Period 49
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 49: 2014-04-01 to 2014-10-01.

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 49.

A total of 68 fault reports were submitted, with an average time lost of 4 min per fault, for a total down time of 0.3% (0.2% on scheduled observing nights). Of these, 49 reported no time lost, 19 reported $<$ 2 hrs lost, and none reported 2 or more hrs lost.

This compares to a down time of 0.4% over all nights (0.4% on scheduled observing nights) in period 48, and 1.0% over all nights (1.0% on scheduled observing nights) in period 47. Of the 65 fault report in period 48, 40 reported no time lost, 25 reported $<$ 2 hrs lost, and none reported 2 or more hrs lost. Of the 69 fault report in period 47, 48 reported no time lost, 22 reported $<$ 2 hrs lost, and one reported 2 or more hrs lost.

Table 1: Technical down time statistic period 49: 2014-04-01 to 2014-10-01

Night included	Time lost	Nights	Percentage[a]	Last semester	Last Summer
All nights	265 min	183	0.3%	0.4%	1.0%
Scheduled observing nights[b]	165 min	160	0.2%	0.4%	1.0%
Technical nights	5 min	23	0.0%	0.3%	0.4%
Service nights	95 min	34.5	0.5%	0.4%	3.2%
Visitor instruments	0 min	0	0.0%	0.0%	0.5%

[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

Both the downtime and the number of fault reports were very low this semester again, the former being at an all time low. The last 12 months had also the lowest downtime (0.3%) ever recorded over a full year.

2.1 Weather

For period 48 a total of 153hr 17min was lost due to bad weather which corresponds to 9.4% of all the dark time, as compared to 29.5% in period 48 and 10.8% in period 47. The total amount of clear dark time was 1470hr in period 49, as compared to 1437hr in period 48 and 1448hr in period 47.

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 (47 and 48).

Table 2: Down-time statistics for period 49[a]

Syst/Type	Soft		Elec		Optics		Mech		Others		Total		P48/P47	
Telescope	5	00:35	4	00:40	1	00:15	2	00:00	2	00:15	14	01:45	10/12	00:50/06:50
Building	0		2	00:00	0		1	00:00	0		3	00:00	1/3	00:00/01:00
Computers	10	00:35	0		0		0		1	00:00	11	00:35	8/8	00:30/00:30
ALFOSC	20	01:10	2	00:00	0		1	00:30	0		23	01:40	25/19	05:05/03:17
MOSCA	0		3	00:00	0		0		0		3	00:00	5/2	01:00/00:00
NOTCam	2	00:00	0		0		0		0		2	00:00	3/9	00:00/01:55
StanCam	2	00:15	0		0		0		1	00:00	3	00:15	0/1	00:00/00:00
FIES	2	00:00	1	00:00	0		0		0		3	00:00	9/8	00:00/01:35
Others	2	00:10	0		0		2	00:00	2	00:00	6	00:10	4/7	00:00/00:40
Total	43	02:45	12	00:40	1	00:15	6	00:30	6	00:15	68	04:25	65/69	07:30/15:47
P48	42	04:55	10	01:30	1	00:00	7	00:45	5	00:20	65	07:30		
P47	35	04:42	17	10:10	3	00:00	7	00:00	7	00:55	69	15:47		

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

2.3 Main problems

There was no fault, or a number fault reports caused by the same problem that caused more than 2 hours downtime during period 48.

However, we have had various issues with the alignment of the secondary after the aluminisation. The secondary mirror unit has a tilt mechanism to align it properly with the optical axis of the system, and a displacement mechanism that corrects for the flexure of the telescope as a function of zenith distance. When remounting the mirror we had some problems installing it properly, which likely damaged the displacement mechanism, and caused some misalignment of the mirror unit. This has caused some minor degradation of the image quality under the best seeing conditions, and caused some misalignment in the pointing which is mostly an inconvenience. The main issue has been that we have had a lot of problems with identifying the precise problem, and correcting this. We do believe that we recently have successfully corrected the tilt of the secondary unit, but we are not sure if there is still an issue with the displacement mechanism as the weather has not allowed us to check things properly over the last few couple of weeks as the weather has been very poor. In any case, we now have a good idea of where any remaining problems might be, and how to solve this, and as soon as we have sufficiently good weather we should be able to confirm if the system is fully functioning, or if some more work is needed.

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 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	71	11.5	24[a]	2.1
FIES	56.5	5	18[b]	2.4
NOTCam	16	4	10[c]	1.5
MOSCA	16.5	0.5	5	3.3
Aluminisation	–	2	–	–

[a] Excluding 19.5 service nights [b] Excluding 13.5 service nights
[c] Excluding 1.5 service night

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

As before, most comments written in the reports during period 49 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. Some remarks were made about the description of the new automatic fiber guiding for FIES being confusing. The documentation was improved to clarify the different behavior when the fiber guiding is used, or when the star acquisition is done automicatically. There was also a complained about the observers not being informed properly about the lack of transport at the observatory, but that was caused by the observers not reading the documentation that is provided to them automatically a month in advance of an observing run.

5 Operations

5.1 Safety

The improve the safety when people are working alone at the telescope, a “Short Term Alarm” facility has been developed and offered to the observers at NOT. This STA is basically a timer which can be activated for a given period during which the person(s) are planning to make short journeys between the facilities on the mountain: e.g., Control Room to Service Building, or Telescope to Residencia. The functionality is identical to the existing “Travel Time Monitor” which we use when travelling between sea-level and the observatory; An increasing circle of observatory personnel are notified through automated email messages if the timer for a given person has not been stopped before reaching the set time limit. We are investigating to expand the notification services to also include an automated telephone call through our newly installed telephone exchange service.

An issue related to safety, is knowing who is expected to be in our facilities on the mountain. Through our data-base duty and observing schedule system we in principle know who is on duty, and who are observing. Information on the people expected to be on site is now being collected and processed each day, for three different parts of the day (morning, afternoon and night).

To improve safety in the workshop, a separate storage box has been placed outside to keep chemicals (oil paints, cleaning liquids, etc.). Also, various old barrels standing outside were removed.

5.2 Service observing

During period 49 a total of 34 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.

5.3 “Fast-Track” program

5.3.1 Proposals

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. All proposals were completed before they expired.

In period 46 there were 18 proposals accepted. Of these there were 14 ‘grade 1’ proposals, 4 ‘grade 2’ proposals, and no ‘grade 3’ proposal. All the proposals have been completed.

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. Of the ‘grade 1’ proposals, 15 have been completed and 2 have been partially completed. All the ‘grade 2’ proposals have been completed. 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. Of the 'grade 1' proposals, 8 have been completed and 1 has been partially completed. Of the 'grade 2' proposals, 7 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, 6 have been completed and 3 have been partially completed. Of the 'grade 2' proposals, 5 have been completed. All the 'grade 3' proposals have been completed.

In period 50 there is up to now 1 proposal accepted, which was rated as 'grade 2'.

5.3.2 Miscellaneous

Some cosmetic improvement were made to the web interface used when selecting, executing, and updating the status of the observing block descriptions used by the fast-track system. Also, a more flexible file format to enter the information is now used, that is allowed by most browsers and is more fail-safe than the previous format.

The system used to assess and follow the status of specific fast-track proposals has been improved further to ensure all proposals are properly processed and tracked afterwards.

5.4 Observatory installations

5.4.1 Uninterruptible power supply

Finally, the new UPS units arrived and were installed. Also a communication card was ordered and installed, providing full control of the unit through ethernet with all kinds of information about consumption, fail states, etc. We are now in the process of adding all this information it to our general monitoring system.

The final design of the electricity circuit provided by the normal mains and the generator through the UPS was slightly changed. All non-essential devices are connected after the generator, but before the UPS, such that the full load will only apply when the generator is working. This also makes the modification simpler and cheaper.

The new UPS units are 99% efficient, so this should results in a somewhat lower consumption. Also, all light bulbs in the telescope entrance and control room were changed to LED type.

There was a mechanical problem with the generator where a glass cup was broken, resulting in the diesel tank emptying. The cup was replaced with a metallic one, and the tank was refilled.

5.4.2 Cooling

Our efforts to modify the cooling system were complicated by the fact that the right kind of valve (a 3-way servo valve with differential thermostatic control and adjustable set point) we needed was not easy to get within the specifications we had. The design was modified, no longer using the cooling water for the cooling of the FIES building, but purchasing a separate (small) cooling unit for the FIES building. This removes that need for the 3-way valve, making the overall design simpler (and likely more reliable) while the overall cost is basically the same.

5.4.3 Visitor's office

The visitors office in the service building was cleaned and converted to a storage room. Some furniture was purchased, and spares and material from the staff office, workshop and electronics lab were stored in the room.

5.5 Telescope Building

5.5.1 Building drive

There still is an issue with getting any error messages from the building drive in to our general logging and data-base system. A possible way was noted on a SIEMENS technical web forum, but this needs to be investigated. As an alternative, a preliminary design was made for a device that can read the messages from the building drive, detect any error messages, and send those to the observing system log. The hardware cost would be low, but it would require significant development work.

When there is a building drive error, we currently do a full power-off of the telescope, read and note down the error message, and power on again. However, the time to do an automatic soft power cycling of the drive system is normally sufficiently short to not cause any problems with the telescope getting too close to the building, and it should be possible to do a reset without powering off the telescope. The error message on the building drive can then be read later. The precise way in which this can be implemented will need to be considered. E.g., if the telescope has a high tracking rate in azimuth (when close to zenith), there might not be sufficient time for the power cycle, while it also depends on the specific error in the building drive if a a power cycle actually solves the problem.

5.5.2 Dome side ports

To improve the ventilation of the dome during the night, the telescope building has side ports that consists of 4 sets of 2 doors. For reasons of safety and the general objective of automating telescope operations as much as possible we are motorising the side-ports. A lot of progress was made, where most of the mechanical and electronic parts have been installed, and the computer system commanding the system has been setup. A more flexible, custom made system has been developed to control the side-ports in a more efficient way, but the idea is to first control the system using the controllers supplied with the motors.

5.5.3 Thermal Monitoring System

Some faulty components needed to be replaced in the new board designed to replace the existing Thermal Monitoring System (TMS), so it has not been installed yet. Some test procedures were written to check the operations of the new board when it is tested.

5.6 Telescope

5.6.1 General

A failure occurred of the power supply of the telescope Interlock when powering on. The power supply was replaced with the last spare. In the meantime, two units that had previously failed were repaired.

The rotator brakes air pressure valve was found to be leaking, and a new one has been installed.

5.6.2 Tracking

Further data is being collected to record the variation in the periodic errors as a function of telescope position. The resulting measured amplitudes and offsets of the errors will be the basis for a look-up table with high resolution corrections for Alt and Az to improve the tracking as a function of position.

5.6.3 Telescope control system

We have been able to order the various spares that were mentioned in the last report. A returning issue noted in our search for spares is that the OS-9 operating system we have is relatively old and does not allow for more modern hardware. A study was made of a possible alternative to the present TCS system. This would be a VME system with a powerful processor, a small UPS to allow full file system update before loosing all power, redundant power supply consisting of 2 identical supplies with a control unit so that when the supply in use breaks the control unit immediately connects the other one, causing zero loss of observing time. The operating system would be real time Linux. The main advantage of a new system is that it is much more powerful and versatile, and spares should be off-the-shelf. However, the software is expensive to develop and maintain, and requires a significant amount of work to install and verify. The main advantage of keeping the current TCS is that it does not require extra work. The main issue is the availability and cost of spares. Potential sources for the required spars have been found, but these are typically refurbished units that are relatively expensive. It is thought that there are sufficient supplies of spares for at least 10 years, but that the cost of spares and maintenance effort will increase over the years. A detailed estimate of cost is being made, where likely the projected future of the telescope and its staffing will be the deciding factor.

5.6.4 Mirror reflectivity

No dramatic changes were found in the ALFOSC zero point monitoring and M1 reflectivity measurements beyond the expected steady decline. The aluminisation scheduled for June 2014 will continue as planned.

5.6.5 Guiding system

As reported earlier, 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, originally a hardware solution had been designed to do the turn counting. In the end it was decided to replace the encoders themselves with encoders that have the same mechanical properties as the existing ones, but that incorporate the multi-turn counting facility. These new encoders have arrived, and were successfully tested with the TCS development system. The new version of the adapter program is ready to be taken into use and will be executing at 10 Hz instead as of now with 100 Hz since guide probe turn counting will not be an issue. The speed of the guide probe can be maximised and several percent CPU load will be saved. The system will be installed as soon as possible. Some parameters will have to be adjusted to compensate for the lower frequency. With the new system, the speed of movement of the guide probe can be significantly increased.

5.6.6 Weather information

Various improvements were made to the weather page. This includes displaying the angular distance to the Moon on SkyCam image, providing the elevation of the Sun and the Moon, and the illumination fraction of the Moon in tabular form, and provide a way to toggle the brightness of the web page background (to make it better readable depending on the surrounding lighting).

5.7 Observing system

5.7.1 Telescope related commands

Various improvements were made in relation to TCS commands that can be given through the observing system.

To make scripting of observations easier, the tcs.guide-object command has been updated to allow for optionally defining the field rotation. It was noted that defining the PA give different rotator positions depending on the instrument and configuration (e.g., horizontal or vertical slit) used. In the above way you have the same capability in scripting mode as in command line mode (i.e., you will have to define yourself what field rotation to use to get a desired PA).

One observer had a problem identifying a target because the parameters for proper motion in the sequencer command 'tcs.enter-object' where set to non-zero values by accident. To be more clear, the command shows on the screen what has been entered (object name, RA, Dec, Epoch, RA proper motion (arcsec/hour), etc) so one can see what parameters were specifically entered. Furthermore, the command was modified such that the values for proper motion and magnitude are only optional, and are automatically set to zero if not given.

Offset commands are provided to move the telescope with respect to the orientation on the detector. Especially if one uses non-standard field rotation angles (e.g., the parallactic angle) it is not obvious how the directions on the detector relate to RA and Dec. For convenience, separate commands (tcs.radelta and tcs.dec-delta) were made that moves the telescope in RA or Dec, independent of the specific orientation of the detector (e.g., this can be used to center a slit on an object which is positioned at a given offset from a nearby star).

A thing noted is that if you measure and set the telescope focus from the sequencer, the value is reset every time you run the instrument setup script (tcs.setup-tel-<instrument-name>) script for the same instrument (e.g., after having used an other instrument). The system has been changed such that if the system for an instrument is started up, the system value is set to the default telescope focus value, but all the instrument scripts have been modified to set the telescope focus to the system value that is defined during the on-going observing session, rather than the default value.

Only for ALFOSC there is a fully automatic focus routine, and this script (alfosc.focus) has been modified to update the system focus value to the value found from the script. The other scripts defining the telescope focus (alfosc.focuspyr, notcam.focuspyr, stancam.focus-auto and mosca.focus-auto) have been modified to print a line saying that once the telescope focus has been set, to execute a script (tcs.updatefocus) to update the system value for the telescope focus.

5.7.2 Observing Blocks

The software needed to translate the Observing Block description into a set of executable sequencer commands has been developed for FIES and the ALFOSC in Imaging and Spectroscopy modes, and is actively being tested. Beyond some technical comments, it was noted that in practise the system of defining OBs, converting them, and executing the resulting scripts was considered to not be very transparent, or intuitive to use. This has also partly to do with individual preferences, and it was decided to have a joint appraisal, test and upgrade session with all the astronomy and software staff involved. The idea is to come to some consensus on how to improve the user friendliness of the system.

The compiler modules for the remaining instruments/modes will be developed and tested in the coming months.

5.7.3 FITS headers

A draft of the updated version of the document defining the complete set of FITS header keywords to be used at the NOT was circulated several times, and a final version is being prepared. Based on this document, a list of the keywords which need to be revised and/or updated will be made.

5.7.4 Data-flow at the NOT

We have been working on writing a renewed set of policies covering the production, treatment, distribution and archiving of NOT's data. This policy will set guidelines for the improved treatment of data, which will define the hardware requirements, and will involve the development of new software to automate as much as possible these tasks.

5.7.5 Remote access

Due to a (potentially) low band-width when observing remotely, we have a somewhat reduced system in use when accessing the system remotely. This is not an optimal situation, but the design of the software does not allow a simple solution. Using VNC graphical desktop sharing is both very convenient and should be less depend on band-width. Life tests will be done during the coming observing courses.

5.7.6 Detectors

We are still waiting for the new (e2v CCD231-42) detectors for FIES and ALFOSC, which the NBI in Copenhagen, Denmark, would deliver, each with a fully upgrade detector controller. The upgrade in the controller should address various pending issue from the commissioning of the current controller for the ALFOSC detector, and includes detector temperature control. Currently, we have a verbal agreement for them to arrive in September. A formal agreement will need to be made.

As far as possible, all the preparations for their arrival on the NOT have been completed.

5.8 ALFOSC

5.8.1 Instrument

A relatively major problem occurred, with all ALFOSC wheel movements timing-out. In the end it was found that the 5V fuse in the motor controller was blown. No specific cause was discovered, but a spare fuse has now been attached to the side of the controller to allow a quick repair in case a similar problem occurs.

5.8.2 Observing system

The FASU filter wheels have absolute encoders and are not moved when they are thought to already be in the correct position. However, when moved by hand the software will not be aware of this. To avoid any problems, an option was added to the alfosc.wheels command that allows a full set-up of the instrument in a single command, to force the FASU wheels to move to a specific position if so requested even when it is already supposed to be in the correct position.

To increase the observing efficiency, as part of dither scripts, the telescope can be moved during detector read out. However, when using the fast read-out speed there are issues with the timing when only part of the detector is read-out. The latter needs to be solved before a general implementation of this feature in dither scripts can be implemented.

5.8.3 Imaging

Some basic statistics were done on all the image data taken with ALFOSC in the UBVRI filters. These are seeing values based on raw frames analysed using SExtractor. The data has been taken between April 2007 and November 2013, and the results can be found at

`http://www.not.iac.es/weather/seeing/alfosc_see.html`

For data within air-mass <1.74 (lower hatch limit), with exposure time longer than 70 seconds, with more than ten stars detected in the frame, and excluding data with extreme telescope focus values (likely being out of focus images), we find raw median seeing values of 1.18", 1.04", 0.86", 0.89", 0.82" in UBVRI, respectively.

5.8.4 Spectroscopy

A 40-arcsec wide long-slit was produced for us by the NBI, Copenhagen, Denmark, as part of a MOS-mask batch. The new slit was requested by Enric Palle (IAC) for accurate measurements of solar-system objects. In particular it was used to do spectrophotometry of the Earth-Sun transit as seen from two Jovian moons, both simultaneously sampled on the slit.

Through people at the TNG, we are currently exploring the possibility to enter a collaboration with the "Osservatorio Astronomico di Brera" in Milan, Italy, who are developing Volume-Phase Holographic (VPH) grisms for the ALFOSC clone AFOSC at the Asiago observatory in Italy. We have agreed on the design of a set of 3 high-efficiency grisms covering the "blue" (337–523 nm), "green" (443–687 nm), and "red" (576–1000 nm) part of the wavelength range covered by ALFOSC at a resolution of ∼1000. In combination with the new CCD (see above), this would make ALFOSC even more attractive to do low-resolution spectra, especially in the red, of transient sources such as GRBs and SNe. At this moment we do not have any specific cost estimate, but each grism is expected to cost a couple of 1 000 Euro.

5.8.5 Multi-Object Spectroscopy

In the past we have relied on the NBI, Copenhagen, Denmark, to assist with software to design MOS masks and manufacture the masks for use with ALFOSC, but it seems clear they will no longer be able and willing to provide masks. For this reason, with have contacted the TNG, and mechanical tests were made from which it was concluded that they can provide MOS masks with well-defined slits with a width of 1.7 arcsec. Furthermore, we have developed software tools to help users design MOS masks, and define a standard way to transform the user's design to the format needed by the cutting machine. In principle, the idea is to offer this as the standard set-up for MOS observations in the future.

A new MOS-mode web page was created with more recent examples, update target acquisition procedure, and the features of the new MOS design software, while removing all references to the now obsolete MOSPLATE program.

5.8.6 Polarimetry

Part of the optics used with the FAPOL polarimetry unit is a calcite mounted in the slit wheel of ALFOSC. When checking the calcite after some report of features in the images when doing polarimetry with FAPOL, it was noted that the calcite was rather dirty. Various tests were made, and it was concluded that using standard observing and data reduction procedures results are not affected by this.

5.8.7 Detector controller

Observes noted that when using binning with ALFOSC you get additional noise in the form of vertical lines. It was found that the vertical strips seen in xbinned images is due to the lose of synchronisation of the controller power supply with the pixel readout timing. When you do binning in X the pixel time increases so giving a none integer period for the PSU to synchronise. For xbin 2 reducing the 'tsam' from 172 clock to 136 clock returns the synchronisation, and no strips are seen. The shorter sample time does increase the noise by $\sim$1 ADU (0.3 e-) compared with no binning.

The Dewar Interface Board (DIB) in the CCD3 controller failed again with identical symptoms as before, a bias level of $\sim$9100 ADU and no signal from amplifier A and a very high level $\sim$700k ADU from amplifier B. The board was replaced and two new boards were requested (and received) from NBI, Copenhagen, Denmark.

5.9 FIES

5.9.1 FIES building

All the preparations were made to install the new CCD pumping system that will allow to have the pump in the FIES front room, and reduce the change in the temperature in the FIES room when the dewar needs to be pumped. The system will be installed when the new CCD is in place (see above).

5.9.2 Instrument

A recurring problem with the ethernet connection to the FIES calibration unit control box located at the telescope when switching on one of the calibration lamps is thought to be caused by the power supply serving both the control box and the lamps. When a lamp is switched-on, the voltage of the power supply is reduce causing the MOXA box of the controller to reboot. An additional power supply has been installed to provide power for the two MOXA boxes separately.

As part of providing a full set of spares, the content of the two FIES Top Unit motor controllers (for the mask and arm movement) have been read so new ones can be programmed if needed.

Due to EU regulation regarding radio-active materials (Thorium), the standard ThAr lamps are no longer produced in the EU and hard to find. There is a company still producing ThAr lamps, but it is said that these are based on Thorium Oxide rather than metallic Thorium. We have borrowed such a lamp from the Mercator telescope for testing. In the mean time, to spare lamps, we no longer include the ThAr in the instrument (which is only infrequently used for the simultaneous ThAr mode), when taking our standard set of calibration exposures normally executed before the start of each observing night. We are considering to actually no longer offer the simultaneous ThAr mode as there are no specific advantages compared to taking ThAr exposures before and after a science exposure, except the time it takes to read out the detector. Especially if we receive the new detector controller for FIES (see above), the latter should not be any issue.

A paper with the title "FIES: The high-resolution Fiber-fed Echelle Spectrograph at the Nordic Optical Telescope" describing the FIES instrument has now been published. The official reference is "Telting et al., 2014, Astronomische Nachrichten, Vol.335, Issue 1, p.41"; see:

`http://cdsads.u-strasbg.fr/abs/2014AN....335...41T`

5.9.3 Radial velocity stability

As an indication of the long-term radial-velocity stability, observations of a standard star with the medium-resolution fiber as part of observing programs spanning various semesters show a standard deviation of 11.4 m/s. The measurements span 15 months (December 2012 – March 2014), which includes 2 times that the dewar of FIES was pumped.

Lars Buchhave (NBI & StarPlan, Copenhagen, Denmark) has expressed his wish to upgrade the fiber bundle in order to decrease the RV zero-point scatter for the high-resolution fiber from the current level of 8 m/s to an aimed-for level of 3 m/s. This involves the use of octagonal fibers and possibly also a double scrambler, the latter at an expected expense of about 20% of the light.

A questionnaire was sent around to the community to poll for other requested upgrades and to see if the expected loss of 20% of the light was found problematic. The general response was that what we currently offer is what the community wants. In order to meet Lars's and the communities wish we can retain the low-resolution and two medium-resolution fibers, and upgrade the high-resolution fiber for superior RV stability. The medium-resolution fibers can be made octagonal as well (without scrambler, so no additional loss of light).

There has been some discussion about the precise way how such changes might be implement. One issue is the design of the new fiber bundle, but also how to achieve optimal stability. The HARPS-N design incorporates a double scrambler, which may be difficult to install in our case. It has also been noted that directly coupling fibers with different shapes (octagonal, hexagonal, heptagonal or circular) in a face-to-face configuration, gives good scrambling results as well.

We had a meeting with Lars at the NOT office, and agreed that Lars will try to secure funds for a new fiber bundle, and we will provide a document that describes all the constraints that may impact on the design of a new bundle (which is needed to estimate the required cost).

5.9.4 Target acquisition

StanCam is used to image and center targets to be observed with FIES. Depending on the colour and faintness of the target, different filters or a clear filter can be used. For faint blue sources there is a bit of a problem. The Bessel B filter that is used largely overlaps with the cut-on of the glass used for the optics to re-image the fiber head on to the StanCam detector. For bright stars this combination gives an excellent attenuation, but for faint stars it is less optimal. To remedy this, a SDSS g'-filter was tested and found to give better results. This filter is now added to the filter set that is permanently installed in StanCam.

5.9.5 On-fiber guiding

The "on-fiber" guiding system is now in the final stages of testing. The system automatically does the whole process from the moment a star is imaged on the fiber head in movie mode, until it is properly centered on the fiber, and kept there. Various improvements were made to optimise the system. It was noted that new users still find the system complicated to use, and will have to be made more intuitive and easy to use before the full system is released for general use.

The offsets calculated by the automatic on-fiber guiding system is now also included in graphical form in the TCSDisplay of the observing system.

A new "handset" used to centered a star manually on the fiber has been developed for use with the system for on-fiber guiding. It now has the ability to turn the automatic on-fiber guiding system on or off, as well as having dynamic knowledge of the current state of this system.

5.9.6 Detector

There were two occasions in which the FIES dewar needed to be pumped. Based on feedback from an observer, the first of these pumping introduced a fixed high-frequency ripple pattern clearly seen in the summed flat field frames. The ripple pattern resembled additional but constant-in-time spacial pixel-to-pixel response variations, and could be fully removed as part of a standard reduction. After the second time the dewar was pumped the ripple pattern had disappeared again.

The CryoTiger compressor used for the FIES detector has an inbuilt filter, and the compressor will need to be send back to the supplier to allow for a regular filter change. A spare compressor is available to cover this period.

5.9.7 FIESTool

A "virtual-machine" distribution of FIESTool was released. This version of FIESTool can be installed on any operating system that supports the Virtual Machine. The FIESTool version should run out of the box. This tool is meant to remove the (non-trivial) installation and setup steps. After ironing out a few rough edges and testing it with regular observers, the virtual machine is now public and offered on our web site.

5.10 NOTCam

5.10.1 Instrument

NOTCam was warmed up and opened in October 2013. The clean room was prepared and cleaned for that work. Several parts in the filling and venting tubes were polished and refitted, and also several O-rings were changed. The pressure sensor was cleaned and re-installed and fitted with new O-rings. The sensor was compared with the sensor on the vacuum pump, and found to be in good agreement. The new KG2 ("red-leak" cut-off) filter was installed, the 64 micron slit was taken out as it is not used and to make room for a mask that was reinstalled, a tremendous metallic dust speck was removed from the collimator lens, and the instrument entrance window was wet cleaned with propanol.

It was found that switching on the buzzer that warns when the shutter does not work properly, caused the temperature reading of the instrument to give false readings. The receiver chip (26LS32) in the buzzer box was replaced, which fixed the problem.

A full review was made of the NOTCam calibration plan, and a new version was sent around for comments.

5.10.2 Observing system

A known problem with NOTCam is that sending an abort signal to the detector controller during an on-going exposure will cause the system to hang, requiring a restart of the system. It was noted that the 'abort' command has been disabled, but that doing a Ctrl-C when running a script can cause a problem when given at the wrong time. To avoid this, basically all commands that perform an exposure (exp/dark/frame/dframe) were modified such that it will ignore any Ctrl-C command (with an appropriate warning message in the Talker) when given during the execution of an exposure.

5.10.3 Imaging

The Z-filter we have has a severe red-leak. The optics supervisor at NDC Infrared Engineering (who made the Z-filter for us) suggested KG4 and BK7 as two possible ways to reduce the red leak. The 5mm BK7 reduces the thermal leak by only $\sim$25%, but has a 90% throughput in the Z-band. The 1mm KG4 we got was, however, out of specs with only 5% transmission at 830-930 nm, while it was supposed to have $\sim$70% transmission. The provider thought this was probably due to old age, and since they do not produce it any longer, they suggested to send us at no cost a 0.5mm KG2 filter as replacement.

The KG2 filter has now been installed. It is very thin and difficult to handle. Dome-flats with lamps ON and OFF were made to check throughput and thermal leak, scaling them to the K-band. Preliminary results show that the throughput of KG2 at 830-930 nm is much better than for KG4, but this needs to be properly quantified. The thermal blocking seems to be no better than the 25% reduction we get with BK7, but this also needs to be properly checked.

The best way to obtain imaging flats with NOTCam is differential twilight flats. The differential mode cancels both the thermal component and the dark. The flat field stability has been checked with a few master flats taken with the WF camera and the JHKs filters. Investigation of ratio flats in periods where NOTCam was mounted several days in a row suggest that stray light is a problem. There seems to be a larger difference between consecutive nights due to pointing on the sky than if the same blank field is repeated. This points to scattered light and different light gradients. We decided to re-install the WF-camera imaging mask, a square mask to be put in the aperture wheel to limit stray light in the system. Because the aperture wheel has only 4 large slots (+ 8 small) we decided to remove the 64 micron slit in order to find space for this mask. The mask was tested once in 2003, but not for twilight flats. On the dark sky it made little improvement and was removed to make space for slits. Full tests will now need to be made to see if this mask reduces stray light. Also, more extensive tests will be made to check the stability of the flat fields.

5.10.4 Spectroscopy

We do NIR spectroscopy from 0.8 to 2.4 microns with one single grism plus the broad-band filters ZYJHK. Each band has a different internal focus setting for the same slit. In the case of a low resolution spectroscopy mode covering the whole range from 0.8 to 2.4 microns, one would need to use one fixed focus setting. We have measured by how much we are out of focus at each wavelength extreme, both in the spatial and the dispersion direction, when using one fixed focus setting.

The focus shift in the dispersion direction is measured by setting the internal focus to the one for the J-band, and measure the width of the argon arc-lines at the approximate center of the wavelength bands. The focus deterioration is very small from J towards the red, and the maximum at Z would correspond to a loss in resolution of $\sim$20%.

Defocusing effects in the spatial direction were measured using a pinhole (which is displaced, however, with respect to the slit, such that only K is in focus at the upper end of the focus mechanism). ZYJHKs and a few narrow-band filter measurements were included. Here we see a best FWHM for Ks (2.14 microns) of 1.4 pixels and a worst case for Z (0.88 microns) of FWHM = 4.2 pixels.

Acquiring the target on the slit for NOTCam spectroscopy has up to now been done in a relatively manual way compared to the acquisition scripts available for ALFOSC and FIES. The procedure for NOTCam has two extra complications compared to optical spectroscopy: 1) sky subtraction may be needed to see the target in the acquisition image and 2) flexure of the instrument requires the slit position to be determined at every pointing. A slit acquisition script (notcam.acquisition) for NOTCam spectroscopy has been made. Some improvements are already identified, and some more testing is needed before it can be released to the users.

5.10.5 Detector

The so-called “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.

An extensive data set has been accumulated running a Cron job that monitors the reset level every hour when NOTCam is off telescope. Since monitoring accumulates 1 GB of data every day, a script was made to analyse the images and delete the images at once. Analysis of the data do show a relation with temperature, but the relation shows occasional jumps in zero-point, and changes in slope. The data sets needs to be analysed more in detail to search for the cause of this lack of stability, but the conclusion might be that no fixed value can be used, and this simply needs to be checked and adjusted when necessary.

5.10.6 Vacuum & Cooling

As part of opening NOTCam, several parts in the filling and venting tubes were polished and refitted, and also several O-rings were changed. This to reduce the recurrent problem when filling the dewar with LN_2 if NOTCam stays off the telescope for a longer time.

The flexible steel hoses that carry helium gas in the closed-loop PTR cooler are exposed to continuous stress. A new, more flexible hose was bought to replace the one that had to be repaired the most (the supply hose). Since then there has been a much lesser need of re-filling the system with Helium.

5.11 MOSCA

5.11.1 Observing system

An update of the control program for the FASU filter wheels was made in order to make it possible to move both FASU wheels simultaneously when observing with MOSCA. The sequencer command mosca.wheels that set the FASU filter wheels was optimised such that it will move both wheels at the same time when commanded, instead of moving one wheel at the time.

An update to the MOSCA focusing procedure was made, where the script now will check that the field rotation is default as otherwise the data can not be automatically analysed.

As a further improvement, the focus script will be upgrade to include the automatic selection of a focus field, the positioning of the telescope to this field, analyse the data, and applying the resulting best focus in a similar way as already existing for ALFOSC.

5.11.2 Detectors

The bias levels of the MOSCA detectors have shown some variability, especially between observing runs. This makes viewing images, especially those with low background levels, rather difficult as the contrast is very different in each CCD. A script has been written that automatically checks the levels and makes it easy to adjust the bias offsets.

5.12 StanCam

5.12.1 Dewar

After the refurbishment of the O-rings the StanCam dewar vacuum is been much more stable, only requiring 2 more pumpings during the semester. A new filter was installed in the CryoTiger, and since then the cooler brings the detector temperature back to nominal much faster than before.

5.13 NTE

A Collaboration Agreement was signed in February 2014 between the NOT and the NBI, Copenhagen, Denmark, to build the "NOT Transient Explorer" which consists of a medium resolution spectrograph covering the region from 350 nm to 1700 nm in two arms. This instrument is planned to be installed at the NOT in early 2018.

A significant amount of the management of the project is currently being done by NOT staff. In order to integrate the NTE project into the NOT organisation, key local staff was brought up-to-date with the state of the project. A small NTE workshop at the NOT office in San Antonio is being prepared to bring together the key people from the NBI and NOT to talk about the planning of the project towards the PDR which is foreseen for September this year.

As part of the NTE development, we have looked in more detail into the operation modes of the proposed NIR detectors 'H2RG' made by Teledyne, including the "SIDECAR" ASIC controller built by Teledyne specifically for these devices.

5.14 SOFIN

Finally, a request to send SOFIN to Potsdam, Germany, was received. Preparations were made for its shipment. As a courtesy, NOT has arranged for all the packing materials. The instrument is already packed, and will be send off soon.

All the FITS files on the SOFIN computer have been copied to a local machine before the was packed.

5.15 Computer system

5.15.1 Monitoring of the system

It has been a long-standing point of action to rationalise and improve the existing automated hardware & software monitoring, both expanding its coverage (to include more elements to be monitored), and as for the reaction of the system when presented with threats, particularly in informing the users about the potential problems they may encounter, as right now the information is typically relayed only to the computing group.

New hardware has been acquired to consolidate those services and the plan for the next months is to start standardising the way we access the information on the different services according to industry standards, and integrating all the identified services/resources under the same system.

As part of the preparations to set-up and configure a system to supervise and monitor the different critical computer and network systems at the NOT, extensive documentation on current system configuration where prepared.