

A Field Guide to WFPC2 Image Anomalies

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ABSTRACT

We describe many of the less-common artifacts and anomalies which appear in WFPC2 images. Examples are given with brief descriptions of their cause, correction, and prevention.

1. Introduction

Maximizing the science return of WFPC2 images requires familiarity with various artifacts and anomalies which can occur. Common artifacts, such as cosmic rays and hot pixels, are familiar to most observers and there are effective observing strategies and analysis tools for removing them. Other anomalies and artifacts are less well-known and less common, and yet impact many hundreds of images per year. These lesser-known anomalies are the subject of this report. Fortunately, with careful planning and data analysis, most can be prevented or removed from the data.

Several anomalies are associated with observations of bright stars and other objects attaining high exposure levels. These include ghost images, OTA diffraction effects, and horizontal smearing. These effects all make it difficult to detect faint companions of bright targets, but can be eliminated with proper observation planning and careful data analysis. Residual image effects are also associated with high exposure levels, though they primarily impact *subsequent* exposures of faint targets.

There are also artifacts associated with bright objects which are merely near the WFPC2 field of view. These include PC stray light and the “dragons breath” patterns. Here the simplest cure is prevention by placing the offending object farther from the field of view.

Contamination patterns, or “worms,” are readily visible only in planetary and flat field

1. Copies of this report may be obtained from the Science Support Division, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore MD 21218, by e-mail to help@stsci.edu, by anonymous FTP to [stsci.edu](ftp://stsci.edu) directory [instrument_news/WFPC2](ftp://stsci.edu/instrument_news/WFPC2), and by WWW at <http://www.stsci.edu/instruments.html>

exposures, but yet affect the calibration of all images at the 1% to 2% level. These can be reduced by planning observations early in decontamination cycles, or by correcting images during analysis.

Some artifacts occur completely at random, and no reasonable degree of planning will eliminate them. While careful analysis techniques can reduce their effects, the only complete cure is taking multiple data frames of the same field and being prepared to discard affected image regions. These anomalies include moving targets, missing data, jumps in bias level, and bias ripples. Similarly, scattered Earth light, which impacts long exposures in broad filters, will be difficult to avoid during planning, but can be eliminated when combining multiple frames of a given field.

Herein we describe these image anomalies, show examples, and discuss steps which can be taken to prevent or correct them. The anomalies are ordered starting with those internal to the CCD, and proceeding backwards along the light path, through the OTA, and finally concluding with those caused by data transmission to the ground. The final section (Section 14) discusses correction of some anomalies by rejecting bad image regions during image combination. Common artifacts, including cosmic rays and hot pixels, are covered in the WFPC2 Handbook (v. 3.0) section 4.2.

Observers who feel their data have been severely compromised by some anomaly should be aware that they can file a HST Observation Problem Report (HOPR) within three months of the data distribution and request a repeat of the observation. The procedure for this is described at http://presto.stsci.edu/public/hopr_instruct.html. Once a repeat observation is granted the current policy is for the corrupted image(s) to become public. This prospect should be weighed when deciding whether to request a repeat observation.

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