RevMexAA (Serie de Conferencias), **24**, 33–34 (2005)

UPDATE OF THE COMMISSIONING PLANS

P. L. Hammersley[1] and J. M. Rodríguez Espinosa[1]

RESUMEN

La oficina del proyecto del GTC continúa desarrollando los planes para la puesta en operación del GTC. Esto será anterior a la primera luz y continuará mucho después de iniciadas las operaciones científicas normales. El objetivo es el convertir una serie de subsistemas en un único instrumento capaz de proporcionar ciencia de alta calidad. Por lo tanto, como parte de las tareas de puesta en servicio, se llevará a cabo un conjunto de proyectos de validación científica.

ABSTRACT

The GTC project office is continuing to develop the plans for the commissioning of the GTC. The commissioning will start before first light, and will continue until well after normal science operations begin. The aim of the commissioning is to convert a series of subsystems into a single instrument which is capable of delivering high quality science. Hence, as part of the commissioning tasks a number of science validation projects will be performed.

Key Words: **INSTRUMENTATION: MISCELLANEOUS — TELESCOPES**

1. INTRODUCTION

During commissioning period, what initially starts as series of subsystems are brought together to form a single unit. As the commissioning period is limited it is important that the stages in the commissioning, and their order, are carefully thought through. In particular, the order in which each capability has to be added to the telescope needs to be planned in detail. In preparing the commissioning plan it is assumed that each subsystem has already been tested; so the telescope moves, the mirror supports work and cameras take images etc. Hence, the plan is more concerned with combined capabilities rather than individual sub systems.

The guide lines used in developing the installation and commissioning plan are:

- Ensure that too many components do not arrive in too short a period, so as to even out the work load.
- Obtain a minimum level of capability in all areas as quickly as possible. There is a bottle neck in the commissioning which is the ability to make a stable image in the focal plane. Once this is achieved then it is possible to concentrate on specific areas, pointing, tracking, image quality etc.
- Where possible do some initial test well before the main test in that area are scheduled. This gives more time understand the system and when the full commissioning of that area begins the necessary tools are in place and tested. Furthermore, the initial test may show up serious faults which will need to be corrected. It is better to find out about these as early as possible.
- Ensure important areas of the operation are not left until very late in the commissioning period, which if there were problems could delay science operations.

2. THE MAJOR MILE-STONES

The commissioning plan is built around a series of five, more or less evenly spaced, miles-stones in the project time line.

The first mile-stone is when the telescope mechanics are handed over to The Project Office and the integration of the the optics begins. There is then a period of about 5 months before first light during which the telescope is prepared for observations. However, the telescope can be moved during most of this time, which provides an opportunity to mount a small refracting telescope on the elevation ring of the telescope. Using this refractor the motion of the telescope mount can be directly measured against the sky, and an initial pointing model constructed. In fact many other commissioning tasks can be started.

First light is the detection of the initial photons through the telescope optics. Although the telescope optics have to be in operation, only 6 segments of the

[1] GTC project, Instituto de Astrofísica de Canarias, La Laguna, Tenerife, Spain.

TABLE 1

THE TARGET PERFORMANCE REQUIREMENTS. THE OPTICS ERRORS DO NOT INCLUDE ATMOSPHERIC EFFECTS.

Errors	Before 1^{st} light	1^{st} sci. inst.	2^{nd} sci. inst.	Day 1
Pointing	10”	6”	4”	3”
Tracking in 10 min	1”	1”	0.5”	0.2”
Single Segment		0.5”	0.2”	0.1”
Stacking		0.2”	0.1”	0.04”
Phase			100nm	50nm
Total optics		0.75”	0.5”	0.2”

primary mirror will be mounted. In the period immediately after first light the aim will be to stabilize the image. Following that, the plan is to move onto the detailed on sky commissioning of the major subsystems: pointing, optics, Acquisition and Guiding and the commissioning camera. The Project Office are currently engaged developing the detailed procedures to be used for these tasks.

By about month four, various telescope performance requirements need to have been met so that the first science instrument can be mounted. The first instrument will be the optical instrument as this does not make as many stringent demands. For example the primary mirror does not have to be phased and in fact the current plans mean that the full primary mirror will not be in place at this point. None the less the image quality, tracking and guiding all have to have reached acceptable levels.

The IR instrument, scheduled for about 8 months after first light, is expected to achieve diffraction limited imaging and this will require the whole mirror to be in place and for the segments to be phased. Also the chopping secondary must be available and hence by this point the telescope performance should be approaching the required levels.

Day 1 is when the full science operation of the telescope will begin and so by this point it is important that telescope is routinely producing excellent image quality. However, full commissioning will not be complete and many tasks will continue over the next few years.

3. PERFORMANCE TARGETS

In order to gauge the progress in the commissioning of the telescope as series of performance test have been made which are associated with the mile stones (see Table 1). Whilst some of these requirements need to be reached if the science instruments are to perform correctly, the main aim is give the commissioning team a bench mark by which to judge the improvements in the system.

4. SCIENCE VALIDATION

The GTC is designed to produce high quality science, and although obtaining a high quality image is a major factor in this, it is also important that all aspects of the life cycle of a science proposal are fully tested. This includes accepting the proposals, preparing the observations, taking the data and finally reducing the data. The best way of doing this is to actually carry out science projects in collaboration with members of the community, and hence we will be approaching the community for proposals to be attempted during this period. However, these proposals will not be ranked on their scientific merit but rather on how much useful information for commissioning the telescope they will provide. Hence, for any project that is undertaken, we would expect rapid feed back on the quality of the data obtained. The science validation will be begin once the basic commissioning of the first science instrument has been completed.

5. CONCLUSIONS

This paper presents an updated overview of what will happen to the GTC during the the period between first light and full science operations begin. The commissioning will be built around the natural mile-stones in the project time line; the hand over of the telescope mechanics, first light, then arrival of the science instruments and finally Day 1. The aim at each stage is to at least meet minimum performance levels in all necessary areas. The goal is to obtain an instrument ready to produce high quality science in the minimum time.

P. L.Hammersley and J. M. Rodríguez Espinosa: GTC project, Instituto de Astrofísica de Canarias, E-38200 La Laguna, Tenerife, Spain.