Astronomical Observational Techniques II

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Introduction

The conduction of *Astronomical Observations* encompasses essentially three stages: (1) the Observing Proposal, (2) the Observations *per se* and (3) the Data Reductions. These items are the subject of this document, whereas the primary motivation for doing these observations in the first place, i.e. the analysis of the results and the subsequent scientific evaluation (the fourth stage), is left to other/future activities.

In the following, the three different items will be illuminated in some more detail.

1 Observing Proposal

The access to modern observing facilities is generally subject to international competition, since the demand for observing time is largely in excess over the time available. This is true regardless of the *type* of observation, i.e. be it from space platforms, be it with ground based telescopes. It is on the basis of the proposals an Observing Time Allocation Committee is deciding whether a given project will be granted observing time. Or mostly not, since s.c. oversubscription factors are often larger or very much larger than two.

The format of observing proposals is quite general and major parts are in common for various facilities. Of course, some essential parts are specific to the particular equipment the proposal seeks to apply for and, below, we will limit ourselves to optical observations in La Plama (the Nordical Optical Telescope, NOT), the internet address of which is

http://www.not.iac.es/

There, you follow the links

Observing at the NOT
Applying for time
NOTFORM

and follow the down-load procedures. What should be filled in, is described in the following two sections.

*Objects in the telescope mirror appear much closer than they are (T. Ayres 2003).

1.1 General Aspects: Scientific Justification

(1) General relevance to astronomy of the proposed observations, i.e. their importance in a broader context.

(2) The specific objectives, i.e. what can be learned from the results of the proposed observations.

(3) The detailed description of how these goals can be reached with the proposed observations.

1.2 Specific Aspects: 'Technical' Justification

(1) Justification for requested facility, including the telescope size/type, the spatial and spectral resolution and the detector(s).

(2) Justification for requested observing time, which includes a detailed worked example how the integration times and overheads have been estimated/computed.

(3) Justification for requested lunar phase (dark, grey or bright time), seeing and other weather conditions.

(4) Description of how the data will be reduced and analysed, including available facilities (hard- and software) and manpower at the observer's home institute.

2 The Actual Observations

An observing facility is generally controlled by several different systems. For instance, at the NOT one has to get aquainted with the Telescope Control System (TCS: see below) and the instrument operation software. As the name indicates, the former is used to operate the telescope and its various functions (e.g., opening/closing the dome, tracking the telescope etc.), whereas the second control system is specific to the focal plane equipment one is using. For instance, for ALFOSC, NOTCAM and STANCAM one has to apply what is provided in

http://www.not.iac.es/

Instruments and Telescope
ALFOSC, NOTCAM, STANCAM

There, one also finds the links to
Telescope, Detectors, Filters.

2.1 Preparing the Observations

Part of the preparations will have been made during the Proposal stage. However, prior to the actual observing run, several refinements need normally to be done. These include

(1) Finding charts (science objects and calibration objects).

(2) Nightly and hourly observing schemes (see below).

(3) Back-up programme, in case of technical failure, insufficient weather conditions etc.

(4) Your own list of sequence(s) of telescope/instrument commands you intend to call during your observations.

(5) Telephone list: whom to call in what emergency case.

2.2 Conducting the Observations

A check list could prove useful, such as

(1) During day time

Dome Flats

Bias Frames

Dark Frames

(2) During dawn/dusk

Telescope Operation (open dome at least half an hour prior to start of observations)

Sky Flats (Note in which order to take the sky-flats: narrow-band vs wide-band filters, shortwave vs longwave filters etc.)

(4) Pointing and target acquisition

(1) Guide Star (find a guide star close to object)

(2) Object Identification (finder charts)

(3) Focussing the Telescope/Camera (on point source = star)

(4) Object onto Slit (for spectroscopy)

(5) Integrations

Photometric Calibrations (Standards)

Air Mass

Seeing

Lunar Distance

Atmospheric Extinction Coefficients

Object Integrations

Integration Time for individual observation

Read-Out-Noise in individual observation

Detector Saturation, Cosmic Ray hit rate

Number of Integrations

Attached in Appendix @ is an example of an observing log sheet, which could be used during the observations.