a fraction of the requested exposure time though the latter appears in the header. For some unexplained reason the array controller decides to read out before it should. Switching the detector controller off and on solves this problem, but if the requested exposure time is short it is easy to miss this and we are looking for some way to detect this when it happens and warn the observer. A daytime test will also be added in which it is checked if the exposure time is not affected, and provide a warning and instructions if there is a problem.

5.13.3 Observing system

Rather than using the old definition files, all NOTCam wheel positions are now read from the database, and the new instrument setup editor is now in use also for NOTCam. The web page showing the current instrument setup was made dynamic. A new NOTCam User Interface which uses the database was installed. It is now implemented and the relevant documentation has been updated.

Following the NOT FITS header standard developed in 2005, a few keywords still remained to be updated for NOTCam, namely the instrument related keywords (wheel positions, names, etc.). This has now been completed and all related software and tools were modified accordingly and the documentation updated.

5.13.4 Imaging

The photometric response over the FOV may not be flat even after having divided by the nightly flat field. For many IR arrays this so-called photometric surface correction (or illumination correction) believed to originate in scattered light in the system, is needed. Some data has now been taken to map the illumination correction for the H-band.

Some few observers spent part of their observing time to obtain illumination correction data for the H-band, and they have also made a model based on these data. A bright standard star was dithered across the array, and the procedure was repeated 15 times with small step offsets in between. The model they developed and used to correct their NOTCam data will be published in a paper (Janz et al., submitted October 2012), together with an H-band illumination model for NICS/TNG. The most pronounced effect of the surface correction is a vertical gradient over the array with a $\sim$10% gradient from the bottom to the top of the array. This is in agreement with the slope we find when calibrating point source photometry. It is not entirely clear whether this photometric surface correction varies with time. Similar data will need to be obtained in the J and the Ks filter.

5.13.5 Filters

The NOTCam Z-band filter (0.83-0.93 micron) red leak is located to be mainly at wavelengths long-wards of the K filter. We have looked for a proper blocking filter - it should let through ¿95% in the Z-window and block long-wards of 2.4 microns - but they are expensive. A cheap option of reducing the red leak would be to add another 5 mm of BK7 glass, or potentially 1 mm of KG4 glass. We got both of these installed in March and tested them in April. The KG4 filter blocks the red leak better but has a poor throughput in Z. We verified the performance of the glass filters in better sky conditions than used for the preliminary testing reported previously. This was then reported to the supplier who were surprised about the low throughput in the Z-band of the KG4 filter and explained it as the material having deteriorated with age. They offered to send a new filter (free of charge) that should give better throughput, since the actual KG4 has gone out of production. This filter arrived in July but we are still waiting to install it as we have to wait for the next time NOTCam will be warmed-up.

5.13.6 Spectroscopy

It what noted that the baffle lamps used for calibrations seem to come on very slowly. Talking to the manufactures they suggested changing the mode of operation of the lamp power supplies from DC to AC, and this was implemented.

A new script is offered to make the spectroscopy calibration observations with NOTCam easier. Since this must be done at night and involves closing the mirror covers, the script allows one to do 1-5 wavelength regions in one go. The script takes 1 Argon, 1 Xenon, and 3 Halogen lamp images per wavelength region each using the default exposure times. The script takes 2 minutes per wavelength region plus 1.5 minutes for mirror-cover closing and opening.

Standard-star observations taken with the new Z band filter and in YJHK were analysed. The overall efficiency was found to be $\sim$7% in Z, $\sim$9% in Y, $\sim$10% in J, $\sim$7% in H, and $\sim$6% in K. As previous J-band measurements showed better results we suspect the measurement may be affected by seeing and transparency and we need to repeat these tests.

5.13.7 Vacuum & Cooling

Due to the occasional failure of the thermal monitoring unit (see above) which includes the measurement of the water temperature of the PTR cooler of NOTCam a second alternative system has been developed as a back-up in case the TMS unit fails. The new monitoring system talks over Ethernet and uses a digital temperature sensor and has been found to track the old TMS calibrated sensor well.

The supply tube of the PTR was cracked just after the point were it is fixed to the instrument and Helium was leaking. The tube needed to be welled, cleaned, and refilled with Helium. The hoses have been attached a bit differently to the instrument in an attempt to minimise stresses as far as possible when moving the instrument. The plan is to purchase one extra hose to have a spare that can be readily exchanged with a broken one next time we get a leak. As it is now, several hours of repair work is needed when this happens. A new quotation from Kelvin International must be asked, but the one we got in 2010 for a 12.5 m long flexible steel hose (including couplings and filled with 99.999% Helium gas), was at $1 090 plus transport.

5.13.8 Reduction software

The IRAF quick-look reduction package ”notcam.cl” has been updated to version 2.5, in which the change-over date for the new FITS header keywords is hard-coded. Reading the observing date of the images, both old and new data can be reduced with the scripts. The documentation on the web was updated.

5.14 MOSCA

A problem with the script that allows you to move targets to specific positions on the array was fixed. The script was tested and implemented. The documentation was updated and the description was improved, providing a clear description as to where a star would be moved depending on the argument given to the command.

5.15 StanCam

The names of the filters used in StanCam are set in the TCS and the information for the FITS header is taken from there. It was noted that the names used did not match those used in our data-base and the names were changed to match the data-base information.

Discussing the observing system used for observations with FIES it was noted that beyond the CryoTiger cooling systems used for the FIES and StanCam CCDs, also the detector controllers are essential and no specific spare exists for the StanCam controller. It is being checked which possible alternative we have that can be used as CCD controller for StanCam.

5.16 Computer system

A physical and logical network design for the new office was made and the network implemented. The new office network keeps computers in separated sub-networks, where they can be better protected from external (and internal) threats. Moreover, laptops and other dynamically connected computers, which used to be fully exposed to the Internet and had to rely on their own firewall (which many people neglects) are now protected. However, there is an issue with the automatic back-up system which is affected by the new network design that limits the speed with which the data can be written to the backup server. A solution is being implemented.

A software voice-over-IP telephone central has been configured and tested, only awaiting the actual connection from the telephone company. Things have been delayed a bit due to a lack of manpower at the telephone company as a storm resulted in many failures in the phone network and they prioritised fixing the existing lines over installing new ones.