MIPS Campaign D2

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Abstract

In this campaign, we obtained data at reasonably low background from the telescope at 24 microns, including both stellar images and calibration frames. We combined the data into a high signal-to-noise point spread function for comparison with the TinyTim image prediction. The correspondence was very close, indicating that focus was already close enough to optimum for any degradation to be hardly noticed at 24 microns and longer wavelengths.

1. First Focus Image

The first focus image is shown in Figure 1. The image is unsaturated, but the stretch on the display burns out the central peak and the first bright diffraction ring - the prominent diffraction ring is the *second* one. The image is in very close agreement with the TinyTim model, a subject that will be discussed in more detail in the summary of Campaign E.

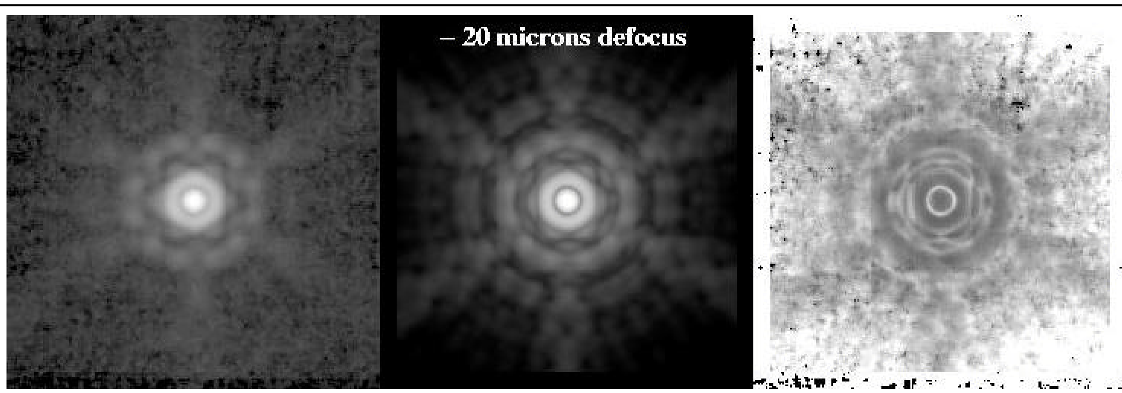

Figure 1. MIPS 24 micron images of (left) K star HD 53501; (center) defocused STinyTIM simulation; and (right) the sky/model ratio. All are displayed in a log scale. This particular set of images is close to the true defocus.

2. Operational Aspects of Campaign D1

2.1 AOR Validation

The operation of the small-field photometry AOT was found to be close to expectations, so long as we carry out an array flip in X (X = -X) and a 180 degree rotation in the Y WCS direction. Once these changes have been implemented in the ground software, we should be able to use mosaicing and other software tools satisfactorily.

2.2 On-board Silicon Array Data Processing

The data set shows that the SUR data compression algorithm works as determined by ground testing. The first DCE commanded in an exposure sequence produces a lower on-board slope value than fitting of a comparable RAW ramp. A sample of the results is given below. We looked at a stim signal, set to a constant level, and compared the results for the slope obtained on-board ("SUR") and those obtained from a full set of data sent to the ground and fitted with a linear regression algorithm thought to be equivalent to that used on board ("RAW"). The on board fitting obtains slightly smaller slopes both in the median and mean. Excluding the first DCE taken in an exposure sequence, the SUR algorithm produces slopes within 1% of slopes derived from RAW DCEs.

MODE	AOR/EXP/DCENUM	MEAN	MEDIAN
SUR	6763264.0.1	1176.03	953.00
RAW	6763264.1.1	1199.37	971.71

This difference was subsequently traced by Tom Glenn to a slight error in the flight software fitting algorithm for the first valid array readout in a series of DCEs. It can be fixed by a revision of the flight software.

2.3 Darks and Read Noise

The telescope was cold enough that we were in a quite dark condition in the nominal dark postion of the scan mirror. The mean dark current was 8.4 +/- 2.1 e/s. A read noise measurement from the ensemble of DCEs yields RN=45.1 +/- 6.3 e. A flux standard was measured and the conversion to flux density found to agree to about 1% with the measurement of a different star in Campaign D1. A more detailed discussion of these data will be provided in a calibration report for the 24 micron array after more data have been obtained.

2.4 Far Infrared Arrays

The 160 micron array continued to be hard saturated. In the best dark position, the 70 micron array was not saturated and we got the first look at its performance on all pixels (the image uses the first few reads on an integration slope, since saturation still occurs on most pixels prior to the reset). The result is shown in Figure 2.

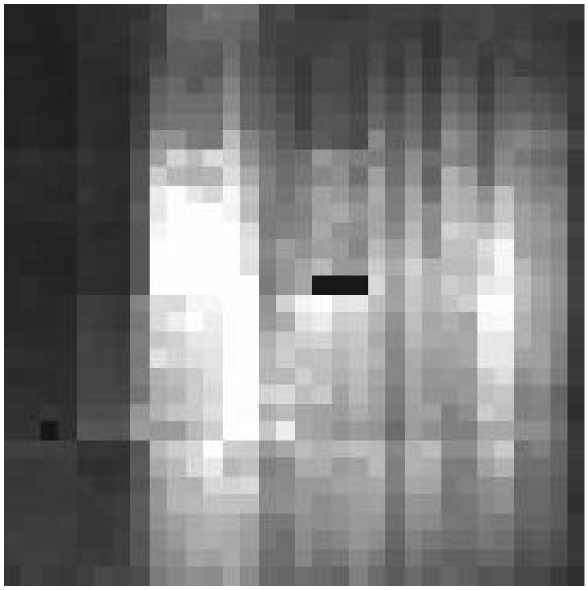

Figure 2. Operation of the 70 Micron Array. The scan mirror is in the "SED" position. The low signal levels to the left show the effectiveness of the total power mode dark area - signals should not be reaching this region except by scattering within the instrument. The array appears to be in excellent health.

3. Summary

.This campaign resulted in excellent images, predicting success in the focus determination coming up in Campaign E. Some coordinate issues were confirmed, and fixes need to be applied in the ground software to provide images in the expected orientation. A difference was found in the slope fitting between ground and on-orbit processing, and it was subsequently traced to an error in handling the first DCE of a series in the flight software. This bug can be fixed by a revision of the flight software. The 160 micron array continued to be hard saturated. The 70 micron array was in good health, although still seeing large signals even in the dark position.