Period 50
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 50: 2014-10-01 to 2015-04-01.

2 Down Time

The down time statistics are based on individual fault reports. In Table 1 I give the general down time statistics for period 50.

A total of 101 fault reports were submitted, with an average time lost of 10 min per fault, for a total down time of 0.8% (0.4% on scheduled observing nights). Of these, 79 reported no time lost, 20 reported < 2 hrs lost, and 2 reported 2 or more hrs lost.

This compares to a down time of 0.3% over all nights (0.2% on scheduled observing nights) in period 49, and 0.4% over all nights (0.4% on scheduled observing nights) in period 48. 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. 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.

Table 1: Technical down time statistic period 50: 2014-10-01 to 2015-04-01

Night included	Time lost	Nights	Percentage[a]	Last semester	Last Winter
All nights	1010 min	182	0.8%	0.3%	0.4%
Scheduled observing nights[b]	465 min	156.5	0.4%	0.2%	0.4%
Technical nights	545 min	25.5	3.2%	0.0%	0.3%
Service nights	230 min	42.5	0.8%	0.5%	0.4%
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

The downtime was somewhat higher, mostly due to one major failure discussed below. Still, the amount of downtime is not high. There were relatively many fault reports due to some new software scripts developed for ALFOSC having some teething problems, while the ‘regular problems with the detector software is being reported more diligently.

2.1 Weather

For period 50 a total of 687hr 20min was lost due to bad weather which corresponds to 33.7% of all the dark time, as compared to 9.4% in period 49 and 29.5% in period 48. The total amount of clear dark time was 1350hr in period 50, as compared to 1470hr in period 49 and 1437hr in period 48.

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 (48 and 49).

Table 2: Down-time statistics for period 50[a]

Syst/Type	Soft		Elec		Optics		Mech		Others		Total		P49/P48	
Telescope	2	00:20	1	00:00	0		4	09:00	1	01:30	8	10:50	14/10	01:45/00:50
Building	0		1	00:00	0		4	00:00	2	00:00	7	00:00	3/1	00:00/00:00
Computers	10	00:35	2	00:00	0		0		2	00:00	14	00:35	11/8	00:35/00:30
ALFOSC	36	00:45	2	00:00	1	00:00	0		0		39	00:45	23/25	01:40/05:05
MOSCA	0		0		0		0		0		0		3/5	00:00/01:00
NOTCam	6	00:00	2	00:00	0		2	00:15	0		10	00:15	2/3	00:00/00:00
StanCam	5	01:30	0		0		0		0		5	01:30	3/0	00:15/00:00
FIES	12	02:55	0		0		0		1	00:00	13	02:55	3/9	00:00/00:00
Others	3	00:00	0		0		1	00:00	1	00:00	5	00:00	6/4	00:10/00:00
Total	74	06:05	8	00:00	1	00:00	11	09:15	7	01:30	101	16:50	68/65	04:25/07:30
P49	43	02:45	12	00:40	1	00:15	6	00:30	6	00:15	68	04:25		
P48	42	04:55	10	01:30	1	00:00	7	00:45	5	00:20	65	07:30		

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

2.3 Main problems

There were two faults causing 2 hours or more downtime during period 50.

- **2014-11-13: FIES fiber guiding**: 2hr 0m

  The software routine to center a star on the fiber, and keep it on the fiber had a problem with one of the fibers. For an unknown reason the fiducial position for that fiber was very far off, outside the normal fiber of the fiber head. This caused the target to not be properly center, and let observers believe the target was in the fiber as no star was see outside the fiber. Beyond that the observers did not follow the instructions, the system also allowed unreasonable fiducial positions. The software has been upgrade to detect large deviations and warn the observers, pointing to the proper procedure to use. Also the instructions in the manual were updated to clarify this point.

- **2015-02-23: Rotator motor**: 9hr 0m

  During the night, with the telescope tracking on the sky, the telescope suddenly crashed giving an alarm about the rotator speed. It was soon established that the cause was a problem with the rotator motors. After a detailed investigations it was determined that the problem must be with one of the motors itself, not the electronics running the motors. However, to get to the motors, the whole rotator needs to be taken off which takes many hours, and it was decided to abandon for the night. The whole next day was used to dismount the rotator and dismantle the motor, where it was found that the motor brushes had failed as suspected. The brushes were replaced with a spare set, and the rotator reassembled, just in time for night time observations.

2.4 Longer term overview

To give a longer term view of the kind of faults, and the amount of downtime as a function of the system and kind of fault, in Table 3 an overview is given for the past 22 semester (the period over which the data base is in use), from April 1, 2004 till April 1, 2015. Over this period, there were 2030 fault reports, reporting a total of 331.5 hr down time. Beyond the amount of time lost and the number of faults reported, also the percentage for each is indicated. These numbers give a good indication of the range and distribution of the kind of problems that are encountered and need to be resolved to maintain operations.

Table 3: Down-time statistics for periods 29-50[a]

Syst/Type	Soft		Elec		Optics		Mech		Others		Total	
Telescope	138	17:45	161	61:35	3	00:15	82	51:30	26	07:05	410	138:10
%	6.8	5.4	7.9	18.6	0.1	0.1	4.0	15.5	1.3	2.1	20.2	41.7
Building	3	00:00	49	08:25	1	00:00	45	01:45	16	00:00	114	10:10
%	0.1	0.0	2.4	2.5	0.0	0.0	2.2	0.5	0.8	0.0	5.6	3.1
Computers	267	17:49	43	06:50	0	–	3	00:00	35	02:50	348	27:29
%	13.2	5.4	2.1	2.1	0.0	0.0	0.1	0.0	1.7	0.9	17.1	8.3
ALFOSC	375	41:57	67	20:35	30	03:05	20	07:45	20	01:10	512	74:32
%	18.5	12.7	3.3	6.2	1.5	0.9	1.0	2.3	1.0	0.4	25.2	22.5
MOSCA	31	04:50	11	00:20	3	00:00	8	00:30	4	00:40	57	06:20
%	1.5	1.5	0.5	0.1	0.1	0.0	0.4	0.2	0.2	0.2	2.8	1.9
NOTCam	119	06:10	32	01:45	7	00:40	28	16:15	14	01:50	200	26:40
%	5.9	1.9	1.6	0.5	0.3	0.2	1.4	4.9	0.7	0.6	9.9	8.0
StanCam	59	07:45	2	00:30	2	00:00	14	00:10	12	02:05	89	10:30
%	2.9	2.3	0.1	1.5	0.1	0.0	0.7	0.1	0.6	0.6	4.4	3.2
FIES[b]	115	18:10	37	06:35	1	00:00	6	00:40	7	00:55	166	26:20
%	5.7	5.5	1.8	2.0	0.0	0.0	0.3	0.2	0.3	0.3	8.2	7.9
Others	18	00:20	34	02:15	4	00:30	34	05:05	44	03:10	134	11:20
%	0.9	0.1	1.7	0.7	0.2	0.2	1.7	1.5	2.2	1.0	6.6	3.4
Total	1125	114:46	436	108:50	51	04:30	240	83:40	178	19:45	2030	331:31
%	55.4	34.6	21.5	32.8	2.5	1.4	11.8	25.2	8.8	6.0	100	100

[a] For each system-type category the total number of faults and total time lost is given. The corresponding percentage compared to all faults are given in the second line

[b] FIES was commissioned in early 2006, and the first observing run was in October of that year, at the start of period 34

3 Instrument use

Table 4 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 4: Instrument use

Instrument	No. of nights		No. of runs	Nights/run
	Scheduled	Technical		
ALFOSC	64	12	40[a]	1.0
FIES	65.5	9.5	19[b]	2.6
NOTCam	11	4	6[c]	1.5
MOSCA	16	0	4	4.0

[a] Excluding 24 service nights [b] Excluding 16.5 service nights
[c] Excluding 2 service night

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

As before, most comments written in the reports during period 50 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. One comment was about having the observing log display the information for a specific instrument when running the telescope setup script for that instrument. This will be implemented. It was noted that the FIES manual could be improved a bit by being more specific as to where (on which computer) to type a specific command. This has been improved. For ALFOSC it was noted that the automatic focusing script is very nice, but that the error messages when a problem occurs (e.g., due to clouds) are rather enigmatic. The error messages were reviewed, and made more specific and clear.

5 Publications

As always, in the beginning of 2015 an exhaustive search was made for publications (partly) based on observations made with the NOT in the previous year. In the list we include refereed journal publications in A&A, MNRAS, PASP, ApJ, ApJL, ApJS, Astronomische Nachrichten, Icarus, Nature, and Science. The list might not be complete, but is unlikely to have missed many publications. A total of 98 publications were found, in line with the number of publications in the last few years; see:

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

Some more extensive inquiries were made concerning PhD theses that were made (partly) based on NOT observations. This list is very likely incomplete, but up to now we have found 90 PhD theses.

6 User contributions

The new rules for the allocation of observing time were implemented effective with the start of period 51, i.e., with the last call for proposals with deadline on November 17, 2014. Following the rules, invoices were prepared and sent for programs requesting ToO and monitoring observations, or observations in queue or service mode, or educational use of the telescope. The total amount invoiced slightly exceeds half the amount budgeted for in this year, were the various ToO programs will have to make a further contribution if they use more than half the time they requested. It seems very likely that the total contribution in this year will reach the amount budgeted for.

For multi-object spectroscopy (MOS) with ALFOSC we now use the TNG services to manufacture the masks. The price to make masks has been agreed with the TNG, where the user is expected to reimbursed these costs to NOT. Detailed information in the price is provided on our web.

It is noted that also a fast-track proposal was received from a PI in the US, who indicated he was aware of, and accepted the rules. The observations were recently completed, and an invoice has been sent.

7 Service observing

During period 50 a total of 42 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.

8 "Fast-Track" program

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 before they expired.

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. 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, 8 have been completed and 2 have been partially completed. Of the 'grade 2' proposals, 6 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. Of the 'grade 1' proposals, 4 have been completed and 2 have been partially completed. All the 'grade 2' proposals have been completed. Of the 'grade 3' proposals, 1 has been completed, and 2 have been partially completed.

9 Operations

9.1 Safety

A safety feature was implemented in the dome that gives a signal when the telescope or rotator moves at high speed, even when the power is not on. Especially the rotator is a risk due to the low braking power.

9.2 Transport

We replaced one of our cars in 2013, but the other car is over 9 years old, and needs replacing as well. A study was made about the convenience for NOT of leasing or buying cars for the particular use we have. After reviewing our yearly car expenses, it is very clear that it is better to buy a car. Several offers were obtained from local car dealers, and in the end based on price, motor power and consumption, it was decided to go for a FORD focus. Our old car is being sold as part of the deal, but we very recently had a major failure of the car just before this part of the deal was completed. It seems that the repair is more expensive than the money we were going to receive for the old car, and we likely will end up with buying the new car and selling the old car as scrap metal, i.e., at a significantly lower price than foreseen.

9.3 Observatory installations

9.4 Telescope Building

9.4.1 Cooling

The passive ventilation system has been installed, and has been successfully tested hydraulically. An electronic control unit has been built by a local company, and is ready to be installed. The recent bad weather has been preventing this. When this is in place, we will be able to run the telescope only on the generator, only passively cooling the telescope. 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.

9.4.2 Side ports

The interface control box acting as an interface between the Ethernet and the control line to the motors, and which allows control of the ports by the TCS, was finished and tested.

Much of the motors, control boxes and rails have been installed, and we expect to finish this soon.

9.4.3 Electronics

The WWW based electronics inventory tables were completely re-written from using raw HTML to using LibreOffice spreadsheets to create the tables, this should make it easier to edit or change them in the future.

A new PC based oscilloscope (Picoscope 2007A) was purchased with one of the main reasons being troubleshooting, to be able to do long (days) of signal monitoring, that was previously done using paper chart recorders. To allow to record very long periods of time with short sample intervals, a program was developed to save and visualise the data.

9.5 Telescope

9.5.1 Motors

The main movements of the telescope, azimuth, altitude and rotation, are controlled through (old-fashioned) motors and tachometers that use brushes. There are infrequent, but recurring problems with this because the brushes wear out. A web page was set-up, detailing all the known work done on the altitude, azimuth and rotator motor brushes and tachometers to keep track of what has been done, and hopefully be able to do preventive maintenance on the brushes in the future, avoiding any night time problems.

9.5.2 Secondary top unit

It is clear that the secondary displacement unit has not been working properly at least since the aluminisation of the telescope mirrors in June 2014. Various adjustments and tests were made, but none of which has explained or fixed the problems.

The whole displacement motor/gearbox/linear mechanism was replaced with a spare. After installing the spare, the same variations in the position remained, so the original motor assembly was put back. In addition, the metal plate the displacement pin pushes against was moved such that it now presses again a flat smooth surface, though this has made no change to the performance of the displacement mechanism.

Further work is being planned.

9.5.3 Image quality

Since aluminisation, there seems to be some issue with the image quality, intermittently showing elongated images. A major difficulty in investigating this is that this is only clearly detectable during good seeing and using the NOTCam high-resolution camera.

Several measurements using the ALFOSC wave-front sensor have been made since the aluminisation of the telescope mirrors in June 2014, but the results are not so clear. It can be seen that the higher order aberrations of tri-coma and quad-astigmatism are consistent in magnitude to before removing the mirrors, though numbers for coma and astigmatism are more variable. Immediately after the aluminisation values for astigmatism were similar to before, but since November have increased to approximately 300nm from ∼150nm. On 15 October there was a problem with the air supply to the M1 support system and on 24 October more work on the position of M1 and M2 was done. Coma shows an increase, from typically 50nm to 160nm. If these aberrations cause elongated images as were observed, then you would expect similar angles from both aberrations but we do not see this. For astigmatism the angle is around 50 degrees where as for coma it has no preferred direction varying from 85 degs to -85 degs. It should be noted that it has never been understood that when we get good round images the wave-front sensing has typically given coma amplitudes of ∼50nm and astigmatism amplitudes of 150nm.

It has been suspected that the problems were caused by problems with the secondary displacement unit (see above), but several test showed no conclusive relation between the image quality and the deviations of the displacement unit. Original problems with the position of M1 and M2, problems with the M1 support system, and problems with the brushes of one of the azimuth motor probably confused things significantly, but our latest tests now shows that the secondary displacement unit is the problem.

9.5.4 Rotator

The major problem with the brushes of one of the rotator motors described above, was the first time these brushes failed since the telescope was assembled. One of the reasons why it took a lot of work to replace the brushes, was that dissembling the rotator and the motor was not done before, and turned out to be very cumbersome. However, the process itself was better understood, and some specialised tools were made to make this task easier so that on a future occasion a similar problem can be resolved in much less time.

As the rotator motors are constantly used in-tandem, it was decided to also check the brushes of the second motor, also giving a chance to try the new tools. We also planned to order a new spare set of brushes, but they turned out to be rather expensive. It was decided to try to repair the broken set of brushes, and try them in the second motor when it would be disassembled to check the state of the brushes. This was recently done, and the brushes in the second motor were in a much better state that those of the motor that failed, but still one of the brushes was close to being worn out, and after a successful test we left the repaired brushes mounted in the second motor. At the moment we are repairing this second set of brushes to have a working spare.

The rotator has a full range of about 400 degrees, that means that a position within 40 degrees from an end stop has a corresponding position 360 degrees away that gives the same field rotation. In some cases it could be preferred to have the rotator positioned for longest possible following of an object (e.g., for a planet transit observation). Normally the rotator goes the shortest way to the destination position. An option has been implemented so that if the reference position ends up within 40 degrees from an end stop it can be adjusted with 360 degrees to give longest possible following of an object when presetting the telescope.

9.5.5 Mirror reflectivity

M1 has been cleaned with CO_2 a few times during this winter, in particular after strong Calima. but it needs wet washing. This winter some rain water found its way to the surface of M1, and it needs to be cleaned. The degraded reflectivity is notable from the on-going ALFOSC zero-point monitoring as well. The intention is to wash M1 in the near future if weather allows.

9.5.6 Telescope control system

An inventory, testing and cleaning was made of all the VT100 terminal, both spares and the ones in use. Enough spares are available for some years, and apparently these terminals are also still made.

When there is ice on the catwalk around the telescope, there is a need to check if the entrance stairs can pass over the ice on the catwalk. In the recent cold period, so much ice had built up on the catwalk, that 2 observing nights were lost because the telescope could not turn. Checking if the stairs can pass over the ice is very cumbersome, and an option to run the telescope azimuth/building very slow was implemented, eliminating the use of a potentially critical engineering program. A person can now stand on the entrance stair or walk along on the catwalk while checking for ice/snow obstacles, and if an obstacle is noted, walk inside and press the ABORT (telescope stop) on the user interface keyboard. This lowers the risk for damage to the stair safety sensors.

In case of an external power failure and if the emergency generator is *not* running then there is limited time before the battery power in the UPS goes down. The TCS has now got access to this vital information so it can decide to close and power down in good time if there is no external power, and before the batteries runs out. A test program has verified that TCS gets the needed information. This will then be incorporated in the security handling.

9.5.7 Power supplies

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 some crates 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 of observing time, a number of standard industry supplies has been purchased, and a design was made to require just turning some switches to change to a spare supply. The most critical crate that handles most of the input/output has got a new spare supply installed and all cables prepared for the switches. The TCS main crate will make use of a dedicated, still unused spare. The switches are planned to be installed in the near future. After this, it will only take a few minutes to change to the spare supply for these two critical crates. The crates on the telescope have modular supplies at the front that are easily replaced in case of a failure.

9.5.8 Guiding system

The automatic focusing of the guide camera has been further developed so that a moderate search range in TV focus (+/-35 units) can be performed in 9 seconds with use of the highest possible moving speed of the TV focus. Before implemented this, the mechanism will be checked for vibrations and sound to avoid exposing it to too much wear.

9.6 Observing system

9.6.1 Data archiving

We a view to a transition to an automated archival of images as part of a new Data Saving Policy at NOT, several long standing issues with the archival hardware were resolved, expanding the available free space. Now there is an extra 2TB free where data can start being stored on a nightly basis, automatically.

9.6.2 Infosys

Telescope Ccontrol System (TCS) log entries are included in our observing system information system, commonly referred to as the Talker. However, the structure and types of messages provided is somewhat different than used for all the other parts of the observing system. All TCS command log entries and responses have been modified so they are more easily searched for in the web Talker interface. A mapping has been made to make warnings and errors appear in the same way in the observing system as the sequencer commands. After a review of the behaviour in practise to see if and what more is needed to make the TCS part appear the same as the sequencer part, this will be implemented.

When operating the observing system, a specific type of 'sequencer' X terminal is used. Beyond the activity log of the system provided in the Talker, logging of all commands and screen output in these observing system sequencer terminals was implemented. This gives detailed information about every command typed in these terminals and the output they give. This feature makes it easier to resolve problems as a complete list of commands given can be matched with other, already existing, sources of information.

9.6.3 Keywords

As part of the introduction of Observing Blocks (see below), 9 new FITS keywords describing properties of the observations, the proposal, PI and observing blocks is being added to the ALFOSC observing system. When implemented they will carry information needed to link individual images to there corresponding observing blocks, and to the type of data in the images needed to process and archive the data automatically.

9.6.4 Observing Blocks

The development of the full system to define OBs and generate observing scripts has been completed for FIES and ALFOSC in Imaging and Spectroscopy mode, and has been tested over the past few months. We feel that the system is close to ready for release, but we need some external checking of the system before considering releasing the system for general use. The PIs of ToO and Monitoring programs in period 51 were asked to help us as a ‘beta tester’. Based on this ’real-life’ experience we expect to be able to come to a version that is suitable for release to the general users, and it is our plan to make the use of the OB generator mandatory for ToO and Monitoring programs, and fast-track and service mode programs, in as far as they use FIES and ALFOSC in Imaging and Spectroscopy mode.

The OB interface allows observers to define fairly complex set of observations on a single target. If the required observations on the other hand involves simple exposures on a large set of different targets, using the interface is not optimal as it will require a fair amount repetitive typing. A suitable mechanism to allow observers to communicate with the OB generator based on OB templates, without the need of going through the complete OB definition using the graphical interface, has been defined. Only a limited amount of parameters can be changed this way, such as target details and exposure time; The remaining parameters are already pre-defined by the template. This method of uploading observing requests may also form the basis of programs requiring observations to be carried out in Rapid-Response-Mode.

9.6.5 Exposure time Calculator

The exposure time calculator has been further improved to include the full set of SDSS u’g’r’i’z’ filters for ALFOSC.

9.6.6 Remote observing

As mentioned in the previous report, we are working on an improvement for the user experience when observing in remote-mode. In particular, our aim is to remove the need of a separate observing system for the remote observers, which was implemented originally to overcome the problems presented by slow networks; the main benefit being to remove the duplicity of documentation, and relying on a single set of instructions and interface commands.

We tested VNC graphical desktop sharing for remote use with ALFOSC and NOTCAM and, though stressing the network – a problem that we will need to sort out –, it worked sufficiently well for general use. We have defined a permanent set up that simplifies the task of connecting at any time from a remote site and operate the approved instruments remotely. The new remote observing system access was successfully used during the FINCA remote school at the beginning of November, allowing them to use modes not available for remote observing before (like observing MOS targets), as they are part of the normal set-up, but no specialised remote version had been made or tested.

The new system was also used for a remote MOSCA observing run on Christmas night made from a kitchen in Norway.

A number of minor details are left to be determine, but we foresee no major problems with remotely observing with all the normally offered observing modes using VNC.

9.6.7 Detectors

It seems the problems concerning reminiscence effects in the new detectors for ALFOSC and FIES have been resolved, but the planning issues still remain. The NBI reorganised the management of the CCD project in Autumn 2014. The main advance has been our (the NOT and NBI) convergence on a detailed planning, and on-going discussions on the precise details of a contract. It was agreed with the NBI to update the current NOTSA/NBI contract with revised information regarding 1) specific requirements, 2) time plan for the completion and commissioning of the FIES and ALFOSC systems and 3) cost. A specific contract proposal detailing this and the related cost is expected soon. The fact that a specific time-line will be defined in the contract gives us some confidence that the planning will be kept.

On La Palma, two new instrument computer have been purchased for use with the new FIES CCD system. One for operation and the other for development. They are ready to begin the software test for the new FIES system as soon as a new, clean, version of the CCD3 control software have been released by NBI.

9.6.8 CryoTigers

The CryoTigers have a filter that needs to be replaced occasionally. One of the newer CryoTigers we have has an inbuilt filter that needs to be replaced by the manufacturer, i.e., the whole compressor needs to be sent for maintenance. Later versions allow for the inbuilt filter to be replaced, and we only need to purchase the filter. This is both cheaper and more convenient. We are checking with the manufacturers if they can change the inbuilt filter with a permanent fitting, to one that can be change by us.

Two sets of (spare) CryoTiger hoses were repaired, cleaned with acetone, vacuum pumped, and refilled with gas, and are ready for use.

A new, faster procedure to wash the CryoTiger head was developed and tested. The procedure has been documented and added to the web.

Each semester we have a few cases were for unclear reasons there is a spontaneous drop in cooling capacity of a CryoTiger resulting in a rise of detector temperature and reduction of vacuum. In general, pumping the dewar and power-cycling the compressor a few times returns the system to normal.

9.7 ALFOSC

9.7.1 Imaging

A script is being developed 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.

9.7.2 Spectroscopy

A new 40-arcsec wide, extra-long slit was designed and fabricated in collaboration with Raine Karjalainen (ING) and Ernst de Mooij (Queens, Belfast). The slit is used for accurate, low-resolution spectral measurements of planet transits.

The blue VPH grism #18 was recommissioned after it was sent back to, and re-aligned by Andrea Bianco and Alessio Zanutta (Merate, Italy) to account for the original too red transmission response. For VPH grisms the throughput as a function of wavelength is determined by accurate alignment of the internal components (prisms and VPH grating), with respect to themselves and with respect to the holding barrel. Re-alignment at the 1-2 degree level was necessary to get the transmission peak around 4400 Å, with a 24% peak total-system transmission efficiency

Standard exposure time for calibration observations with the new VPH grisms (nos. 18-20) were determined, and added to the system table to be used in calibration observing scripts.

There is some issue with flat fielding ALFOSC spectroscopic data in the blue (¡4500 Å), where the light in the flat field is dominated by scattered red photons from the halogen lamp which is bright in the red, but faint in the blue. A different way of constructing a flat field using broad-band imaging flat field was developed. This should be of interest to all users, and instructions are provided on the ALFOSC web page, see:

`http://www.not.iac.es/instruments/alfosc/flatfieldingInTheBlue.html`

The 1.0 and 1.8 arcsec slits were re-clued; the ultra-thin slit plates had come loose on one side due to day-to-day use.

9.7.3 Documentation

Various parts of the staff and users web pages concerning spectroscopy were updated to include information concerning the new VPH grisms #18, #19 and #20.

9.8 FIES

9.8.1 Observing system

There was returning problem with a corrupted data base status file causing high-level scripts to fail. A work around was defined that avoids any corruption of the data file to cause any subsequent problems. Since this was implemented, no more problems have occurred.

9.8.2 FIES building

We keep on having intermittent problems with the temperature sensors in the FIES building causing large periods without recorded temperatures in our data base. At one point this was "fixed" by lightning, and a second time by fixing some connections, but once again the sensors are broken.

9.8.3 Instrument

The new Photron ThAr lamps were found to work OK. This new supplier/brand was chosen as European companies cannot work with radio-active Thorium any longer due to restrictive EU regulations. Tests with FIES show that the spectrum is very similar to the Hereus lamp spectrum. A very similar number of lines is found (by FIESTool) from the standard ThAr-line list. One of the new Photron ThAr lamp was installed in the top FIES calibration unit in February

9.8.4 On-fiber guiding

The new fiber-guiding system that puts and keeps the star on the fiber, was further developed and streamlined. The improvements include fine-tuning fiber-position finding algorithm; reducing overheads (both in software, and in the way the system operates); improved sanity checking of the automatic and manual fiber positions, and; faster system response when *not* using the automated fiber guider

9.8.5 Radial velocity stability

It has been proposed to provide octagonal fibers and a double scrambler in order to improve the radial-velocity stability of FIES. A first step is to define the requirements of all the users to see how best to serve all of their the needs. A questionnaire was sent around to the community.

The conclusion was that what we currently offer is what the community wants. In order to meet the radial-velocity stability requirements and the communities wish we can retain the low-resolution and two medium-resolution fibers, and upgrade the high-resolution fiber for superior radial-velocity stability. The medium-resolution fibers can be made octagonal as well.

To come to a final design, the physical constraints on the design of the fiber bundle should be defined. The relevant info was presented on a web page, see

`http://www.not.iac.es/instruments/fies/staff/fiber-bundle-constraints.html`

and the link was sent to the various people involved. This page describes in full what are the technical and optical constraints for a new fiber bundle. A new fiber bundle will decrease the RV scatter, that is now at best at 8m/s, by a factor 2-3.

Very recently, a regular user of FIES in OPTICON time doing observations of planetary systems, Davide Gandolfi from the University of Heidelberg, Germany, has show interest in improving the radial-velocity stability of FIES, indicating he could both provide some funds and manpower.

It seems timely that the next step of making a first design is taken soon.

9.8.6 FIESTool

To streamline the reduction of FIES data, a version of the interface was produced that runs 24/7, without the need of user intervention, saving resources and storing the data in a predictable way, which makes it easier to distribute the reduced products. The automatically reduced spectra are saved on the user and archive DVDs produced each night.

Along with this automated FIESTool, we have developed and implemented a "viewer" program for the reduced spectra, independent of FIESTool, such that users can view the data without the need to connect to the automatically running FIESTool session. In principle the on-line version of FIESTool can still be used by the observers in the control room, but the reduced data written to DVD is independent of what the user does.

A simple cosmic-ray clipper was added in FIESTool as an extra reduction step before spectral extraction. This to weed out the strong cosmics that can inhibit proper 'optimal' extractions.

Various small improvements were made to the FIESTool documentation, and updates were made to described the changes presented above.

9.9 NOTCam

9.9.1 Observing system

NOTCam observations typically consists of multiple short exposures. Thus, checking whether the rotator will reach limit for each exposure, as is implemented for the other instruments, does not make sense. Instead, it was decided to add this check into the template dither scripts we offer.

The implementation has been done by calculating the total time the script with the selected parameters will take, using a conservative estimate of the overheads, and compare this to the time to reach rotator limit (requesting the TCS). If there is not sufficient time to terminate the script, it is aborted at the start with an error. The user can then decide to try the script with modified parameters (i.e. faster) or to turn the rotator. All the standard dither scripts have been modified and tested. The new versions of these scripts are now in use.

9.9.2 Spectroscopy

NOTCam spectroscopy mode uses the 3 lamps installed on the inside of the baffle lid. The Argon lamp usually switches on with a delay, but the delay time is variable. The problem arises in automatic calibration scripts, since we have no feedback on when the lamp is actually on. The recommended script for night-time in-situ calibrations, "notcam.easy-calib", has therefore been programmed to switch on the Argon lamp as early as possible (as soon as the TV is switched off, while mirror covers are closing), which gives the lamp 40 seconds to come on, and then do Argon exposures for all setups first. But even in this mode, it happens that there is no lamp light. Tests show that the lamp can come on relatively fast, i.e. within a few seconds, or relatively slow, up to 2 minutes.

With the help of Francesca Ghinassi of the TNG we tested our Argon lamp with their power-supply, which is different from ours, and it turns out that the lamp comes on with no delay. The TNG uses fix current AC power supplies, while we have a dual-mode power supply, but it turns out that the AC mode of our device is somewhat different than the definition of AC mode in the fix current AC power supply. A new power supply for the Argon lamp (plus a spare) of the same kind that TNG uses was ordered, and is expected to arrive this month. If this solved the problem with switching-on the Argon lamp, the calibration script can also be modified, and made more (time) efficient.

The NOT Exposure Time Calculator was upgraded to include Z- and Y-band spectroscopy for NOT-Cam.

9.9.3 NOTCam calibration plan

The NOTCam calibration plan V2.0 was finished and made available on our web pages, see

`http://www.not.iac.es/instruments/notcam/calib_plan.v2.0.pdf`

9.9.4 Detector

The use of an "H2RG" array for the future NTE instrument requires Copenhagen to provide a controller that works for this IR array. In order to test both the array and this new controller before NTE goes on the telescope, it has been suggested to do this with NOTCam. This idea could be a great advantage both for the NTE development time-scale, as well as for NOTCam users. Since NOTCam still suffers from important out-of-spec features (such as too long readout time, an inability to abort exposures, as well as a zero-valued column in the centre of the array due to the controller) that were never corrected, and for which we have been waiting for a controller upgrade ever since, our IR observers should benefit from this temporary solution for NOTCam. In order for this to be useful, however, a number of requirements must be met. As a minimum, the requirement is that NOTCam can deliver what it does today, or preferably better. For the delivered data product to be acceptable, certain requirements are put on the controller and the data acquisition system. The technical requirements will be summarised in a short document, to be written NOT. The document will specifically address the requirements tailored to the "H2RG" array in NOTCam. As such, it is different from the 34 page document "User Requirements for the new Controller and Data Acquisition System" we provided to the NBI in 2012, see

`http://www.not.iac.es/instruments/development/IR_user_requirements.pdf`

which was specifically tailored to issues with the current "Hawaii-1k" array.

9.9.5 Vacuum & Cooling

We have a very good experience with the new Helium hose for the PTR installed in November 2013. It is more flexible than the old hoses. We are using a pair of hoses for the supply and return flow of helium, and initially the idea was to buy one extra hose, to always have a spare ready to exchange. Our experience over the last half year is, however, that the old hoses tend to break more and more easily, up to once per month, requiring exchange and time-consuming repair. A new hose was purchased and installed in February. Since then we are running with two hoses of the same ultra-flex type. The old hoses were repaired, cleaned and refilled and are ready for use as spares.

9.9.6 Reduction software

The quick-look reduction package for NOTCam, "notcam.cl" to be run under IRAF, is mainly for imaging data, but contains a tool for non-linearity correction that is equally useful for spectroscopy. The latest version, V2.6, has two added features: better handling of edges by proper reject masking, and distortion correction as an option also in the "skysub.cl" script.

9.10 NTE

In late November 2014, the Preliminary Design Review (PDR) of NTE was held. Beyond the NOT involvement with various work packages, it also included preparatory work in collaboration with the NBI main project manager in terms of document control and revision, event organisation and general management. In January we received the sad new about the severe illness of the NBI main project manager, who currently is on sick leave until September 2015. Due to this, the NOT is contributing a substantial extra effort in project management towards the NTE to carry the project on through a delta-PDR, and to the Final Design Review with the least amount of delay.

As part of the redesign of the Cryogenic system of the NTE following the PDR, advice and information has been provided based on our experience with NOTCam and the use of CryoTigers. The modified design probably means the telescope liquid nitrogen requirements will be similar to our existing usage.

A continuous issue is the overbooking of the central persons in the project at the NBI. Their simultaneous involvement in the NTE, Euclid and the CCD project causes many difficulties, and seems bound to lead to more delays. The CCD project directly involves the NOT, as this concerns the new ALFOSC and FIES detectors, but it is hoped that this can be concluded in the coming months. The situation with Euclid is not very clear. As far as can been seen, the Danish involvement in Euclid seems to be let by DTU Space (Danish National Space Institute) in Copenhagen, and it is not clear what are the NBI's commitments towards Euclid.