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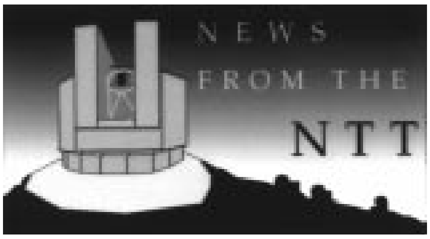
F. Malbet
Fabien.Malbet@obs.ujf-grenoble.fr



NEWS FROM THE NTT

G. MATHYS, ESO

The NTT Upgrade Project has come to an end at the end of March. Over the past 4 years, the readers of this column have been able to follow the progress of this project through its three distinct phases: the stabilisation of the operations of the NTT, the installation at the NTT of the VLT control system, and the use of this refurbished facility for scientific observations within the framework of the VLT operational model (see *The Messenger* Nos. 75 to 91). The upgrade project has fulfilled its objectives of strengthening the NTT as a world leading 4-metre-class telescope and of using it as a testbench for the technical and operational concepts and solutions adopted for the VLT, prior to the entry of its first unit telescope into operations. With consideration for the latter objective, the NTT Upgrade Project has been conducted under the overall responsibility of the ESO VLT Division (but with important resources of other divisions, in particular the La Silla Division). Now that the project is completed, quite naturally, NTT operation has come back since the beginning of Period 61 under the responsibility of the La Silla Division, like all the other ESO telescopes on La Silla.

The end of the NTT Upgrade Project also marks the end of the present series of dedicated articles presenting "News from the NTT", or more specifically, news from the upgrade project: this note is the last one of this series. From the next issue of *The Messenger* on, in line with the above-mentioned reassignment of the responsibilities, information about the NTT will be reintegrated in "The La Silla News Page". The author of these lines will, as a matter of fact, have left the NTT to move to the Paranal Observatory and to participate in the preparation of the operations of UT1. He will be replaced, in his function of NTT Team Leader, by Olivier Hainaut, who has recently joined the NTT Team (see below).

The end of the Upgrade Project

The NTT News published in the last issue of *The Messenger* had been written between the installation and the commissioning of SUSI2. The latter was completed at the end of February, in spite of adverse weather conditions, and a brief report was given in a dedicated article by S. D'Odorico in the previous issue of *The Messenger.*

Bad weather also severely hampered the SOFI commissioning period, in March. In spite of the limited amount of astronomical observations that could be carried out during the latter, its outcome was very positive, with the successful implementation of a number of new features:

– an ATM connection between the Local Control Unit (LCU) of the detector and the instrument control and acquisition workstation *(wsofi).* The use of such a connection in a real-time operational environment is a première at ESO. Until now, at the NTT as well as at the other telescopes on La Silla, data read out from the detectors were transferred to the acquisition computers through an Ethernet link. For its installation at the NTT in December, SOFI also was initially configured in this way. However, with the most recent increases of instrument performance in terms of detector array size and readout speed, Ethernet becomes a bottleneck for the achievable rate of data acquisition (both for the IR and for the visible: SUSI2 also suffers from this). In order to overcome this limitation, the option retained by ESO for new instruments (and existing instrument upgrades) is the replacement of Ethernet by ATM. SOFI is the first instrument to benefit from this new technology. The success of its implementation is a major step for the future of the ESO observatories, as it paves the way for other instruments on La Silla (in particular, the Wide Field Imager and SUSI2) and on Paranal.

– a new version of the Phase 2 Proposal Preparation (P2PP) tool, which supports the preparation of Observation Blocks for SOFI (in addition to EMMI and SUSI2, which were already supported before).

– an on-line reduction pipeline for imaging, through which, in particular, large sets of dithered images can be automatically combined in a very effective manner, taking away a large fraction of the burden typically affecting IR observers. SOFI is the first instrument to come on line which has been designed from the start for use within an end-to-end data flow context: thanks to this, it has been possible to develop for it powerful and effective automatic reduction tools which are far superior to those that could up to now be offered for conceptually older-fashioned instruments such as EMMI.

On the other hand, the end of the Upgrade Project has also marked the end (or, at least, the temporary suspension) of the Service Observing experiment at the NTT. The outcome of the latter and the lessons that can be drawn from it are reported in a separate dedicated article in this issue of *The Messenger.* Here, it should just be pointed out that, in spite of a number of shortcomings and weaknesses in what was primarily a learning period for both ESO and the astronomical community, Service Observing at the NTT has been quite favourably perceived by ESO users, to the extent that ESO has been urged by various of its advisory committees to consider the possibility to keep offering this option at the NTT (and possibly to develop it at other La Silla telescopes) in the future. The requirements and implications of this service are currently being studied by ESO.

Current NTT Status

In the last issue of *The Messenger*, I reported the emergence of a few new technical problems as a result of the installation in January of the latest version of the NTT common software at the NTT. The two new problems with the highest rate of occurrence in the weeks following the software upgrade, and with the most damageable impact on operations (or, in other words, those responsible for the largest amount of technical downtime), were the spontaneous reboots of LCUs and the random failures of technical CCDs. The origin of both was found to be related to inaccuracies in the time distribution protocol. While the technical CCD control software was successfully modified to handle properly such inaccuracies and avoid further failures, the exact mechanism by which the time inaccuracies trigger the LCU reboots has not been identified yet. As a provisional workaround, LCUs are now running on their internal clock rather than on a centrally distributed time. Although the internal LCU time is considerably less accurate, so that the currently adopted option is not conceptually satisfactory, it does not have any significant negative impact on the operation of the telescope and of the instruments, and it effectively solves the annoying problem of the LCU self-reboots. Therefore, it is quite acceptable until a “cleaner”, more permanent solution has been worked out and is implemented. With it, and with the above-mentioned modified technical CCD software, the reliability of the NTT control system has now come back to the excellent level achieved in the last months of 1997.

From the point of view of the visiting astronomers, the end of the NTT Upgrade Project and the return of the telescope fully within the La Silla operational context should, in practice, be a very smooth transition, since classical observing at the NTT will continue to follow the scheme set up during the last year. After the completion of the major technical works of the December 1997 – March 1998 period, time and resources have been, and will in coming months be, available to refine and to consolidate a stable operational model, in which emphasis will be laid especially on an improved service to observers. In particular, we hope to be able to provide NTT users with a few new auxiliary tools, which should allow them to have a better interaction with the system and with their data. One such product that has been put into service on the astronomer’s workstation is the File Handling Tool, which provides the observer with a number of features allowing him, for instance, to examine the headers of his FITS files, to have a quick look at his data, or to take advantage of various options for easy saving of his data to tape.

Staff Movements

End of March, Domingo Gojak, an electronic engineer who was in the NTT Team since the beginning of the Upgrade Project, was transferred to the team in charge of the 3.6-m telescope to support the upgrade of the latter. Domingo had been one of the key players in the success of the technical upgrade of the NTT, and he will undoubtedly play an equally important role in the upgrade of the other La Silla major telescope. I have enjoyed to work in the same team as Domingo during more than 4 years and I wish him all the best in his new assignment.

At about the same time, Olivier Hainaut, a former fellow from the Medium-size Telescope Team, passed to the NTT Team as a new senior staff astronomer. Olivier, a very experienced observer specialised in the study of small bodies of the solar system, has been designated as the future Leader of the NTT Team, a responsibility that he will take over from the author of these lines in July, after a period of overlap which will allow him to integrate himself in the team and to become familiar with his future task.

Two new fellows have also joined the NTT Team, at the end of April and the beginning of May: Vanessa Doublier, a former student at ESO in Garching, and Leonardo Vanzi, who comes from Arcetri (Italy). Both have experience in IR observations, and they will accordingly, at least in part, be assigned to the support of SOFI.

It is a pleasure to welcome these newcomers, with whom I am looking forward to collaborating in the last months of my involvement with the NTT and to whom I shall be pleased to hand over the responsibility of this telescope, trusting that they will maintain it as a world leading 4-metre-class telescope for the greatest benefit of the ESO astronomical community.

G. Mathys
gmathys@eso.org

Tuning of the NTT Alignment

Ph. GITTON and L. NOETHE, ESO

1. Introduction

Since the end of the NTT upgrade project it has been known that the alignment of the secondary mirror (M2) was only marginally within specification. When the atmospheric seeing was greater than one arcsecond, the misalignment had no noticeable effect on the image quality. But, under better seeing conditions, it was a limiting factor for the image quality. Therefore, it was decided to tune the position of the M2 unit. We used the NTT wave front sensors, which are part of the Active Optics system, in a novel way to measure the required realignment of M2.

2. Effects of a Telescope Misalignment on the Image Quality

2.1 The NTT optics

The NTT is an aplanatic telescope of the Ritchey-Chretien type. Aplanatic means that the telescope, if it is properly tuned and aligned, is free of spherical aberration and coma in the field. A proper alignment requires that the distance between the primary mirror and the secondary mirror is correct and that the optical axes of the two mirrors coincide. The by far most important aberration remaining in the field is then astigmatism, which is zero at the centre of the field and increases quadratically with the field angle. The aberration is therefore rotationally symmetric with respect to the centre of the field.

In reality, any telescope is to some extent misaligned. Such a misalignment will introduce additional optical aberrations, first of all the so-called decentring coma. At the NTT, a wave-front sensor is used to measure the aberrations affecting the telescope. The detected coma is corrected by tilting M2 around its centre of curvature.

Since coma is not field dependent, the telescope will then, despite the misalignment, be free of coma over the whole field. But this coma correction is not sufficient for a complete alignment, since the axes of the two mirrors are not yet necessarily coincident. In this optical configuration, the axes of M1 and M2 will actually intersect at the coma-free point (CFP), forming an angle α (Fig. 1). The name