



AHELP for CIAO 3.4

monitor_photom

Context: [tools](#)

Jump to: [Description](#) [Example](#) [Parameters](#) [NOTES](#) [Bugs](#) [See Also](#)

Synopsis

Generate a photometric lightcurve from ACA monitor data

Syntax

```
monitor_photom infile output [dark_ratio] [min_dark_limit]
[min_dark_meas] [max_dither_motion]
```

Description

The Aspect Camera Assembly (ACA) is capable of providing simultaneous optical monitoring of a target during an observation. The monitor_photom script is used to generate a photometric lightcurve for a Chandra target which was observed using an ACA monitor window.

The basic idea of the detection algorithm is to sample pixels from the outer edge of the readout window and look for values higher than a threshold. At the edge, the contamination of the dark current measurement from the monitor star is minimized. Since the readout window moves with respect to the CCD due to dither, the edge pixels end up sampling much of the CCD region used for imaging. In this way one can build up a map of warm pixels.

The main processing steps of the monitor_photom script are:

- Read the image data file.
- Median filter image data in time on a pixel-by-pixel basis to remove cosmic rays.
- Search for "warm" pixels that have a dark current well outside the normal distribution. These pixels can significantly affect photometry as they dither in and out of the 8x8 pixel image readout window.
- Subtract the background from each image readout. For warm pixels the detected value for that pixel is used, while for all others the median background dark current reported by the ACA is used.
- Produce lightcurves in counts, counts/sec, and mags.

Limitations

There are three limitations to the algorithm:

- Background pixel sampling is not complete nor uniform.

- For brighter stars, even the edge pixels have significant contribution from the star light so it is not possible to get a true dark current measurement. The "dark_ratio" parameter specifies that the warm pixel threshold be no less than dark_ratio * avg_source_counts.
- The current algorithm does not account for flickering.

This script is used in the [Processing ACA Monitor Window Data thread](#).

Advanced Support

If the monitor photometry data indicate scientifically interesting results worthy of detailed study, users may wish to contact aspect_help@cfa.harvard.edu for further advice on possible techniques to reduce the systematic errors.

Example

```
monitor_photom pcad_adat71.fits monitor_lc.fits
```

monitor_photom is run with all the default parameter values. The following screen output is generated:

```
Filtering image data (cosmic ray removal)...
  Image 23624 of 23624

Average counts (e-) = 2137.996582
Warm dark limit (e-) = 80.000000

Stacking dark current data...
  Image 23624 of 23624

Warm pixel at CCD (row,col) =  -18,10      Dark current (e-) =  85
Warm pixel at CCD (row,col) =  -17,11      Dark current (e-) = 325
Warm pixel at CCD (row,col) =  -11,11      Dark current (e-) = 615
Warm pixel at CCD (row,col) =  -15,12      Dark current (e-) = 105
Warm pixel at CCD (row,col) =   -8,16      Dark current (e-) = 115
Warm pixel at CCD (row,col) =  -10,17      Dark current (e-) = 105
Warm pixel at CCD (row,col) =  -17,19      Dark current (e-) = 170
Warm pixel at CCD (row,col) =  -14,20      Dark current (e-) = 130
Warm pixel at CCD (row,col) =  -13,20      Dark current (e-) = 175
Warm pixel at CCD (row,col) =   -9,20      Dark current (e-) = 110
Warm pixel at CCD (row,col) =  -7,20      Dark current (e-) = 350

Enter return to exit the program:
```

Parameters

name	type	ftype	def	reqd
<u>infile</u>	file	input		yes
<u>output</u>	file	output		yes
<u>dark_ratio</u>	real	input	0.005	
<u>min_dark_limit</u>	real	input	80.0	
<u>min_dark_meas</u>	integer	input	10	
<u>max_dither_motion</u>	integer	input	10	

Detailed Parameter Descriptions

Parameter=infile (file required filetype=input)

ACA image data file

The PCAD Level 1 ACA image data files (pcad...adat71.fits) are a "supporting" data product. The "7" in "adat71" refers to image slot 7, which is the slot where monitor window data always appear.

The monitor window data are available beginning with standard data processing (SDP) version DS 7.6.0. Check the ASCDSVER keyword in the event file header to see which software version was used in processing the data.

Typically the image data are split over a number of files. Use dmmerge to merge them into a single file for input to monitor_photom:

```
unix% ls -l *adat71.fits > adat71.lis
unix% dmmerge infile=@adat71.lis outfile=pcad_adat71.fits \
  outBlock=ACADATA
```

Parameter=output (file required filetype=output)

Output lightcurve

The lightcurve contains columns with the time, counts, count rate, magnitude, and background-subtracted image. The magnitude is defined as

$$m_{ACA} = 10.32 - 2.5 * \log_{10}(\text{cnt_rate} / 5263.0)$$

An approximate formula relating B and V magnitude to m_{ACA} is given in the [Aspect chapter of the Proposers' Observatory Guide](#).

Parameter=dark_ratio (real filetype=input default=0.005)

Dark ratio

This parameter affects the way in which warm pixels are detected.

Parameter=min_dark_limit (real filetype=input default=80.0)

Minimum warm pixel dark current

This parameter affects the way in which warm pixels are detected.

Parameter=min_dark_meas (integer filetype=input default=10)

Minimum warm pixel measurements

This parameter affects the way in which warm pixels are detected.

Parameter=max_dither_motion (integer filetype=input default=10)

Maximum possible dither motion (pixels)

NOTES

This script is not an official part of the CIAO release but is made available as "contributed" software via the [CIAO scripts page](#). Please see the [installation instructions page](#) for help on installing the package.

Bugs

See the [bugs page for this script](#) on the CIAO website for an up-to-date listing of known bugs.

See Also

tools

[dmtype2split, tg_create_mask, tg_resolve_events, tgdetect, tgextract, tgidselectsrc, tgmatchsrc](#)

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URL:
http://cxc.harvard.edu/ciao3.4/monitor_photom.html
Last modified: March 2007