PC 3246: Astrophysics I

Telescope Equipment Guide

1 Portable Equipment

The Physics Department has a number of portable telescopes available for loan. The telescopes and equipment available to this module are as follows:

Portable Telescopes:

- Vixen R130sf with Porta II

  This is on a manual alt-az mount and does not track. Easy to set up but somewhat bulky to transport. 130mm objective diameter, 650mm focal length Newtonian reflector.

- William Optics Z73II with iOptron SmartEQ Pro+

  This is on a computerised equatorial mount with full tracking and goto capabilities and option for autoguiding (advanced users only). Complicated to setup but capable of long exposures. 73mm objective diameter, 430mm focal length apochromatic doublet refractor.

- Celestron Nexstar 5SE

  This is on a computerised alt-az mount with full tracking and goto capabilities. Requires initial alignment for tracking, but long exposures will have field rotation. 125mm objective diameter, 1250mm focal length catadioptric Schmidt-Cassegrain.

- Telescope-in-a-box Model 2005Mk3

  This is a custom-built ultralight truss dobsonian telescope with an integrated alt-az mount. Requires some setup, but this is the most portable way of getting a large objective diameter. Full manual tracking. 200mm objective diameter, 1000mm focal length Newtonian reflector.

Cameras

- Celestron Neximage 5

  This is a USB2 5-megapixel CS-mount webcam. The camera may be old but it is known to work. Best for lunar/planetary/solar imaging.

- Canon 60Da DSLR

  This is the astronomy-optimised variant of the Canon 60D with additional H-alpha sensitivity. Best for deep sky long exposures.

- QHY294C

  This is a specialised cooled astronomy camera for long exposure astrophotography. 12-megapixel in standard mode. Best for deep sky long exposures with the William Optics Z73II.

- QHY5III-462C (part of the Nexstar 5SE set)

  This is a USB3 2-megapixel 1.25-barrel webcam. The USB3 interface and small sensor allows a faster data rate for lucky shot imaging. Best for lunar/planetary/solar imaging.

Other Equipment

- Thousand Oaks Solarlite white light solar filter (for Vixen R130sf, Celestron Nexstar 5SE or William Optics Z71)

  This is a basic but effective white-light filter for small portable telescopes.

- SA100 Star Analyser

  This is a 100 lines/mm transmission grating that normally goes between the telescope and the camera for low resolution slitless spectroscopy. It may be possible to mount the grating at the objective of a DSLR lens (requires 90-150mm focal length).

- Autoguiders (ZWO and Orion)

  These are auxiliary telescope/camera pairs that will normally ride piggyback on the main telescope. The autoguider camera can send a correction signal to the mount to keep the telescope locked on target when set up with the appropriate software. Setup is significantly more complicated, and autoguiding is generally not required in Singapore.

- Camera Adaptors

  We have camera adaptors should you want to use your DSLR with the portable telescopes. Supported camera models are Canon EF, Nikon F/G, Pentax K, Sony/Minolta Alpha, Sony E and Micro Four-thirds.

2 Observatory Equipment

The Observatory has the following equipment:

Main Telescope Planewave CDK17 with Hedrick focuser.

425mm objective diameter 2939mm focal length Dall-Kirkham reflector with integrated corrector lens assembly.

Auxiliary Telescope Takahashi TSA102 with feathertouch focuser.

102mm objective diameter 816mm focal length triplet apochromatic refractor.

Long Exposure Camera QHY294M ColdMOS

This is a USB3 12-megapixel monochrome cooled camera. It is normally attached to a filter wheel for imaging. Available filters are Johnson-Cousins UBVRI and narrowband H-alpha, SII and [OIII].

Spectrograph Camera QHY178M ColdMOS

This is a USB3 6-megapixel monochrome cooled camera. It is normally attached to the DSS7 spectrograph.

Lucky Shot Camera Celestron Skyris 132M CS-mount webcam.

This is a USB3 1-megapixel monochrome camera. The USB3 interface and small sensor allows for faster frame rates. Available filters are Johnson-Cousins UBVRI and narrowband H-alpha, SII and [OIII].

Lucky Shot Camera ZWO ASI224MC CS-mount webcam.

This is a USB3 1-megapixel colour camera. The USB3 interface and small sensor allows for faster frame rates.

Spectrograph SBIG DSS7

This is a low resolution ($R \sim 500$) slit spectrograph operating between 400nm to 700nm that should be capable of capturing the spectrum of bright nebulae when paired with the QHY178M.

White Light Solar Filter Baader AstroSolar Full Aperture filter

This is a full aperture white light filter that is used with the CDK17. The full aperture means that we can potentially get high-resolution white-light images of the sun under lucky shot conditions.

H-alpha Solar Filter Solarscope SF70 H-alpha etalon

This is an interference etalon optimised for H-alpha. Prominences, filaments and other features will show up through this filter. This filter is normally placed on the TSA102.

3 Equipment Request Rules and Procedures

To request for portable equipment, you will need an observing plan comprising of the following information:

- What you plan to do: lucky shot, long exposures, spectroscopy, or something else.

  This will determine what you actually need to achieve your observing goals.
- When you plan to observe.
- Where you plan to observe.

  Your observing site makes a difference and we need to know so we can be sure you will be safe and successful.
- The equipment you are requesting.

  We may suggest different equipment if your equipment request is not optimal for your observing goals.
- A list of targets with name/catalog number, right ascension, declination, magnitude/surface brightness and rise/set/transit time.

  This is to show that you have done your preparatory work and we will reject your equipment request if your targets are clearly not observable during your proposed session.

The observing proposal and observing plan is part of the preparatory work and often can make or break an observing session. If you fail to plan, you plan to fail.

3.1 Rules

The following rules apply to all portable equipment requests:

- All prevailing safe management measures take priority over observing activities. If you are told to stop observing because you are in breach of any safe management measures, you are to comply without exception.
- We reserve the right to call back any or all equipment at any time. This is usually done in preparation for lockdown measures, or if there is a long waiting list for the equipment.
- You are fully responsible for all the equipment you borrow, even the small screws and dust caps. Some of the small screws are special items that are extremely difficult to obtain.
- Portable equipment will only be issued to groups for accountability purposes.
- Equipment loans are only confirmed after your observing plan is approved.
- For observing sessions that are not during the scheduled field sessions, all group members need to complete the safety worksheet satisfactorily.
- You are not allowed to book the equipment first and provide an observing plan later.
- All equipment collection and return appointments must be scheduled at least 7 days in advance.

3.2 Procedure

The following is the general procedure for equipment loans:

1. Prepare your observing plan.
2. Fill in the equipment request form and send it to us with your observing plan.

   If your observing plan is not in order, you may have to make corrections until we are confident that you have done enough preparatory work to have a decent chance of success.
3. We will send you a safety worksheet to complete individually.
4. Send us your completed safety worksheet.

   If your safety worksheet is not in order, you may have to redo it until we are confident you will be safe.
5. If the documents are in order, we will confirm your equipment request. Schedule a time to collect equipment when your equipment request is confirmed.
6. Do your observing activities.

   If you need a loan extension, let us know as soon as you can. Extensions will be granted on a case-by-case basis and may be denied if there is a waiting list for the equipment.
7. Schedule a time to return equipment.
8. Return the equipment.

4 Observatory Request Rules and Procedures

To request for observatory access, you will need an observing plan comprising of the following information:

- What you plan to do: lucky shot, long exposures, spectroscopy, or something else.

  This will determine what you actually need to achieve your observing goals.
- When you plan to observe.

  You are required to provide 3 dates (subject to confirmation), and we will observe during the first clear opportunity. All night targets must be observable between 7pm and 10pm.
- The equipment you are requesting.

  We may suggest different equipment if your equipment request is not optimal for your observing goals.
- A list of targets with name/catalog number, right ascension, declination, magnitude/surface brightness and rise/set/transit time.

  This is to show that you have done your preparatory work and we will reject your equipment request if your targets are clearly not observable during your proposed session.

The observing proposal and observing plan is part of the preparatory work and often can make or break an observing session. If you fail to plan, you plan to fail.

We may also recommend that you use portable equipment instead of the observatory if it is justified by your observing goals.

4.1 Rules

The following rules apply to all observatory requests:

- All prevailing safe management measures take priority over observing activities. We will cancel observatory sessions if safe management measures do not allow us to proceed.

- We may combine groups if the observing plan allows, and we may suggest alternative dates for multiple groups to use the observatory together.
- Only the people listed in the observing proposal will be allowed in the observatory during the session. You may make a request to join an existing group at least 24 hours before the commencement of the observatory session.
- Observatory use privileges may be revoked for repeated and/or wilful safety violations, or repeated no-shows without an acceptable excuse.
- Observatory sessions are only confirmed after the observing plan is approved. You are not allowed to book the date first without a plan.
- Observatory request dates must be scheduled at least 7 days in advance.

4.2 Procedure

The following is the general procedure for observatory requests:

1. Prepare your observing plan.
2. Send us your observing plan with 3 proposed dates.

   If your observing plan is not in order, you may have to make corrections until we are confident that you have done enough preparatory work to have a decent chance of success.
3. If the documents are in order, we will confirm your observatory request.

   At this time, we will reconfirm your proposed dates.
4. Do your observing activities.

   We will observe on the first clear opportunity of your scheduled dates.