WFCAM

UKIRT

Title of Test	CROSSTALK MEASUREMENTS IN THE IR DETECTORS
Date	June 9, 2004
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PURPOSE OF TEST

The tests reported on here are intended to measure the level of electronic crosstalk inherent in the HAWAII-II infrared detectors. This effect is visible as inter-channel and inter-quadrant crosstalk and it is vital to measure the level of the effect.

SUMMARY OF TEST RESULTS

The level of inter-channel crosstalk is found to be <0.04% of the spot intensity in all channels in the quadrant expect the two directly adjacent to the spot. The ghost images in the channels either side of the spot are ~30% brighter than the other channels, <0.14% of the spot intensity. They also consistently show an unusual profile, with a negative and positive component (see §Test Results for further information.)

TEST SETUP

With the science grade WFCAM infrared detectors mounted and cold in the small co-planarity cryostat, images where taken with a single LED spot illuminating one channel of one detector. Multiple exposure CDS frames where taken with a variety of exposure times between 1 millisecond and 4 seconds. Equal length non-illuminated images where taken after each spot image. Detectors 41, 60 and 63 where available for use at the time of testing. Using standard IRAF commands the 'blank' frames where subtracted from the object frames, allowing the crosstalk ghosts to be seen.

TEST RESULTS

The crosstalk images where investigated using standard IRAF commands, taking note of intensity and FWHM. The ratio of the spot intensity was then found for each of the crosstalk ghosts ([crosstalk counts/spot counts] * 100), and histogram plots produced. Figures 1 – 4 show the histogram plots for the three detectors but only show the peak values. The x-axis represents the detector channels, 1 – 8, with the percentage ratio of crosstalk to spot intensity on the y-axis. It is clear from the plot where the spot was located on each set of exposures by the lack of data for the given channel. The different colours of columns in each plot show the different results for different exposure times, details of given in the ledgers.

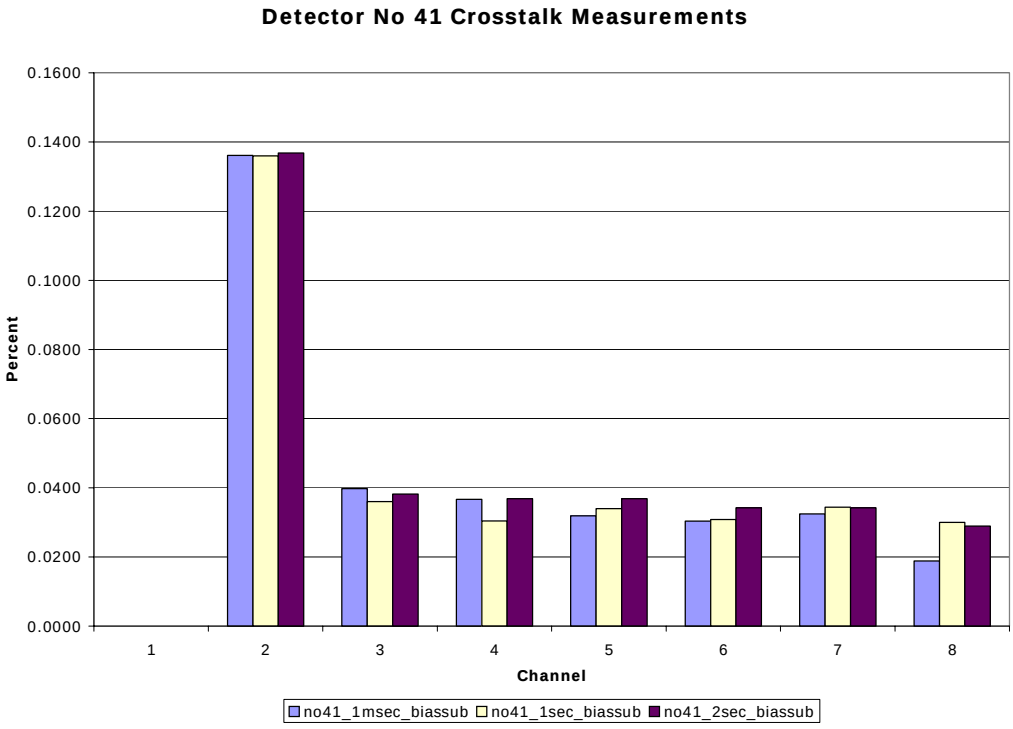

Figure 1: Spot was positioned on channel 1.

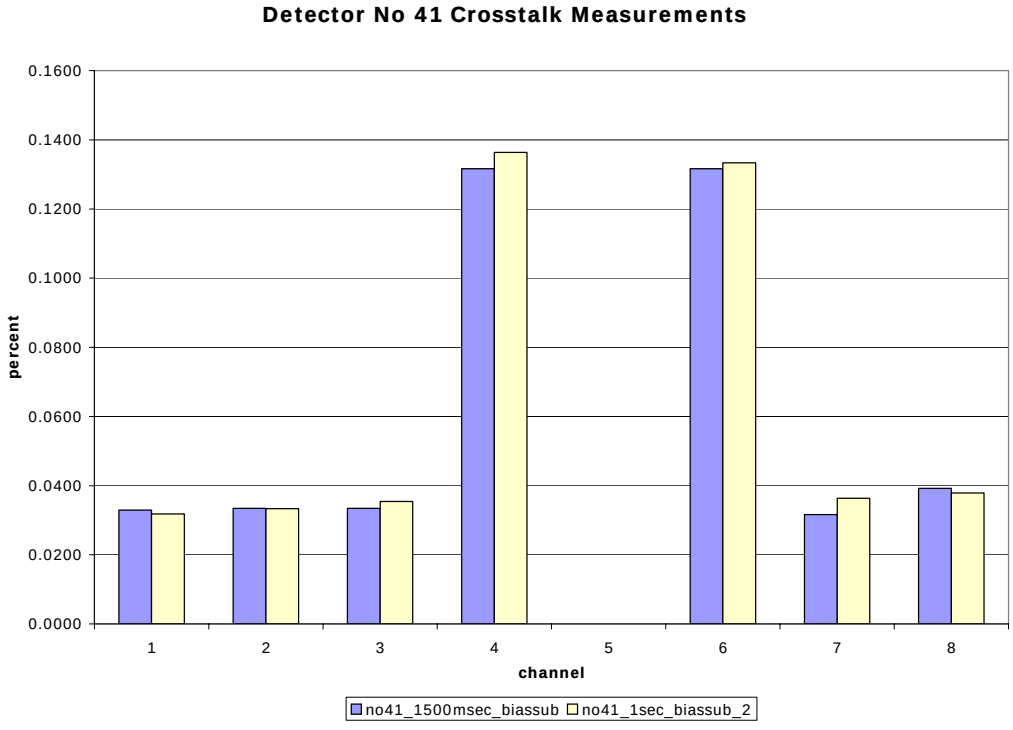

Figure 2: Spot was positioned on channel 5.

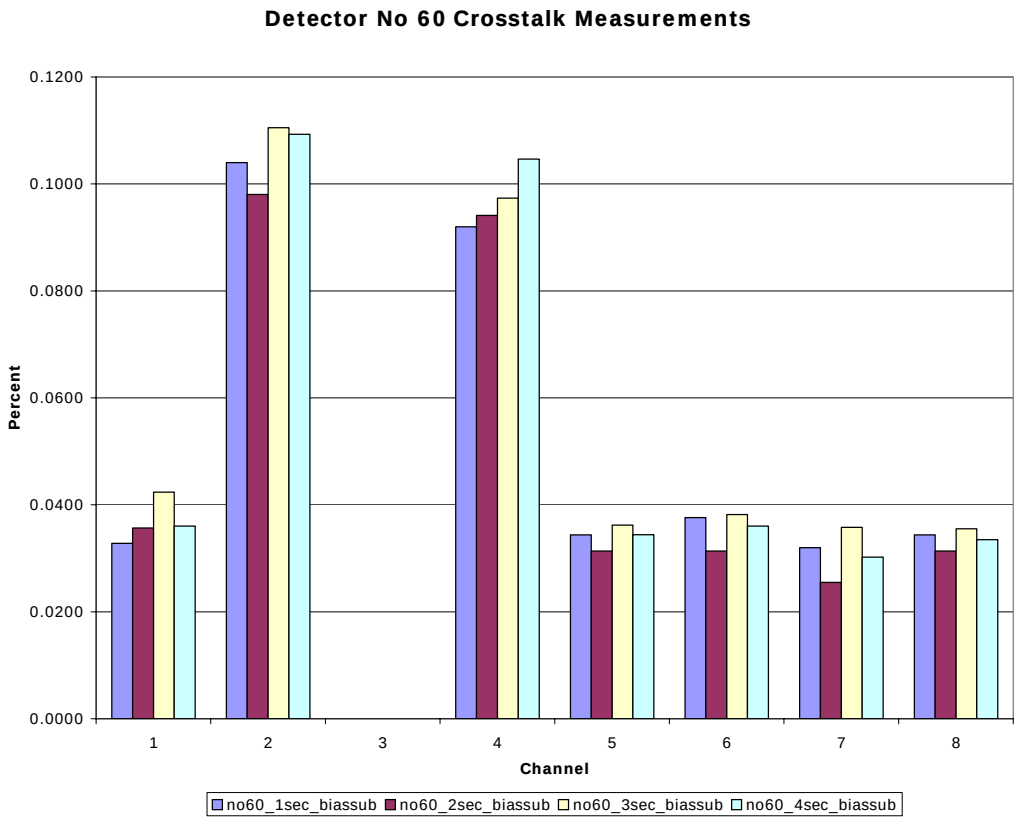

Figure 3: Spot was positioned on channel 3.

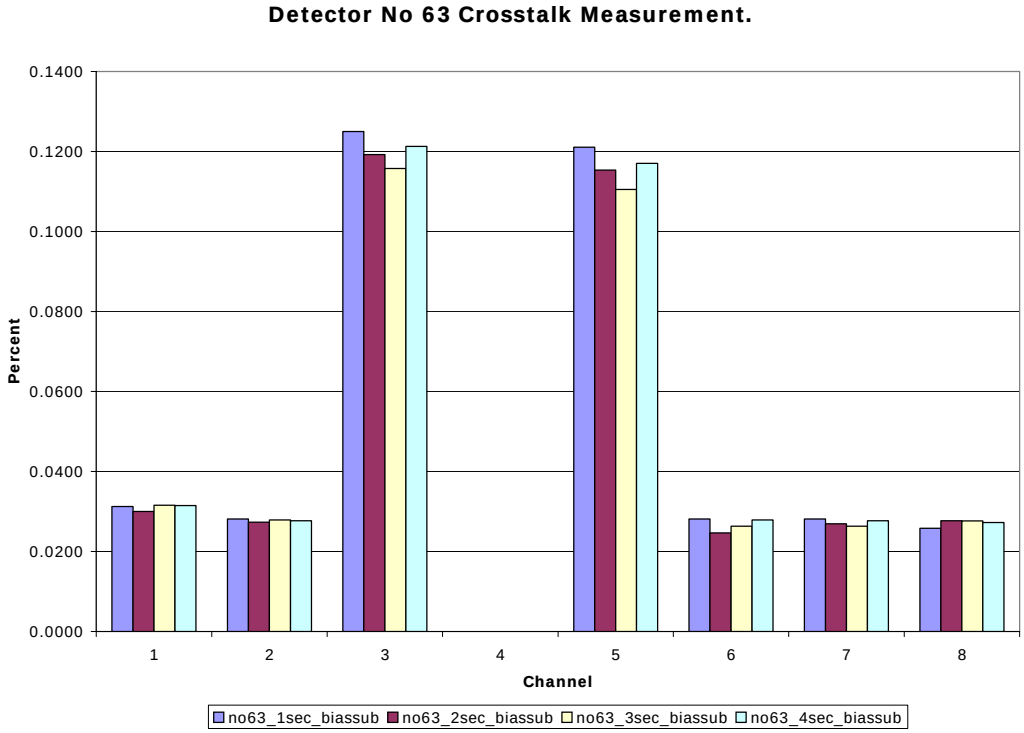

Figure 4: Spot was positioned on channel 4.

The plots show a clear consistence in behaviour regardless of detector, spot position or exposure length. For all non-adjacent channels the crosstalk ghosts are all <0.04% of the spot intensity. Even as the exposure times increase and the spot intensities increase the ratio of crosstalk image to spot image remain constant. In all cases the directly adjacent channels to the spots have a higher crosstalk/spot ratio, with the crosstalk peaks all being <0.14%.

As mentioned the adjacent channels to the spot behave differently to the other detector channels, an effect which was seen on all the three tested detectors. The adjacent channels have two components to the ghost images, seen as a peak and a trough on the subtracted images. Both components have roughly the same strength, as demonstrated with Figure 5. This histogram plot shows the counts in all the adjacent channels for all the frames analysed, all images have strengths ≤ ±0.15% of the spot intensity.

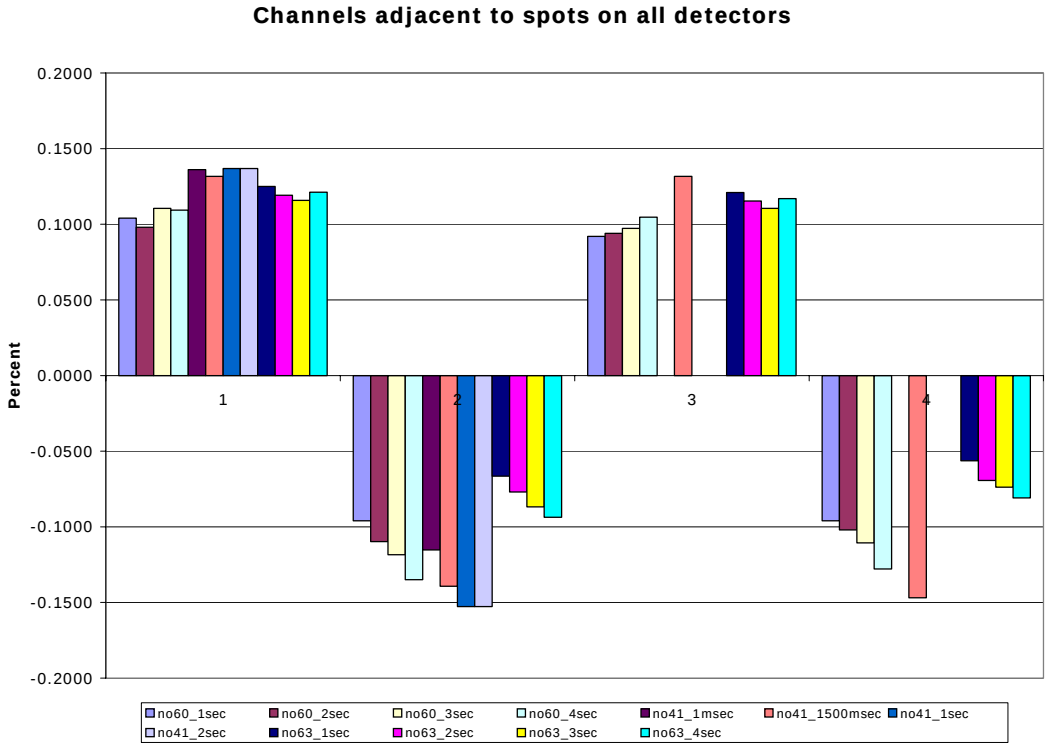

Figure 5: Strengths for the 'peak' and 'through' components for spot adjacent ghost images.

Figure 6 shows the characteristic profile for the ghost images in the channels either side of the spot image. The profiles are consistently negative on the same side of the ghost image, regardless of which channel or location of the spot. See Figure 7 for a image of the spot and ghost images on the adjacent channels, black is negative while white is positive.

There is no measurable inter-quadrant crosstalk.

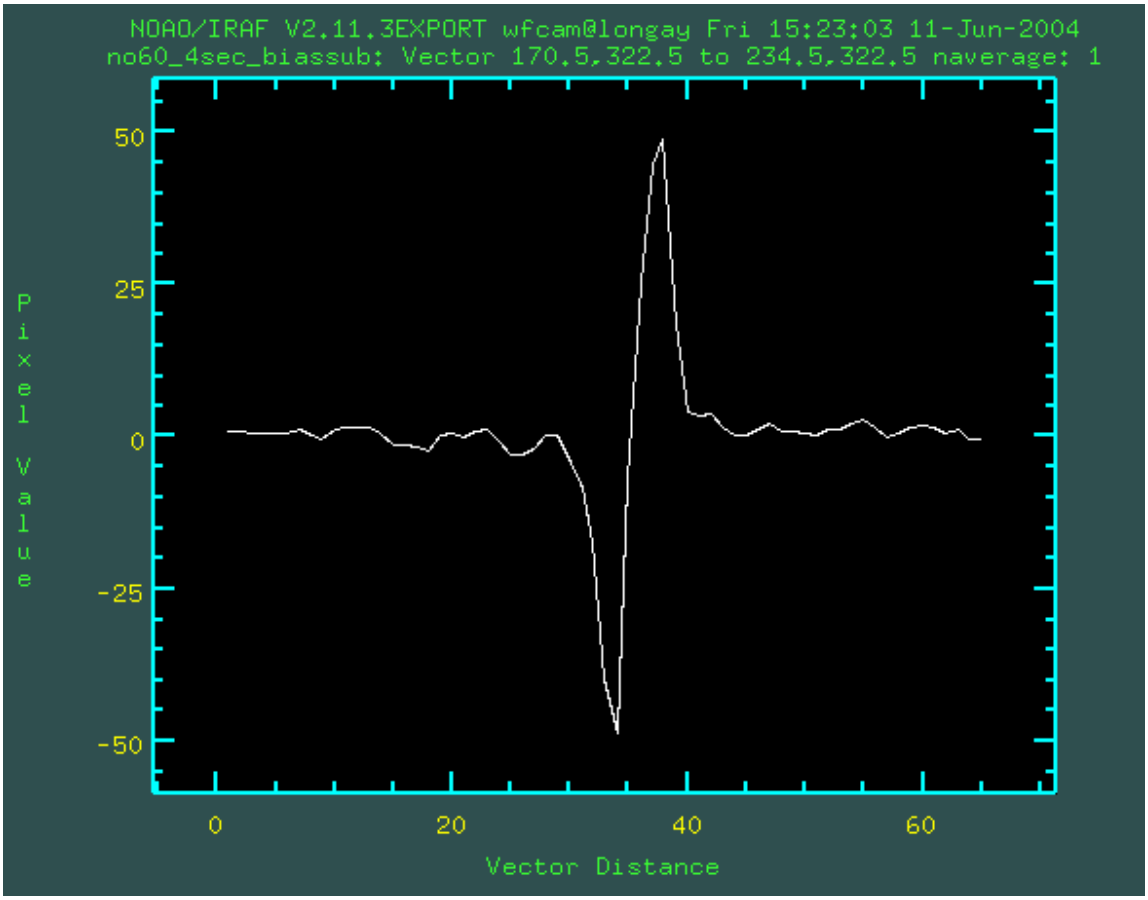

Figure 6: Profile characteristic of the ghost images on channels either side of the spot.

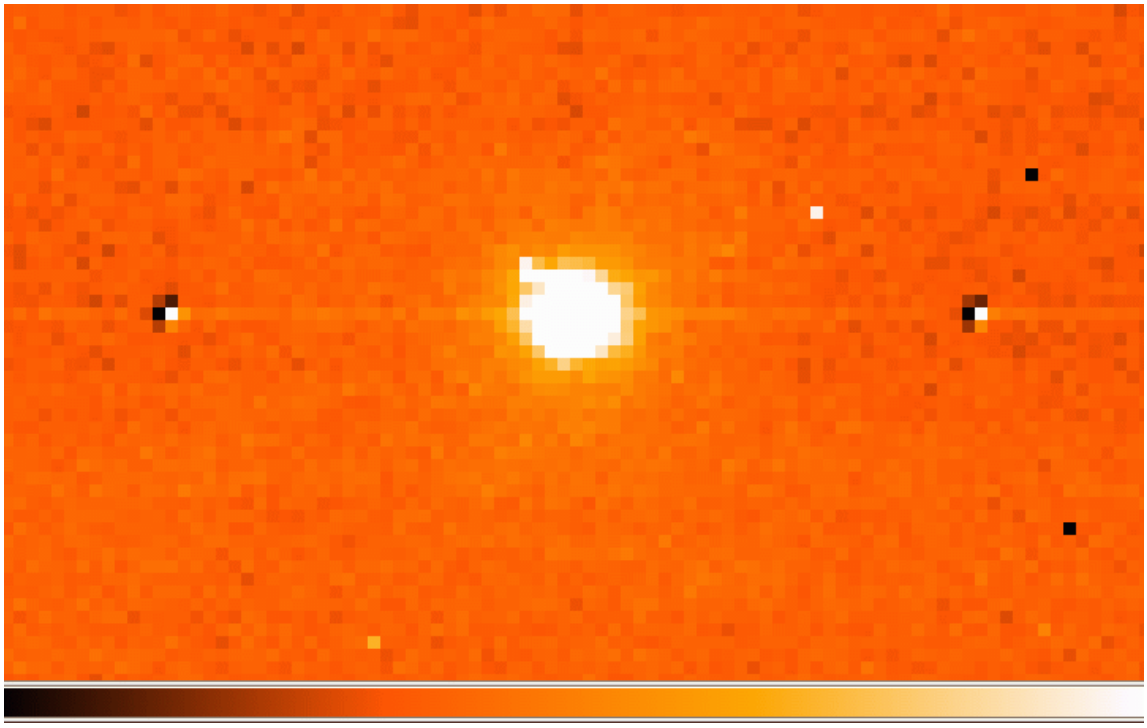

Figure 7: Image of a spot and the ghost images on the adjacent images. Colour bar located at the bottom, black is negative while white is positive.