

A Quick Guide to CCD Imaging at the OAN/SPM

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Planning Your Observations

Telescopes

Table 1 summarizes of the characteristics of the telescopes.

Note that all of the telescopes have restricted northern declination limits.

All of the telescopes have finders equipped with video cameras and guiders. The two smaller telescopes are generally operated by the observer. The control program is simple to use.

See the [WWW page](#) of the OAN/SPM for more details of the telescope optics and manuals for the control programs and guiders.

CCDs

Table 2 summarizes of the characteristics of the CCDs. The Thomson is awful. The Marconi is hot in U and B , the SITE3 and Marconi have fringes in I , but otherwise there is not too much difference between the two SITE CCDs and the Marconi. Note that the observatory will often restrict the use of CCDs to certain telescopes; see the call for proposals.

There is an program of CCD characterization every fall that measures zero points, gain, read noise, and linearity.

The SITE and Thomsons CCDs are controlled using a comercial program called PMIS. The Marconi is controlled using with a program written at the OAN.

See the [WWW page](#) of the OAN/SPM for the report of the latest characterization run and the manuals for the control programs.

Filter Wheels, Filters, and Focal Reducers

The filter wheels are summarized in Table 3. The observatory doesn't like to move filter wheels unless there is a scientific reason, so you're most likely to get the Mexman at the 84-cm, the Ruca at the 1.5-m, and either the Mexman or the Italiana at the 2.1-m.

The complement of filters in the Italiana are fixed. Johnson-Cousins $UBVRI$, Strømgren-Crawford $uvby\beta$, Thuan-Gunn $uvgriz$, and nebular filters are available for use with the other filter wheels.

See the [WWW page](#) of the OAN/SPM for filter curves and manuals for the filter wheels.

Computers

The telescope and ancillary equipment is controlled from a Linux computer. The CCD is controlled either from the same Linux computer or from a Windows computer. IRAF

is installed on the Linux computer to allow you to quick-look your data. There is another Linux computer available with IRAF for more detailed reduction.

Data can be transferred to an anonymous FTP area on haro.astrossp.unam.mx or be written to CD-ROMs.

Estimating Performance

If you're working in *UBVRI*, you're in luck; there is a simulator. If you're working with other broadband filters, you could try scaling from the simulator. If you're working with narrow band filters, you'll probably have to use the approximate zero-points given the reports of the CCD characterization runs.

See the WWW page of the OAN for the broad-band simulator, filter curves, and the report of the CCD characterization run.

Table 1: Telescope Summary

Telescope	$f/$	δ Limits	HA Limits
84-cm	15	$-45^\circ \leq \delta \leq +65^\circ$	$-5.0 \leq HA \leq +5.0$
1.5-m	13.5	$-40^\circ \leq \delta \leq +59^\circ$	$-5.0 \leq HA \leq +5.0$
2.1-m	7.5	$-40^\circ \leq \delta \leq +69^\circ$	$-5.5 \leq HA \leq +5.5$

Table 2: CCD Summary

CCD	SITe1	SITe3	Marconi	Thomson
Size	25mm	25mm	28mm	31mm
Format	1024×1024	1024×1024	2048×2048	2048×2048
QE in U	Good	Okay	Excellent	Poor
QE in BVR	Good	Good	Good	Good
QE in I	Good	Good	Okay	Okay
Read noise	Okay	Okay	Good	Good
Non-linearity	$< 1\%$	$< 1\%$	$< 1\%$	3%
Fringes	None	in I	in I	in VRI
Read time	Fast	Okay	Fast	Slow
Normally used	at 1.5-m/84-cm	at 2.1-m	at 1.5-m	anywhere

Table 3: Filter Wheel Summary

	Mexman	Ruca	Italiana
84-cm	yes	possibly	no
1.5-m	no	yes	no
2.1-m	yes	no	yes
Filter size	50-mm round	50-mm square or round	50-mm round
Number	14	8	10
Focal reducer	$\times 1.5$	$\times 1.6$ at 84-cm only	no

Observing

Simple Rules for Happy Observing

- Plan your observations. Arrive at the observatory having read the manuals, with coordinates and finding charts for your objects and standards, and knowing what filters you wish to use.
- Remember to fill the dewar as needed.
- Make sure the fans are on and the doors open or closed as appropriate.
- Close when the humidity gets to 85% or when there is condensation on metal surfaces.
- Check the focus after every image. IMEXAM is your friend.
- Carefully center your object before looking for guide stars.
- Correct the telescope coordinates after centering an object and before moving to a new one.
- Back up your data onto haro.astrossp.unam.mx at the end of each night.

Start-of-Night Check List

This check list applies to the 84-cm and 1.5-m only; at the 2.1-m the telescope operator handles start-of-night activities.

- Check that the fan in the the observing room is on. It should be left on permanently.
- 84-cm only: Check that the fan in the communications room is on. It should be left on permanently.
- Turn on the telescope console. Wait 3 minutes then turn on the motors and fans. Start the telescope control program.
- Open the dome. Remove the covers for the two finders.
- 84-cm only: Turn on the mirror cell fans. Open the two doors to the balcony.
- 1.5-m only: Open the two doors to the north.
- Move the telescope to the south.
- Remove the telescope cover.
- Now is a good time to fill and take twilight flats.

- Start the finder control program. Turn on automatic dome movement and tracking. Move to a first magnitude star. Center the star in the video camera. If you can't find the star, center it first using the small finder. Correct the telescope coordinates.
- Move to a sixth magnitude star. Center it on the CCD and focus roughly. Correct the telescope coordinates.
- Start the guider control program and turn on the guider intensifier. Select the center. Insert the mirror. Center and focus the star. Define the center. Remove the mirror.

End of Night Check List

This check list applies to the 84-cm and 1.5-m only; at the 2.1-m the telescope operator handles end-of-night activities.

- Remove the guider mirror, turn off the guider intensifier, and stop the guider control program.
- Stop the finder control program.
- Now is a good time to take twilight flats.
- Move to the zenith. Replace the covers on the finders.
- 84-cm only: Turn off the fans on the mirror cell.
- Move to the south.
- Replace the cover on the telescope. Close the dome.
- Now is a good time to fill the dewar.
- Move to the zenith. Stop the telescope control program. Turn off the fans, motors, and console.
- Leave the building fans on.