OBSERVING SUMMARY June 17 – July 19 1995:

- Instrument: nominal performance.
- Acquisition: 8 peak-up sequences and 3 binary acquisitions, 1 peak-up failure, which we have concluded to be due to proposal coordinate error of more than the $1''$ limit imposed for FOS acquisitions.
- Pointing: 66% within $1''$.
- Executed programs: 8 GO/GTO proposals, 4 calibration programs.
- Publications and Communications: 2 ISRs.
- Other: $\sim$ 16 IS Reviews completed.

PUBLICATIONS/COMMUNICATIONS:

- CAL/FOS–144 "Cycle 4 Photometric Calibration of the FOS", R. Bohlin, D. Lindler, C. Keyes
- CAL/FOS–145 "FOS Filter-Grating Wheel Repeatability Measurements", A. Koratkar & S. Martin

CYCLE 4 PHOTOMETRIC CALIBRATION

- **Salient points:** No systematic variation in the FOS sensitivity with time over the period Feb. 1994 to July 1995, except for the redside G190H and the G160L gratings.
- Changes in the FOS flux calibrations relative to those in use by the pipeline are typically less than ∼3% for large apertures and high dispersion gratings. For small apertures the fluxes may differ by 10%. Flux calibration for the low dispersion gratings, especially for the prisms is worse.
- The overall uncertainty of the large aperture FOS flux calibration for point sources is estimated to be 3% if the pointing uncertainty is $< 0.1 - 0.2''$
- When the new calibrations are implemented in the pipeline, the header keyword AIS COR will be set to COMPLETE.

FOS FILTER-GRATING WHEEL REPEATABILITY STATUS:

- **Motivation:** (1) Non-repeatability of the FGW leads to wavelength calibration errors. (2) Understand the nature of the scatter seen in the YBASE calibration analysis which leads to photometric errors for the large apertures and target acquisition difficulties.
- **History:** Pre-flight measurements of the FOS filter-grating wheel (FGW) repeatability showed that the FGW repeatability was of the order of 10 microns (12.8 ybase units in Y and 0.2 diodes in X) in both the X and Y directions of the FOS blue detector and of the order of 14 microns (17.9 ybase units in Y and 0.3 diodes in X) in both the X and Y directions of the FOS red detector.
- **Observations:** Uninterrupted repeated observations with different gratings were obtained in the first part of the calibration program 6146.
- **Results:** The 1σ rms deviations of the position of the spectra for both FOS detectors are 0.47 pixels in the FOS X direction and 0.36 pixels in the FOS Y direction. These rms deviations translate to 0.1 diode in FOS X direction and 9 ybases in the FOS Y direction.
- The range of deviations is 0.06 - 1.44 pixels in FOS X (0.02 - 0.36 diodes) and

0.01 - 0.74 pixels in FOS Y (0 - 18 ybases). Since the deviations in the analysis are Gaussian distributed, we can expect 3σ deviations as large as 1.5 pixels (0.36 diodes)in FOS X and 1.08 pixels (25 ybases) in FOS Y sometimes.

- We see that the range of deviations for the red detector are slightly larger than for the blue detector.
- The scatter in the FOS X direction (along the dispersion axis) leads to wavelength uncertainties in the range of 0.02 - 0.36 diodes. For a typical FOS observation, uncertainties in the absolute wavelength calibration are due to; (a) the non-repeatability of the FGW, (b) the uncertainty in the location of the FOS apertures in the FOS X direction which ranges from -0.21 to 0.13 diodes (CAL/FOS 131), (c) the changes in the ambient magnetic field of the detector, and (d) the target acquisition accuracy. Of these four sources of uncertainty, the non-repeatability of the FGW is the dominant internal instrumental source of inaccuracy in the wavelength calibration of spectra. A contemporaneous calibration lamp spectrum without any change in the aperture position can reduce the effect of FGW on wavelength calibration
- We note that the amount of deviation in the position of the spectra obtained in this test are similar to those obtained during pre-launch calibration mea-

surements. Thus, the post-COSTAR test indicates that there has not been dramatic wear in the FGW notches that hold the grating in a given location.

- Since the pre-launch measurements were in a constant magnetic field and showed similar deviations as the post-COSTAR measurements, we conclude that the scatter in the location of the FOS spectra due to non-repeatability of the FGW is no less than the scatter induced by the magnetic field environment.