ACS Solar Blind Channel Absolute Flux Calibration

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Introduction

In the last few years, observers and STScI staff have noted that the predicted count rates for the ACS/SBC imaging modes do not match observed count rates. The ACS Team conducted a campaign with the ultimate aim of fixing the absolute flux calibration of the imaging modes.

Photometry and Spectra

SBC photometry and associated UV spectroscopy of sources are necessary in order to determine the absolute flux calibration of an observation mode. These data exist for the open cluster NGC6681. Figure 1 shows the six selected stars within the clusters and their corresponding spectra. Spectra were obtained with the Space Telescope Imaging Spectrograph (STIS) using a 52”× 2”long slit, and the FUV/G140L, NUV/G230L, and CCD/G430L modes.

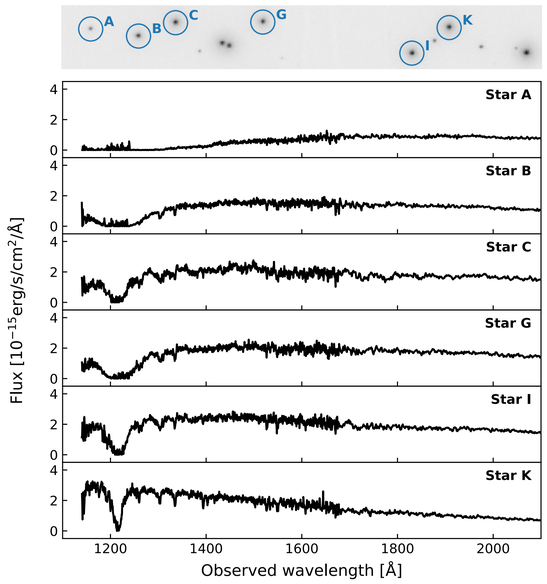
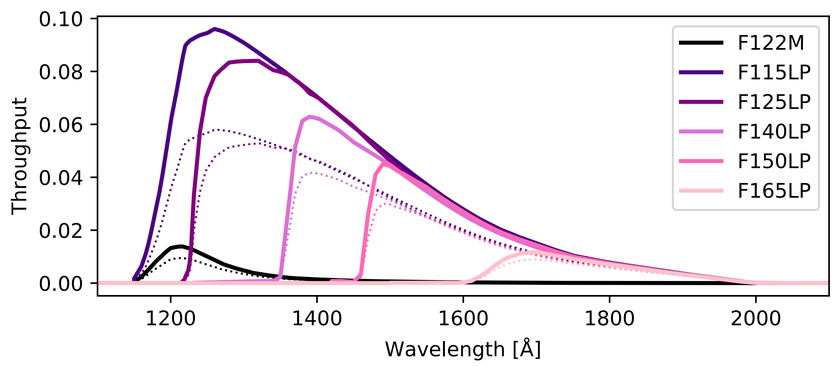


FIGURE 1 - (TOP) APPROXIMATE LOCATION ON THE SKY OF THE STIS SLIT ON THE NGC6681 CLUSTER. THE MARKED STARS WERE USED FOR THIS STUDY. IMAGE IS 2.75" X 20". (BOTTOM) STIS SPECTRA OF THE SAME SIX STARS. G140L MODE WAS USED BELOW 1687Å, AND G230L ABOVE.

THE THROUGHPUT CURVES FOR THE IMAGING MODES OF THE ADVANCED CAMERA FOR SURVEYS SOLAR BLIND CHANNEL HAVE BEEN UPDATED TO CORRECT FOR A 15% - 30% ERROR IN THE ABSOLUTE FLUX CALIBRATION.



Matched Photometry

Synthetic photometry was performed using the PYSYNPHOT python package. Bandpasses are convolved with observed UV spectra to simulate HST observations of targets, yielding predicted count rates. Figure 2 shows the ratio of synthetic photometry to observed photometry of each star and filter combination, as a function of the effective wavelength of the observation. The bottom set of points (squares) show the results from using the set of uncorrected throughput curves. The synthetic photometry deviates from the observed photometry by ~15% – 33%. The discrepancy is such that the SBC is more sensitive than previously estimated.

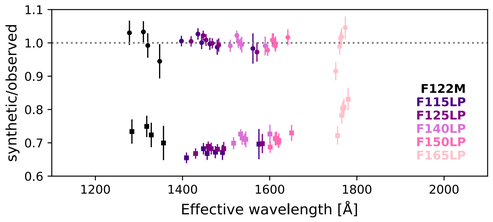


FIGURE 2 - RATIOS OF SYNTHETIC TO OBSERVED PHOTOMETRY FOR EACH STAR. SQUARE POINTS SHOW THE RATIOS BEFORE ANY ADJUSTMENTS WERE MADE TO THE THROUGHPUT CURVES. CIRCLES SHOW THE RATIOS AFTER CORRECTIONS.

Adjustments were made to both the detector and filter throughput curves in order to correct the discrepancy between predicted and measured count rates. The final set of throughput curves for the six imaging modes of the SBC are shown in the central panel of this presentation. For comparison, the curves being replaced are shown in dotted lines.

Results

The aggregate adjustments resulted in throughput curves with higher sensitivity in all imaging modes. The practical result of these changes is that the new zeropoints are fainter than before. In other words, until now, the observed astrophysical fluxes of sources have been overestimated. Updated zeropoints for F122M and F165LP have accuracies of ~ 4.5%, while the other filters have accuracies better than ~ 1.7%. New throughput curves and other necessary support files have been delivered to the calibration pipeline so that, from now on, SBC images downloaded from MAST contain the appropriate zeropoints.

Background image courtesy of www.vecteezy.com
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