# FOS APERTURE WHEEL REPEATIBILITY

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**ABSTRACT**

Repeatibility of the FOS aperture wheel was measured in the ambient calibration of March 1988. Cross-correlation of the emission-line spectra revealed a systematic drift in the X position of the spectra. Over a ~160 minute time interval, the spectra drifted linearly by 0.1 pixels for all three apertures measured. The trend is similar to that seen in March 1983, although the magnitude of the present drift is greater. A possible source of the drift is thermal shifts due to the warm-up of the electronics immediately following high voltage turn-on.

## I. Introduction

Spectra were taken with an external Pt-Cr-Ne lamp in the ambient calibration of March 1988 to determine the repeatability of the FOS aperture wheel. A total of 30 spectra, with grating H27 and 8 x-steps, were obtained with the red detector over a 167 minute time interval, using apertures C2 (0.25X2.0), B2 (0.3), and A4 (0.1-PAIR), in the following order:

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| C2 | B2 | A4 | B2 | C2 | B2 | A4 | B2 | A4 | B2 | C2 | A4 | B2 | C2 | A4 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| B2 | C2 | B2 | C2 | A4 | C2 | A4 | B2 | C2 | B2 | C2 | B2 | C2 | A4 | B2 |

This procedure, YCAPRT, always moves the aperture wheel forward to C2, backwards to B2, and both ways to A4.

## II. Data Reduction

To determine whether there were systematic shifts between spectra, a cross-correlation technique was used; the program CROSS was written at ARC for this analysis. The first observations through each aperture served as a template, with subsequent observations shifted by ±3 pixels and correlated with the template; since there were 8 x-steps, a total of 49 correlations were performed for each pair of spectra. The resultant values of the cross-correlation function were then fit with a Gaussian to determine the shift between the two observations; an example of a fit is shown in Figure 1. All apertures were correlated both against other observations through that aperture, as well as observations through the other two apertures.

## III. Analysis

The offsets for each aperture group were plotted against time to search for any systematic drifts. The results for all three apertures are displayed in Figure 2, where a clear trend can be seen; the trend is also seen when the apertures are correlated against each other. Data taken in March 1983 revealed a similar trend, with a shift of 0.014 pixels seen over a period of approximately 60 minutes (Wheatley, Ford, and Bohlin 1984), roughly half of what is seen in the 1988 data. The tape log indicates that these observations were the first of the day. However, the high voltage should stabilize after ~30 minutes (Lindler and Bohlin, 1984), and since the drift was linear over a 160 minute period, power-up settling is likely not the cause of the drift. A more likely candidate is thermal shifts due to the warm-up of the electronics, which takes ~4 hours to stabilize.

References

Lindler, D. and Bohlin, R. 1984, CAL/FOS-10, STScI.

Wheatley, J., Ford, H., and Bohlin, R. 1984, CAL/FOS-08, STScI.

FIGURE CAPTIONS

Fig. 1. Cross-correlation function for the initial and final 0.1-PAIR aperture observations.

Fig. 2. Pixel offset as a function of time for all apertures (B2-asterisk, C2-plus, and A4-diamond).

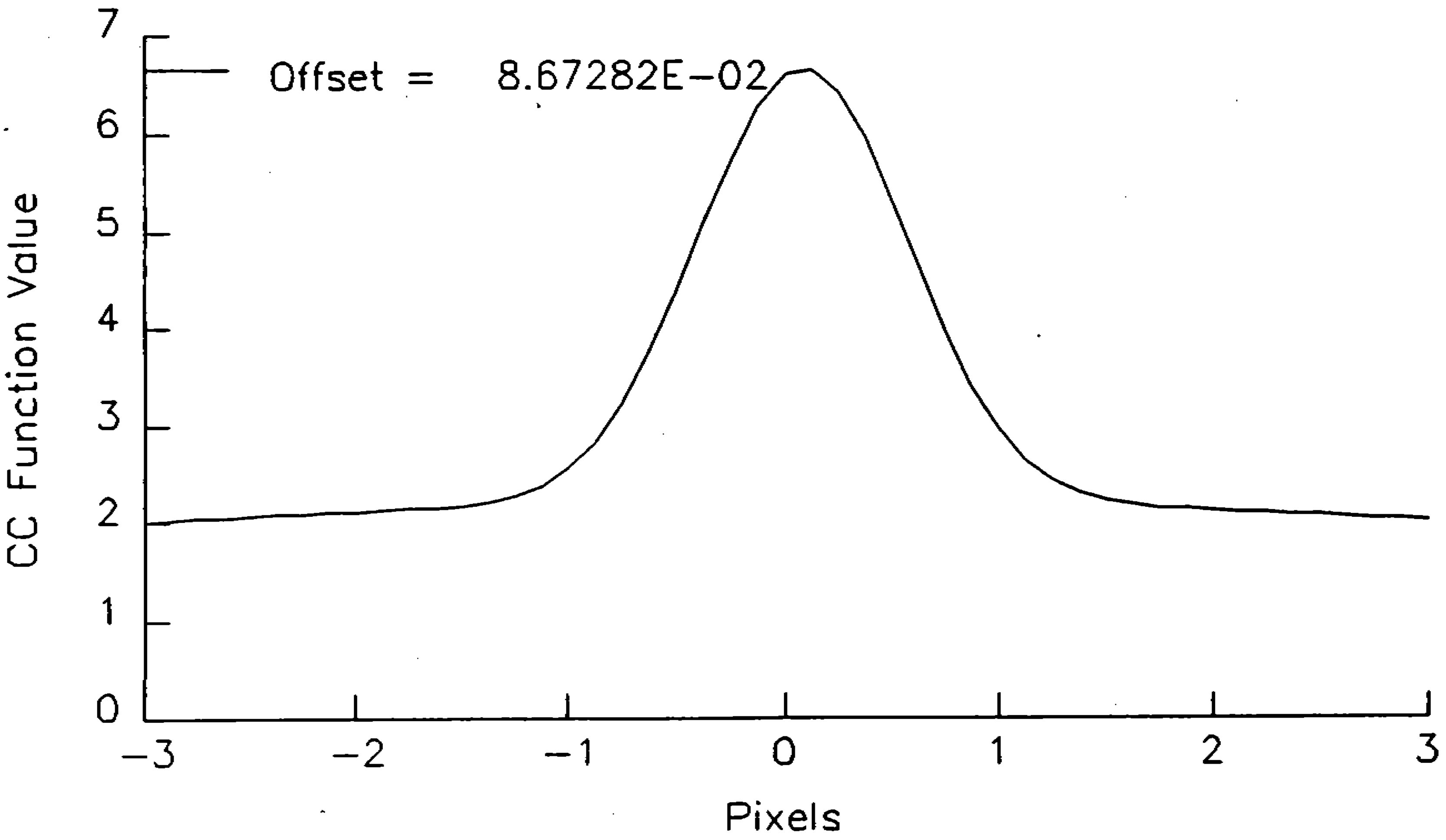
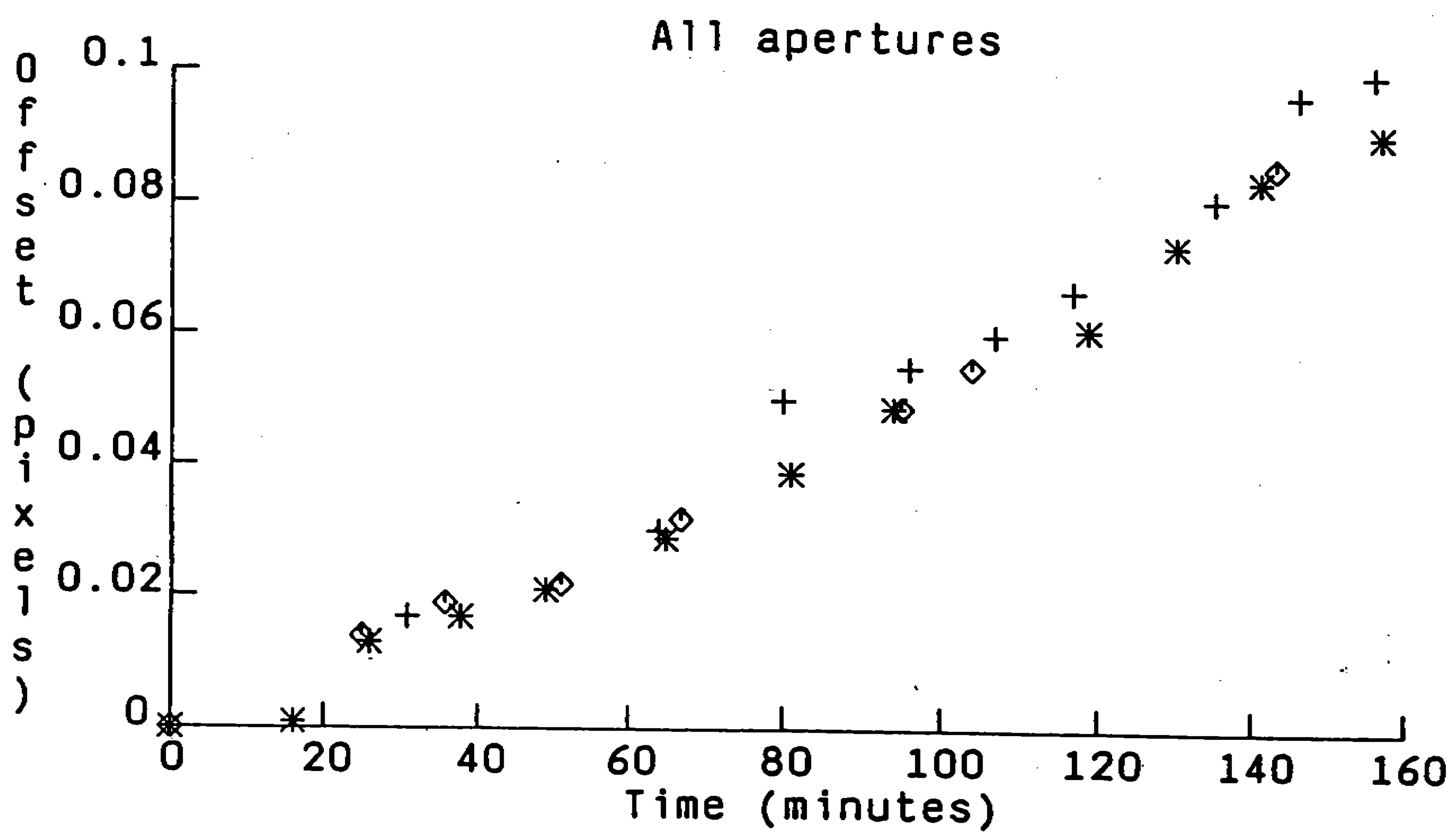

Offset = 8.67282E-02
CC Function Value
7
6
5
4
3
2
1
0
-3
-2
-1
0
1
2
3
Pixels

Figure 1


All apertures
Offset (pixels)
0.1
0.08
0.06
0.04
0.02
0
Time (minutes)
0
20
40
60
80
100
120
140
160