PHARO Maintenance and Operation Notes

Updated 2000 August 8 by T. Hayward

Vacuum gauge:

The vacuum gauge on the PHARO dewar appears to be calibrated correctly. We have typically been reaching 30 or 40 millitorr on the gauge after an hour or two of diffusion pumping, and the gauge does not get lower even after 3 or 4 more hours. This is probably due to the getters in the dewar which outgas very slowly.

Refilling PHARO on telescope:

The preferred time to fill PHARO on the telescope is **early in the morning**. When the dewar is refilled in the late afternoon, then the telescope is pointed at far-southerly objects early in the night, significant LN_2 spillage will occur. The outer can may ran out of cryogens before the next afternoon, less than 24 hours after the fill

Please monitor the fills and note if the dewar still runs out of cryogens. I've measured outer can hold times of 36 hours and if they're well below this there may be a serious problem with the dewar.

Fibers on telescope:

The fiber running from the Cass Cage patch panel to PHARO is protected by a vinyl tube. Make sure the tube is cable-tied to the PHARO power cables close to the dewar so that the tube, not the fiber, will take the strain if someone or something pulls on it.

Network box:

The gray network interface box is no longer used. Plug the ethernet cable from the back of ezra2 directly into the T1 ethernet wall connector.

Shutter:

The shutter is currently inoperative for unknown reasons. It is stuck in the open position so it does not adversely affect the data. We recommend not trying to operate the shutter because if it even partly closes then sticks, the blockage may be impossible to correct without warming and opening the dewar.

Starting the XPHARO program:

We now communicate with the TCS (for telescope commands and header data) through the AO TAO program over the ethernet. Therefore, **the TAO program must be running AND connected to the TCS before starting XPHARO.** If TAO is not running properly, the telescope pointing data in the log file (and FITS headers) will be garbled or blank. There is a warning that appears in the log file if the TCS connection cannot be established, but all the error modes are not fully checked at this time, so it is important to make sure the TCS connection is OK by checking the log file.

If TAO and XPHARO are running together properly, then TAO has to be restarted for any reason, the TCS connection will be broken and the XPHARO program must be restarted. Fortunately, TAO usually runs all night without interruption (even though other parts of the AO system may be rebooted), so as long as the connection is OK at the start of the night you'll probably be OK.

If you want to run XPHARO without connecting to TAO (for dewar testing, etc.), type "xpharo -nonet". Make sure to re-run the program with the standard "xpharo" command to establish the network connection before you start observing for real.

Finally, it is possible to recompile XPHARO so that it communicates to the TCS directly. If this is ever desired please let me know.

Fiber Optics:

On August 6, 2000, I replaced the software driver that the XPHARO program uses to access the Fiber Optic Interface (FOI) board in the workstation. A second bug in the XPHARO code was also identified and corrected. As a result, the FOI appears to operate much more reliably than before.

The fiber system should require virtually no **FOI Reset** or **Null Command** operations if it continues to operate reliably. If **ANY** problems occur, please record the following information.

1. How you noticed the problem. Appearance of image; pop-up warning windows, information in log window, etc.
2. The XPHARO command being executed at the time (detector integration, continuous acquisition, motor move, etc.); the more detail the better. Were the commands being executed manually (pushing buttons) or from a macro?
3. Current detector settings: Size of the frame in pixels; number of cycles; number of start, end, and pause frames and integration times in the standard and quick modes.
4. Debug messages from the console window. Scroll back as far as possible, cut and paste entire window into an editor such as vi or emacs, save to file. If the Debug mode was turned off, turn it on (in the **Options** pulldown menu), and try to reproduce the error.
5. Frequency of problem. One isolated occurence, or frequent and repeatable?
6. Data room temperature.
7. Other programs running on ezra2 at the time. (e.g. netscape, emacs)

Spectra:

Taking spectra requires careful planning and great care. The slits and grisms must be aligned accurately in order to achieve proper background subtraction, flat fielding, and flux calibration. The detector causes interference fringes, especially with the narrowest slit, and careful calibration is required to correct them. The following procedure is based on our (minimal) experience to date.

1. Put the carousel in 40 mas/pixel mode (to disperse the full design wavelength range across the detector). Make sure the "40 mas toggle tripped" message appears in the console window.
2. Open the Carousel tweak menu.
3. Make sure the Update Mode is set to "None".
4. Apply a 4 step tweak using the down arrow. This ensures that the carousel is firmly against its hard stop. (I plan to automate this soon.)
5. Close the tweak menu.
6. It is highly recommended that the carousel be left in the 40 mas mode until all desired spectra and calibrations are complete.
7. Select the desired slit, order-sorting filter, and grism. The motors currently have no backlash correction, so approach the desired slit and grisms from lower numbers. The Lyot stop does not have much effect because of diffraction at the slit, but we usually use the Std. Cross. It may be worth experimenting with different stops to find the best one.
8. Take a 30 sec integration on blank sky, and examine the telluric lines that run vertically on the detector. If they are not vertical, open the Slit Tweak menu, and set the Update Mode to "Current" (which will update the saved position of the current slit with every tweak, so the slit will return to the desired position when it is selected in the future). Move the slit, take another spectrum, and repeat until the lines are exactly vertical.
9. Put a star on the slit and take another integration long enough to show the star clearly. The star should be exactly horizontal on the detector. If it is not, open the Grism Tweak menu and adjust the Grism accordingly. (Make sure the mechanism in the Tweak menu is the one you want – it's necessary to reopen the menu to change mechanisms and this is easy to forget.)
10. Repeat the procedure for other desired slits and grisms.
11. We've found that the slits and grisms will usually return to their proper positions when moved from lower position numbers. However, it is best not to move ANYTHING between source and background pairs so that the telluric lines subtract as accurately as possible (this is the largest potential source of error). There may be flexure within the camera, so to divide the fringes out as well as possible, a standard star close to the target on the sky is preferred. Also, there is significant non-common path flexure between the AO system and PHARO so that stars will gradually drift off

the slit even when the AO loop is locked. Therefore, the pointing should be periodically checked.

12. We still have a lot to learn about taking spectra – feedback on these procedures is welcome.