Wide-field Infrared Survey Explorer (WISE)

Cold Cover Test Analysis 20090128 - Looking for Scan Mirror Dependent Flux Offsets

Version 1.0

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Revision History

Date	Version	Author	Description
	1.0	S. Wachter	Initial Draft

1 Introduction

During the Cold Cover test, data were obtained with the scan mirror at various scan mirror positions. This provided an opportunity to investigate the presence of a scan mirror dependent flux offset, similar to that seen in the images acquired with the MIPS 24 μm array of the Spitzer Space telescope. In the end, the environmental conditions during the test were not sufficiently stable to allow for the derivation of any conclusive results regarding a scan mirror dependent offset.

2 Cold Cover Test Details

A short description of each data file from an email by Pedro Sevilla to Amy Mainzer:

- CVR0002: 1-hour run, FPA temps nominal, scan mirror at the center position
- CVR0003: 6-minute run, FPA temps nominal, scan mirror at the positive end
- CVR0004: 6-minute run, FPA temps nominal, scan mirror at the negative end
- CVR0005: 6-minute run, FPA temps colder, scan mirror at the center position
- CVR0006: 16-minute run, FPA temps warmer, scan mirror at the center position. This file was started while the FPAs were still colder and data was taken while the FPAs warmed up and settled. The temperature of FPA 2 only reached 32.5K because the EU FEB heater range for this FPA is lower (~28.5K to 32.5K).

3 Analysis

Only data from 20090128 were used in the analysis. CVR0002 consists of 333, CVR0003-0005 of 33, and CVR0006 of 90 fits files, respectively. The average flux for each image was calculated (with imstat in IRAF) and plotted as a function of continually increasing file number (see Figure 1). The resulting horizontal spacing is not strictly correct as there are gaps between the start times for the different files. However, the file headers within a given CVR000# exposure do not contain any acquisition time information (the time stamp is the same for all the files within one exposure), making it difficult to plot as a function of time. For the purposes of this analysis, the even spacing with file number is sufficient. To correlate the file spacing with time, the start time of each exposure sequence is as follows:

CVR0002: 19:12:11
CVR0003: 20:15:27
CVR0004: 20:23:53

CVR0005: 20:45:20
CVR0006: 20:52:18

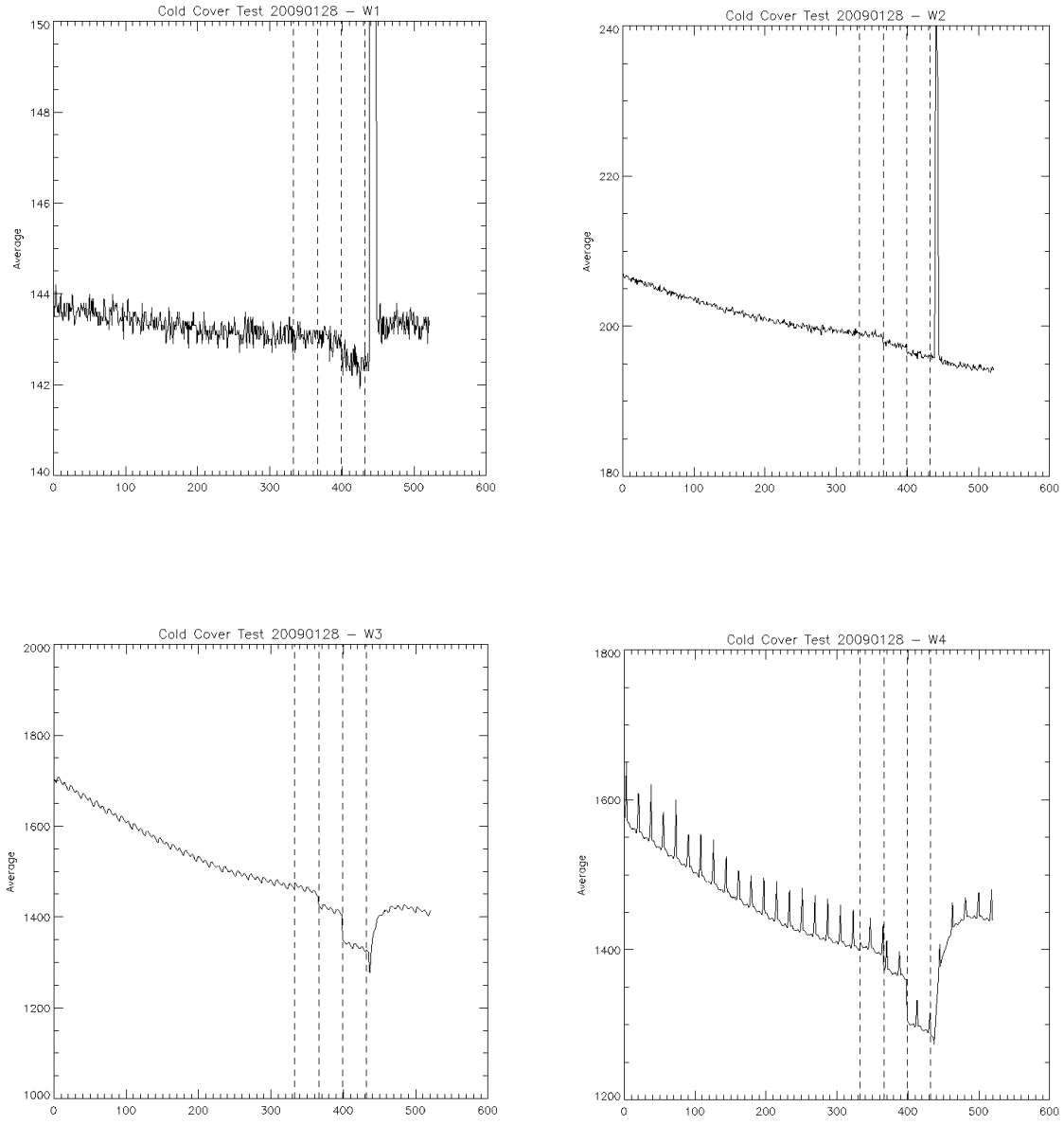

Figure 1: Average flux as a function of file number for each array. The start of each new exposure (CVR000#) is indicated by vertical lines. Note that there is a trend of decreasing flux throughout the duration of the data acquisition. It is not clear whether this is due to a change in temperature or illumination. None of the arrays are at the dark levels measured for the engineering unit, which are 139.3, 172.1, 265.1, and 295.3 for w1-w4, respectively (based on my

measurements of the MIC2 test data from 20081120). An offset to the (truly) dark reference pixels is also seen for every array.

For W1, the observed flux behavior is consistent with the test description, i.e. the flux drops for CVR0005 which was obtained at a colder temperature and increases for CVR0006 obtained at warmer temperatures. There is no evidence for a change in flux levels between the various exposures obtained at different scan mirror positions.

For W2, the behavior does not follow the test description, since the flux for CVR0006 does not increase as seen in W1. However, note that the email above mentions that the heater temperature range for focal plane array 2 was lower, which might explain the observed flux levels. There is an offset between exposure CVR0003 and CVR0004, but since we can see an overall time dependent decaying component and the x-axis does not correspond to actual elapsed time, it is difficult to determine what causes the offset.

W3 and W4 follow the same overall trends, with offsets visible between most exposures. Strange oscillations (in W3) and periodic spikes (in W4) are also present. It is unclear what caused that particular behavior.

4 Ratios

From each exposure, 33 fits files were median combined and ratio images computed between the various exposures obtained at different scan mirror positions. Some selected results are shown in Figures 2 and 3. No structure is apparent in the ratio image for W1 and W2 apart from noisier readouts. For W3 and W4, we see gradients as well as a possible dust donut between the different scan mirror positions. It is not clear what causes the gradients, since we have no information about the uniformity of the illumination during the cold cover test.

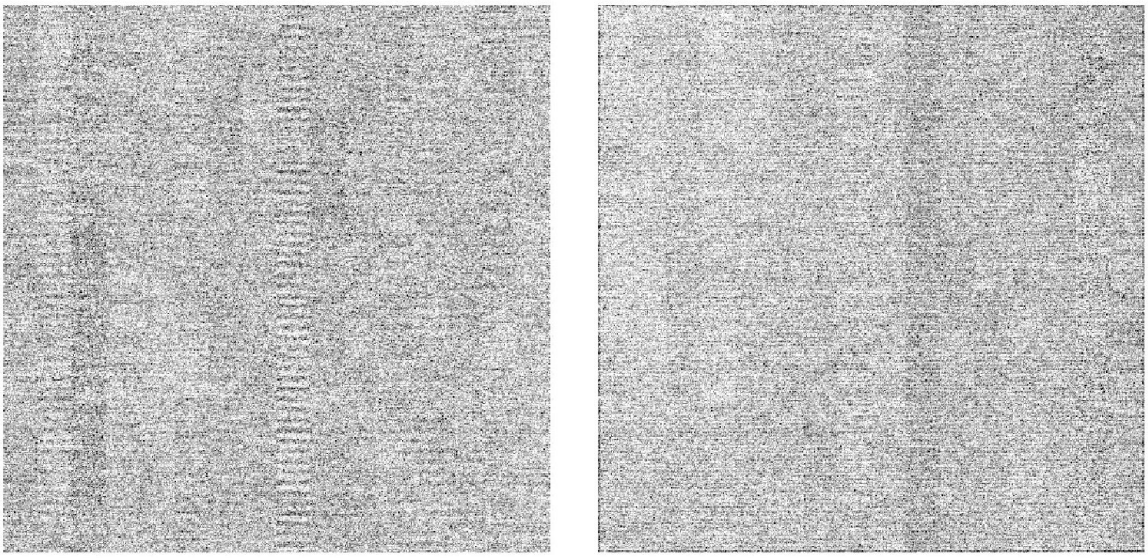

Figure 2: Ratio between combined images created for CVR0004 and CVR0003, sampling the extreme range of the scan mirror positions. W1 left, W2 right.

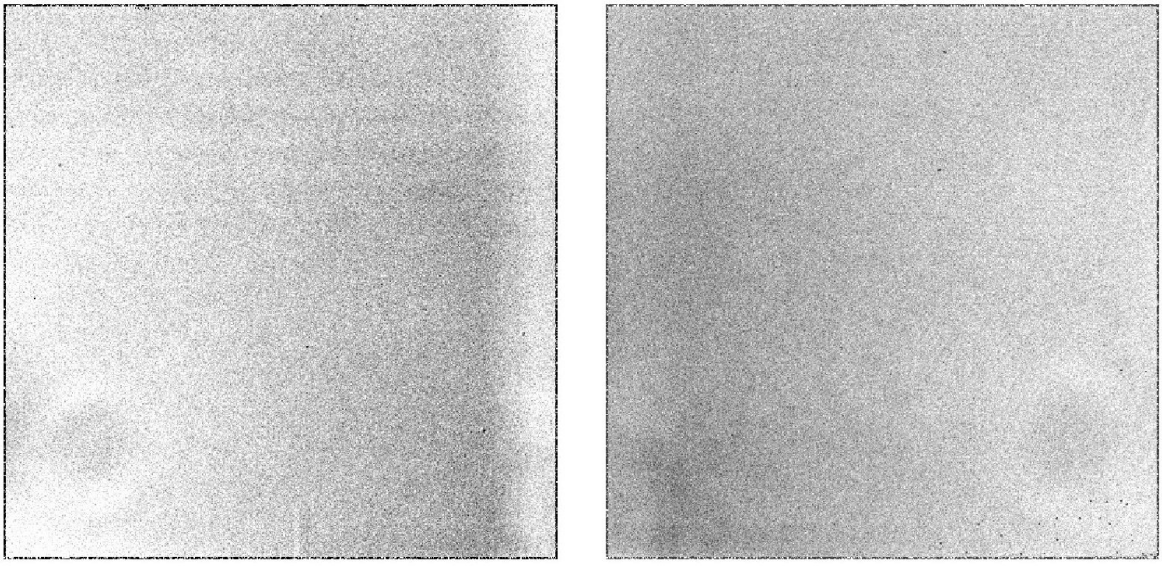

Figure 3: Same as Fig. 2 for W3 (left) and W4 (right).