Period 51
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 51: 2015-04-01 to 2015-10-01.

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 52.

A total of 123 fault reports were submitted, with an average time lost of 6 min per fault, for a total down time of 0.8% (1.2% on scheduled observing nights). Of these, 91 reported no time lost, 27 reported < 2 hrs lost, and 5 reported 2 or more hrs lost. The latter includes 2 fault reports which were caused by a power failure external to NOT, and are not included as technical downtime. The effect of including this downtime in the statistics is show in Table 1 in parenthesis.

This compares to a down time of 0.8% over all nights (0.4% on scheduled observing nights) in period 50, and 0.3% over all nights (0.2% on scheduled observing nights) in period 49. Of the 101 fault report in period 50, 79 reported no time lost, 20 reported < 2 hrs lost, and 2 reported 2 or more hrs lost. Of the 68 fault report in period 49, 49 reported no time lost, 19 reported < 2 hrs lost, and none reported 2 or more hrs lost.

Table 1: Technical down time statistic period 51: 2015-04-01 to 2015-10-01

Night included	Time lost	Nights	Percentage[a]	Last semester	Last Summer
All nights	760(1290) min	183	0.8(1.3)%	0.8%	0.3%
Scheduled observing nights[b]	665(1195) min	102.5	1.2(2.2)%	0.4%	0.2%
Technical nights	95 min	24	0.7%	3.2%	0.0%
Service nights	295 min	46.5	1.2%	0.8%	0.5%
Visitor instruments	0 min	0	0.0%	0.0%	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

Excluding the downtime caused by the external power failure, the downtime is still somewhat on the high side when compared over the last few years, but basically in line with the longer-term average (0.75%). At least partly, the height of the downtime was caused by the absence of our technician, as this would likely have limited the amount of time lost in one of the two 'normal' major failures. Also, the effect of the external power failure would likely have been limited if he would have been able to complete one of the projects he was working on. Below this is discussed in a bit more detail.

As for the total number of fault reports, like in the last semester, there were relatively many fault reports due to some new software scripts having some teething problems, while the 'regular' problems with the detector software is being reported more diligently.

2.1 Weather

In period 51 a total of 183hr 35min was lost due to bad weather which corresponds to 11.3% of all the dark time, as compared to 33.7% in period 50 and 9.4% in period 49. The total amount of clear dark time was 1440hr in period 51, as compared to 1350hr in period 50 and 1470hr in period 49.

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 (49 and 50).

Table 2: Down-time statistics for period 51[a]

Syst/Type	Soft		Elec		Optics		Mech		Others		Total		P50/P49	
Telescope	2	00:50	9	00:20	2	00:00	3	04:10	3	08:50	19	14:10	8/14	10:50/01:45
Building	0		2	00:25	0		0		1	00:00	3	00:25	7/3	00:00/00:00
Computers	21	00:45	0		0		0		1	00:00	22	00:45	14/11	00:35/00:35
ALFOSC	26	01:15	3	00:00	0		2	03:00	0		31	04:15	39/23	00:45/01:40
MOSCA	1	00:00	0		0		0		1	00:00	2	00:00	0/3	00:00/00:00
NOTCam	8	00:50	4	00:00	0		2	00:00	1	00:20	15	01:10	10/2	00:15/00:00
StanCam	7	00:45	1	00:00	0		1	00:00	3	00:00	12	00:45	5/3	01:30/00:15
FIES	10	00:00	0		1	00:00	1	00:00	0		12	00:00	13/3	02:55/00:00
Others	3	00:00	0		0		0		4	00:00	7	00:00	5/6	00:00/00:10
Total	78	04:25	19	00:45	3	00:00	9	07:10	14	09:10	123	21:30	101/68	16:50/04:25
P50	74	06:05	8	00:00	1	00:00	11	09:15	7	01:30	101	16:50		
P49	43	02:45	12	00:40	1	00:15	6	00:30	6	00:15	68	04:25		

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

2.3 Main problems

There were 3 faults, spread over 5 fault reports, causing 2 hours or more downtime during period 51.

- **2015-05-09: ALFOSC grism wheel stuck**: 3hr 0m

  Due to a grism not being installed properly, the wheel got stuck when observations were started. This has occurred before and requires manually turning a shaft which moves the wheel, and which takes a fairly large amount of time. However, beyond identifying the problem itself, most time was lost in finding the detailed description how to remedy the problem in the fault data base. To avoid this in the future, the specific instructions what to do if this occurs has been added to the general trouble shooting information, but also the facility to search in the data has been upgraded to allow for a more targeted search.

- **2015-08-09/10/11: External power failure**: 8hr 50m

  During an unusual lightning storm in the summer, the general electrical power line to the observatory was damaged. Due to the very bad weather, it took several days for the local electricity company to repair the damage and restore power. This included a significant amount of time which would normally have been used for observing, which was reported as downtime. This is not a specific problem with any part of our observing system, and as such should in principle not be considered as part of technical downtime (I understand that at other telescopes this has been counted as weather downtime). However, it does affect the use of the telescope, and I have included it in the general overview given in the Table 2, and also shown the effect of including this downtime in Table 1. It should also be noted that if our technician would not have been on sick leave, we likely would have had our passive cooling system fully automated, and we would have been able to observe normally just using our emergency power generator.

- **2015-09-10/11: Main mirror bellows**: 4hr 10m

  Some problems where found with the optical quality of imaging data, showing varying distortions of the star images, not allowing the telescope to be focused properly and effecting observations. It become soon clear that the problem was with the adaptive optics system of the main mirror, but which part (electronic, mechanic or pneumatic) of the system was not clear. Some first adjustments of the system remedied the problem somewhat, but only after consultation with our technician the problem was localised to the individual bellows which support and shape the main mirror. A full check of all the bellows revealed that the pressure regulators of 2 bellows were failing, and they were replaced. These are only the second and third of the regulators which have failed since there installation, and it is actually suspected that one of the regulators already failed earlier, explaining some of the problems we encountered since re-installing the mirrors after their aluminisation last year.

  One of the issues in identify the problem was that the pressure regulators do have a sensor to check if they work, but these sensors are very unreliable, and have been deactivated for a long time. We could replace the regulators, but they are rather expensive and replacing them would require a lot of work, and telescope downtime. To avoid future problems, a system has now been set up to regularly check the pressure regulators manually.

3 Instrument use

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

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

As before, most comments written in the reports during period 51 were very positive, both about the observing system and the support from the staff.

In general, there were very few comments, mostly referring to the weather or faults that were also reported through the fault data base. A suggestion was made as for a better weather forecast to use.

Table 3: Instrument use

Instrument	No. of nights		No. of runs	Nights/run
	Scheduled	Technical		
ALFOSC	82.5	10	21[a]	1.7
FIES	65.5	6.5	20[b]	2.5
NOTCam	15	6.5	6[c]	1.5
MOSCA	20	1	3[d]	3.7

[a] Excluding 36 service nights [b] Excluding 10 service nights
[c] Excluding 2.5 service night [d] Excluding 8 service nights

This was implemented. It was also noted that the focusing of the autoguider camera is not always optimal. We are working on improving this. When using StanCam as fiber viewer for FIES, the scaling of the image size is not specifically set, while the contrast settings for the images are changed with each new image. These parameters are now set to specific values when fiber viewing for a specific observation is started. It was suggested to make some standard commands that would combine various commands that would normally be executed together (e.g., when taking a number of BIAS images, setting the image header, setting the exposure type, and executing a 'dark' exposure command will be executed in sequence). This is just an example of a much larger set of 'standard' commands we are planning to make. In fact, as part of the Observing Block generator (see below), these kind of command sequences are already generated as part of complete observing scripts.

5 Service observing

During period 51 a total of 56 and a half nights of service observing were done. 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.

5.1 "Fast-Track" program

In period 47 there were 28 proposals accepted. Of these there were 17 'grade 1' proposals, 10 'grade 2' proposals, and one 'grade 3' proposal. All the 'grade 1' and 'grade 2' proposals have been completed before they expired at the end of period 51. The 'grade 3' was a time-critical proposal that could not be executed at the specific time, so it effectively expired.

In period 48 there were 18 proposals accepted. Of these there were 9 'grade 1' proposal and 9 'grade 2' proposals. All the 'grade 1' and 'grade 2' proposals have been completed.

In period 49 there were 21 proposals accepted. Of these there were 10 'grade 1' proposals, 8 'grade 2' proposals, and 3 'grade 3' proposal. Of the 'grade 1' proposals, 9 have been completed and 1 has been partially completed. Of the 'grade 2' proposals, 7 have been completed and 1 has been partially completed. All the 'grade 3' proposals have been completed.

In period 50 there were 14 proposals accepted. Of these there were 6 'grade 1' proposals, 5 'grade 2' proposals, and 3 'grade 3' proposal. All the 'grade 1' proposals have been completed. Of the 'grade 2' proposals, 4 have been completed, and 1 has been partially completed. All the 'grade 3' proposals have been completed.

In period 51 there were 8 proposals accepted. Of these there were 4 'grade 1' proposals, and 4 'grade 2' proposals. Of the 'grade 1' proposals, 3 have been completed. Of the 'grade 2' proposals, 3 have been completed.

In period 52 up to now, there were 4 proposals accepted. Of these there were 2 'grade 1' proposals, and 2 'grade 2' proposals. Of the 'grade 1' proposals, 1 has been completed. Of the 'grade 2' proposals, 1 has been partially completed.

5.2 Target-of-Opportunity, Monitoring & Fast-track Service Programs

The so-called Nordic service nights were originally introduced to execute the fast-track service programs. With time, and the increase of the number of ToO and Monitoring observing programs (typically adding up to 40+ nights in total in any given semester) that are executed throughout the semester, these nights have more and more been used to fit in observations for these programs. With the introduction of the new rules for the allocation of observing time and user contributions, we now also offer full compensation of time lost due to observations for ToO or Monitoring programs during regular observing runs. In particular, the compensation observations and a fair fraction of the Monitoring programs are executed through the same system that manages the Fast-track programs, and the number of Nordic service nights have been increased over the last few semesters for this purpose.

As users contributions are now required, properly managing the ToO, Monitoring & Fast-track Service Programmes have become more and more of an issue. A new software suite has been developed for this purpose which includes features such as a stand-alone interface for reporting program execution and a sophisticated tracking system that allows the PI to keep a detailed record of observations. From a management point of view, the system allows for a precise bookkeeping of the time spent for each program. This system will be further upgraded when all observations can be managed through the Observing Block generator, and the use of Observing Blocks will be obligatory.

The specific scheduling of the different Monitoring programs is now managed through a data-base system. The information in the data-base is used as input to our operational schedule, for checking of scheduling conflicts and for displaying the monitoring-schedule information for the observing staff (which include reminders to the staff by email).

6 Operations

6.1 Safety

There were some problems with the telescope entrance safety sensors. There are two sets of sensors at the front and back of the stairs. The amplifiers for both systems were replaced and the rear light transmitter was changed. New controller/amplifiers modules and transmitters and receivers have been purchased. Later, adjustments were made to the sensitivity setting of the sensors, and the specific operating frequency of the beams.

A worrying aspect is that when the system does not work, this is not specifically registered. This is an intrinsic problem in the design of the system. In the end it was decided to make a additional, passive system that verifies if the safety system is working. This will stop the telescope if the primary system fails.

6.2 Transport

A new car was purchased. As part of the purchase, our old car was being sold, but shortly before the deal was concluded this car had a major technical failure. The required repair was estimated to cost about as much as we were going to receive for the old car. In the end, still a reasonable deal could be made in which the old car was handed over without any repair, in return for 1000 Euro (as compared to the 2500 Euro estimated market value of the car).

6.3 Weather Station

The old weather station anemometer was repaired after damage from snow and ice in 2014. Also the Vaisala unit was secured after noting it was loose on its mount.

6.4 Telescope Building

6.4.1 External power

Lightning caused an external power failure of the electrical supply. It was necessary for the electricity company (Endesa) to get a special vehicle to the island to help identify the location of the problem, followed by the repair itself. As the weather was also bad, this took a rather long time.

When we do not have external power, the telescope can not be operated as we need the cooling to keep the electronics at working temperature, and the emergency electricity system (UPS) we have does not have sufficient capacity to keep the telescope running. When there is a power cut, we still have some time to stop and close the telescope as the electronics do not warm up that fast.

To avoid this problem, we have been working on a passive cooling system. As long as the outside temperature is low, which is likely the case in any night, we will be able to run the telescope always, even if there is no external power. For this to work, an electronic control unit was built, but due to the sickness of our technician this was not installed yet.

When there is a power cut, the UPS immediately supplies power. This comes first from its batteries, and the emergency generator is started as soon as possible. The batteries have only a limit capacity, and when the generator does not work, we can operate only for a short while. A system has been developed where the Telescope Control System (TCS) knows what is the remaining time the system can still be operated using the current capacity of the batteries. If there is no external power, and the battery capacity gets to the lowest level where we are still sure the telescope can be stopped and fully closed, the telescope will close down automatically.

During the extended period of the power cut, a temporary installation was made to use the passive cooling system by the local company that developed the electronic control unit for it. With the passive radiator cooling it was possible to get the water temperature down to approximately 17 C with an ambient temperature averaging around 12 C, showing that the system functions. In the limited time we might have operated the telescope when this was working, it was considered too dangerous to be used when regular observers are alone at the telescope, as there was no safety system in place to make sure this was working properly at all times.

When the electricity cable was finally repaired, observations were started within 1/2 hour.

6.4.2 Side ports

Work has continued with the installation of the automated side-ports. All the control boxes for the motors are now mounted and the communication wiring is almost complete. Some of the cable assemblies between the control boxes and the motors have been made. Power cabling to the boxes is still required. More rails have been mounted and almost all motors have been fitted to the side-ports.

Also here there has been some effect of the sickness of our technician, and we hope this to be finished soon after he returns to work.

6.4.3 Cooling System

The cooling system is set to cool the water to a given temperature. We have learned that this water temperature should not be too different from ambient temperature as this causes effects on the telescope encoders (likely due to thermal stress) that affects the telescope tracking. The idea is to make this automatically adjusted, but for the time being we do this manually. In particular, we change the set point between summer and winter. We now have added the current value to the data base so that at least we will be warned if the difference with the ambient temperature is too large and we have to adjust the temperature.

6.4.4 Lower hatch

There was a failure in the operation of the lower hatch during closing, which was probably caused by mechanically ware of the hinge which caused the hatch to bouncing back a short bit. This required the controls of the hatch to be changed to account for this, and make the hatch close properly. This caused some concern as the hatch is controlled by a PLC (programmable local control unit), and the programming device is a quite old laptop. We have spares for the PLCs but no spare for the programming device. The PLC programming software requires a Windows machine with an old fashioned serial port hardwired in it, and tests with an advanced USB based serial port on the old building drive laptop failed. Fortunately, we do have a Windows machine with an old fashioned serial port, and there was no problem to install the programming software and load a new program.

6.5 Telescope

6.5.1 Telescope Control Room

The control room cooling/heating system has failed. It was found that the electromagnetic valve for the cooling had seized up and it has been removed for repair. Also resetting the heating does not work so there is a problem with the heating system as well. This is being worked on.

6.5.2 Motors

Last semester one of the rotator motors had a problem with the brushes which were replaced. Buying a new spare is very expensive, so the old brushes were repaired. It was also found that replacing the brushes was very difficult, and some modifications were designed to make this simpler. It was decided to take the opportunity to make the modifications, test the repaired brushes, and check the brushes in the second rotator motors. This was very fortunate, as the brushes in that motor were also close to been worn out, and they were replaced. The repaired brushes work fine, and are currently installed.

As part of the investigation in to the problems with the image quality, it was suspected there might be problems with the brushes of the azimuth motors, and both units where opened and cleaned of carbon dust and any other residue. For the motor with the encoder mounted on it, this was a new procedure for all who participated, but was successfully done eventually. Some dust was removed and the brushes inspected and all found to be in good working order.

As part of being prepared for possible problems, some spare analogue PI boards for the altitude and azimuth drive systems were tested and configured.

6.5.3 Secondary top unit

Since the aluminisation last year we have had problems with the secondary displacement mechanism which compensates for the bending of the telescope with altitude. Extensive work was done on the secondary unit, mostly to restore it to the state it was in before aluminisation. It was found that friction between metal parts had caused the positioning problems. The mechanism was properly re-positioned to the original specifications. There is still some residual friction, and the position errors in the mechanism are still higher than before, but it is now at a level that should not effect the image quality.

Unfortunately during this work the encoder wires for part of the tilt mechanism used to align the secondary mirror were damaged. A software fix has been implemented to get around the lack of servo control of this mechanism which provides a satisfactory solution. The next time the secondary will be dismounted the encoder wiring can be repaired.

6.5.4 Image quality

As reported earlier, we have had problems with the image quality which we suspected to be related to problems with the displacement mechanism (see above). However, even after all the work on the displacement mechanism, we occasionally still had distorted images. Following the problems with the main mirror support (see below), everything seems to be back to as it was before. It was also discovered that there is a flaw in the autoguider correction software which can affect the image quality at high altitude. In fact, this has been in place for a very long time. The software is being corrected, and will be tested soon.

As for the problems with the bellows of the mirror support system, as noted these were only the second and third unit to ever fail, which makes us suspect that one unit (probably one on the outside and top of the mirror) already failed earlier, causing some of the image quality problems we encountered before. The position of this bellow likely means that in many positions the effect of it not working was rather limited. Together with the various issues with the secondary unit, but also the effect caused by the autoguider, this added to the sometimes very confusing results we obtained.

6.5.5 Mirrors

There were some serious problems with the mirror control system which support and shape the mirror. This adaptive optics system consists of 45 bellows which are controlled through a pneumatic system. When checking the individual bellows, it was found that in 2 of them the pressure regulators had failed. The regulators were replaced, after which things worked properly again.

The main mirror was washed again during the semester, and the photometric zero points measured with ALFOSC were found to be close to the “fresh aluminium measured after the aluminisation in summer 2014.

6.5.6 ADC

On-sky tests have shown that the ADC throughput has decreased from its initial 90% (across all wavelengths) to about 80%. It is thought this is due to dust building up on the top surface. However, it is difficult to get access to the ADC for cleaning, and we are still considering if, and when we want to clean it.

6.5.7 Telescope control system

If a power supply for one of the TCS crates fails, the time to change it can be many hours depending on the conditions. In one crate the supply sits well hidden inside and requires all cables to be disconnected and the crate to be taken out completely. To avoid loss of many hours observing time, a number of standard industry supplies were purchased and a design for just turning some switches to change to the spare supply was made. The main crate that handles most of the input/output now has got a spare supply and a set of switches installed so that the power source can be changed using the switches in a minute.

6.5.8 Guiding system

Some more work has been done on the focusing of the TV of the guiding system. After the basic implementation, it was checked that no excessive sound from high speed moving was heard from the camera mechanism during movement. No vibrations were detected but the speed was set a bit below full speed as a safety precaution and a box car filter has been applied to the sampled focus values to obtain a more stable result.

6.5.9 Instrument Communication Fibres

After the failure of one of the rotator motors which necessitated the lowering of the whole rotator, two communication fibres on the adapter no longer worked. The fibers were checked, and one simply needed re-seating of the fibre connectors, but the other appears to be broken inside the cable twist and so an available spare fibre is now used.

6.6 Observing system

6.6.1 Fault data base

When looking in the fault data base, it was found that the search facility of the data base is very limited which makes it hard to find a specific report. This facility has now been expanded, and includes the possibility to in- or exclude a set of specific keywords, making it much easier to find a particular report.

6.6.2 Computer system

An application to monitoring computer systems, networks and infrastructure was installed and configured in a dedicated server located at ORM. The complete telescope and service building network (10 servers, 5 instrument computers, 2 TCS computers, 9 computers, 13 switches and 3 web-sensors) are now being monitoring permanently.

In a next step, it is planned to include the San Antonio Office in the system.

6.6.3 Data archiving

A new data policy is being defined and several alternatives for redesigning the data storage system were studied. The main goals are the following:

- All raw and reduced data are available for staff at all the time (in a private NOT cloud). This also includes all the calibration files generated by the post-processing systems. All files will be compressed.
- Data in the archive at the observatory will be synchronised with an archive at the sea-level office. The access to archives will be across scripts internal to NOT.
- The public FTP server will be moved to a new machine and remote observers will be able to view its content immediately (now, they have to wait 5 minutes). 'Regular observer will have their own user account to download their observing data.
- The new system will be implemented in parallel to old system. When we are sure that all works fine, no more DVD will be burned.

In the coming semester this new system will be implemented.

6.6.4 Observing tools

There is a facility to check the visibility of targets in any given night. To remove any dependence external to NOT, the system was migrated from the ING to the NOT system, and the system was modified to show the specific limitations at the NOT.

6.6.5 Observing commands

The software for each instrument has internal checks to make sure lamps are not on when they should not, but it does not check if there is an other lamp on in a different instrument. To avoid such problems, a system wide command was made that checks the status of all the FIES/ALFOSC/NOTCAM lamps, and provides a WARNING if any one lamp is on. This script is executed in all the instrument set-up scripts that are normally run when switching from one instrument to an other.

Further work was made towards the implementation of the new FITS keywords that will carry information needed to link individual images to there corresponding observing blocks. A facility to automatically determine the observing mode in use, based on the setup-of the instrument was made.

6.6.6 Observing Blocks

Since the Observing Block (OB) generator was made publically available, more than 30 programs and an equal number of users are now using the OB Generator to prepare their observations at the NOT.

Programs that particularly benefit from the OB Generator are Fast-Track, Service, Monitoring & ToO programmes, where the execution is done either by staff or by the visiting observer.

With the launch of the OB generator and the increased demand on NOT staff to carry out a bigger variety of programs in service nights (Fast-Track, Service, Monitoring, ToO, Pay-Back, Queue), an upgrade of the observing planning tool was highly needed. Based on the Fast-Track management interface, a new tool named the 'OB Queue' has been developed which allows for optimal planning of all the kind of different programs that request observations through the use of the OB Generator. Remaining "old style OBs that were still active have all been ported to the new system.

The new OB generator has been used over the last half year also for NOTCam fast-tracks, although the compiler is not yet ready. This meant that all the instrument setup and observing scripts now are entered as comments in the OBs. The corresponding OB compiler for NOTCam is being developed.

6.6.7 Remote observing

A system using VNC graphical desktop sharing for remote is now in regular use. This removes the need of a separate observing system for remote observers, and provides an experience even closer to observing at the telescope.

6.6.8 Detectors

An agreement was signed with the NBI director on June 16 2015. This included a planning for the installation of the new FIES and ALFOSC detectors in September. However, there has been a large delay due to, principally, two reasons. The first was an unexpected reminiscence problem on the detectors. The second is the work on the video card, which was planned to only require some minor debugging, but it turned out that as the present design is around 10 years old, and some components were becoming obsolete. Furthermore, the planned parallel work of revising the other boards could not be done in parallel, but had to be done after the work on the video board. All this have added an extra 5.5 months of calendar time to the project as the situation is now.

The last received planning foresees the installation of the new FIES and ALFOSC CCDs in February 2016.

6.6.9 CryoTigers

On one occasion, the hose of the StanCam CryoTiger sprang a leak. The location of the leak seems to have been at exactly where the hose leaves the springs that connects it with the telescope rotator. The hose was repaired at a workshop on La Palma. The repaired hose has been cleaned inside with acetone and dried with compressed air. Then one end was sealed and again using the compressed air and a bucket of water the repair was checked for leaks and none found. A new connector was fitted to the end of the hose to replacing a known damaged one.

We have several CryoTiger gas bottles in various location around the telescope. This gas is highly inflammable and proper storage is required. Looking in to this, the best and safest solution is to store the bottles outside in suitable metal cabinets. Cabinets are being sourced.

Two new 20lb bottles of PT13 gas have been ordered along with a pair of filter dryers for the compressors. The filters have arrived but the gas is delayed due to problems with the transport.

6.7 ALFOSC

6.7.1 Instrument

In the event of a problem with either the ALFOSC grism or filter wheel, typically caused by poorly mounted optical components, it can be necessary to manually rotate the wheel. Although the procedure to remedy this is documented in a fault report, it is hard to find. Specific instructions on how to do this have been written (including a picture), have been provided on the web.

6.7.2 Imaging

A script was made for ALFOSC, where the telescope will point the telescope to the nearest/optimum Landolt standard field and will take UBVRI-frames using default integration times.

The (easyflat) script to take a (set of) flat field(s) have been expanded to include a reduction of the obtained data if 3 or more flat fields are obtained in the same filter.

6.7.3 Spectroscopy

A full report on the recently installed new VPH grisms is now provided on the ALFOSC web page. These new grisms are relatively large, and the ALFOSC grism wheel was modified to have all 3 VPH grisms installed at the same time.

The quicklook spectroscopic reduction script for ALFOSC has been upgrade to include a correction for the slit position when the standard wavelength solutions are applied to the extracted spectra. The precise slit position changes every time a slit is installed, which causes an apparent shift in the wavelength. Also, the automatic search for the target spectrum was modified to avoid the wrong identification of cosmic rays as a target.

A reported problem with the slow turn on of the ALFOSC He spectral calibration lamp was believed to be caused by a failing starter. Requesting spares from the manufactures Osram of the ST191 device they replied stating it is no longer manufactured and they could not suggest a direct replacement. Some normal fluorescent tube starters were tried but they did not turn on the lamp. After a lot of effort eventually a source of the ST191's was found in Sweden, and these were found to work properly.

6.7.4 Polarimetry

The update was made of the ALFOSC polarimetry web pages. Also the standard scripts were further optimised, turning the retarder-plate in parallel with reading out the detector.

6.8 FIES

6.8.1 FIES building

The cooling of the FIES front room changed, and the cause was found to be the failure of an external valve for the main cooling system water. The valve control unit was replaced and a second spare purchased.

We have a continued problem with the temperature monitoring system of FIES, with temperature sensors in the building failing one by one. We are currently down to 3 working units. As part of a potential upgrade of the science fibres for FIES, new equipment was identified to improved temperature control of the instrument room. This included a different temperature monitoring system, alternative temperature controllers and an accurate barometer. Quotes for this equipment were obtained.

6.8.2 Fiber viewing system

Info has been added to the FIES trouble-shooting section on how to observe with FIES when StanCam, which is used as fiber-viewing system, is not properly cooled by its CryoTiger. Even at relatively high temperatures (-40 C), it is still possible to observing source with FIES. In case that there is a problem with the cooling of StanCam which effects normal imaging observations, it might still be possible to observe with FIES normally.

6.8.3 Radial velocity stability

In collaboration with Lars Buchhave (StarPlan, Copenhagen, Denmark), and optical engineer Julian Stuermer (University of Chicago), and with the help of Gabor Furesz (MIT) and Christian Schwab (Macquarie University, Australia), a preliminary optical design was made for a new fiber bundle for FIES, aimed for high RV stability while offering the same set of resolutions offered now. The new bundle will allow polarimetry fibers to be connected to the spectrograph, but the design for the bundle is separated from the polarimetry-channel design at the telescope end.

6.8.4 FIESTool

The way that the reduction data is stored in the observing system has been rationalised. The reduced FIES files are now in sub-directories with the standard file prefix as directory names on a night-by-night basis. Once disk space will become available in our future reduced-data archive, the files can simply be moved over from the observing-system disk to the archive disk(s).

The automatic (headless) version of FIESTool permanently running in the background, and reducing all data take, is now automatically restarted every afternoon to make sure it works properly every night. The manual version of FIESTool is automatically killed every afternoon, and has to be restarted explicitly by the observer in case he/she want to use it.

6.8.5 Detector

A preventive warm-up and pumping was made of the detector. Unfortunately, this again introduced a fixed-pattern in the flat fields. This pattern is likely due to condensation on the CCD, but it flat-fields out perfectly. For the moment we decided to leave things as they are.

6.9 NOTCam

6.9.1 Imaging

As part of our investigation in to the problems with the image quality, regular tests were done with the NOTCam high-resolution camera which provides an image scale of 0.078 arcsec per pixel. To do such tests more regular, and make them part of the NOTCam calibration plan, a script will be made to do a full test every first night that NOTCam is mounted. This script should take little time, and can be done in twilight so should not interfere much with regular observations.

6.9.2 Spectroscopy

Due to the continuing problems of the slow starting of the Argon baffle lamp, a new AC type power supply was purchased and installed. This new PSU seems to have solved the timing issue. As delays are no longer an issue, the script to take calibration exposures can be made more efficient.

Specific instructions have been provided on the web on how to replace a spectral calibration baffle lamp.

The acquisition script to center a star includes measuring the slit position as it varies due to flexure of the instrument. A problem occurred in which the slit position was not properly determined, and observations were done without the object in the slit. As the slits in NOTCam are permanently mounted, the precise position of the slit is still fairly well defined, and a sanity check will be added to the target acquisition script that warns if the measured slit position is far away from the nominal position.

6.9.3 Detector

One of the NOTCam detector quadrants failed. All the external wiring and associated boards in the controller were checked, but nothing could be found. The pre-amplifiers, mounted in small die-cast boxes on the side of the NOTCam vessel, where examined and amplifiers swapped but still the problem persisted. Then the amplifier boxes where physically removed, exposing the electrical connections of the detector, but as before nothing could be seen wrong. The boxes where remounted and magically the quadrant started working! It is believed that the probable cause of the fault was liquid nitrogen spilling from the filling tube which is directly above these amplifier boxes and associated vacuum connectors. A cardboard cover was made to protect the amplifiers from further LN2 spillage.

The ”reset level” is the count level of the pre-integration readout of the array. It is supposed to be a function of detector temperature. When commissioning the array, it was adjusted to an optimal level, i.e. a level that maximises the dynamical range and minimises bad pixels. Over the years we have experienced various jumps in this level, needing a re-adjustment of the dc-offset voltages each time.

It was found that having the detector controller always switched on we no longer saw large jumps. However, recently large jumps have happened again and therefore the voltages needed to be adjusted. The monitoring of the reset-level has been restarted.

6.9.4 Vacuum & Cooling

NOTCam has been running cold for two years without opening. This is a new record, but we have started to noticed that the holding time has become short and the average pressure has increasing from 2E-4 mbar to 5E-4 mbar, while also the pressure variations have a higher amplitude with temperature fluctuations (i.e. between LN2 filling cycles). Thus, there is a need to warm-up NOTCam and open it in the service building clean room, in order to bake the charcoal and pump NOTCam warm.

The opportunity should be taken to install some optical components for testing, and take out a filter for proper characterising. In particular, there is an interest in having an additional warm filter wheel for the NTE IR imager. This requires blocking the thermal emission somehow. As a preparatory exercise it has been suggested to test a narrow-band filter (VISTA NB118, centred on 1.1185 microns and 0.012 micron wide) in front of NOTCam, i.e. outside the Cryostats in the cookie box, and using the J-band filter as a blocker. In addition, because it is not well known to what extent the J-band does not leak, thermal blocking through a KDP (potassium dihydrogen phosphate) crystal and its deuterated analog DKDP will be tested. These will need to be surface treated, as they don't like water vapour. In order to minimise the effect of a non-perfect optical surface, the KDPs will be put in the aperture wheel, and to reduce the cost, the small (18mm) slots will be used as this is sufficient for testing. (It should be noted that if the KDPs are working well, they will also solve the problem we are facing with our leaking Z-band filter.) Two small test KDPs have been ordered for testing and we hope they will arrive by Christmas such that they can be installed in NOTCam when we open it.

We should also exchange/check the gear wheel bearings as it will be 4.5 years since they were previously exchanged (May 2011). This is part of our maintenance plan.

The opening is scheduled for January 2016, and a detailed plan is being made.

6.9.5 Reduction software

A bug was detected in the IRAF quick-look/reduction package notcam.cl that affected several tasks. The bug caused the scripts to crash when image extensions of higher number than 9 were used. Apparently, this was never tested and not discovered before.

The new bug-fixed version 2.7 of notcam.cl still needs to be installed at the sea-level office, and made available for download over the internet.

6.10 MOSCA

A link was added to the MOSCA web page where the current instrument set-up can be checked. This is specifically aimed as information for ToO programs.

There were some problems with the dewar pressure sensor. It was checked and a new O-ring was installed, after which there were no more problems.

6.11 NTE

The NOT is still contributing a substantial effort in project management towards the NTE. The NBI main project manager returned to work in September on reduced time, and is for the time being occupied with managing competing projects. The main advances are on sub-system prototypes, redesign of visual imaging filter wheel and cryogenics concept. Substantial advances towards the re-scoping of the imaging capabilities have been made.