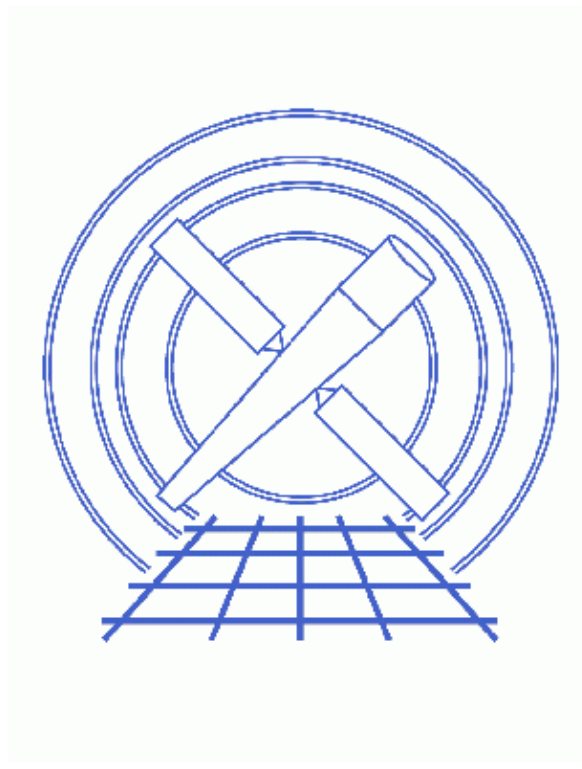


# Displaying the FEF Regions Covered by a Source



## ***CIAO 3.4 Science Threads***

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# Displaying the FEF Regions Covered by a Source

*CIAO 3.4 Science Threads*

## Overview

*Last Update:* 1 Dec 2006 – reviewed for CIAO 3.4: no changes

### *Synopsis:*

The RMF used to analyze a source depends on what part of the chip the source falls on. As described in the mkrmf help page, the RMF is calculated using information stored in a FEF file. Since the information in the FEFs changes over the chip – the exact regions over which a particular FEF is valid depend on the chip and the focal–plane temperature – it is sometimes useful to see how the source photons are distributed with respect to this grid (this is particularly true for extended sources).

### *Purpose:*

To view the distribution of source photons on the FEF grid.

### *Read this thread if:*

you are working with an ACIS observation (imaging or grating) and intend to create an RMF with mkrmf.

This thread does not apply to users running mkacisrmf, since that tool uses a different format of calibration file in place of the FEF files.

### *Related Links:*

- Analysis Guide: Extended Sources

*Proceed to the HTML or hardcopy (PDF: A4 / letter) version of the thread.*

## Download regions.sl

The most recent version of `regions.sl` is v1.2 (17 July 2003):

```
unix% grep Id $ASCDS_CONTRIB/share/slsh/local-packages/regions.sl
% $Id: regions.sl,v 1.2 2003/07/17 18:48:39 dburke Exp $
```

Note that `$ASCDS_CONTRIB/share/slsh/local-packages/` is the default path in the standard CIAO scripts installation; see the Scripts page for more information. ***Please check that you are using the most recent version before continuing.*** If you do not have the script installed or need to update to a newer version, please refer to the Scripts page.

## Getting Started

*Sample ObsID used:* 459 (HETG/ACIS-S, 3C 273)

***File types needed:*** evt2

The script provides a S-Lang function (`display_fef_regions()`) which requires an event file containing the source photons; it will accept the DM virtual-file syntax for filtering on-the-fly. The input file should only contain photons falling on a single ACIS chip, so it will be necessary to include a filter such as "`ccd_id=<number>`" if the source region covers more than one chip. It should also contain a TIME column, as the first entry is used to find out the focal plane temperature at the time of the observation.

For this example, we use the 3C 273 source and background regions defined in the Extract ACIS Spectra for Pointlike Sources and Make RMFs and ARFs thread, namely:

```
unix% cat 3c273.reg
# Region file format: CIAO version 1.0
rotbox(4148.125,4043.625,7.58978,22.338761,44.516094)

unix% cat 3c273_bg.reg
# Region file format: CIAO version 1.0
circle(4119,4014.75,10)
circle(4077,4025.75,10)
circle(4186.5,4023.25,10)
circle(4196.25,4064.5,10)
```

## Run the script

The S-Lang script must be loaded into *ChIPS* (or *Sherpa*) before it can be run (this step is only necessary once per *ChIPS/Sherpa* session):


```
chips> () = evalfile( "regions.sl" )
```

or by loading the code using the `--slscript` option:

```
unix% chips --slscript regions.sl
```

First we shall look at the source region:


```
chips> display_fef_regions( "acisf00459N002_evt2.fits[sky=region(3c273.reg)]" )
# Reading points from acisf00459N002_evt2.fits[sky=region(3c273.reg)]
# Chip is ACIS-7
# Focal Plane temperature = -110 C
# Number of photons in region = 736
#      Region      Num  Fraction
#  chipx  chipy  photons
# 0257:0288 0353:0384      344  0.4674
# 0289:0320 0353:0384      187  0.2541
# 0257:0288 0385:0416      151  0.2052
# 0289:0320 0385:0416       52  0.0707
# 0257:0288 0321:0352        1  0.0014
# 0289:0320 0321:0352        1  0.0014
```

Figure 1  shows the plot. The output tells us that almost half of the source photons fell in the region CHIPX=257:288, CHIPY=353:384.

Looking at the background region, we get:

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```
chips> display_fef_regions( "acisf00459N002_evt2.fits[sky=region(3c273_bg.reg)]" )
# Reading points from acisf00459N002_evt2.fits[sky=region(3c273_bg.reg)]
# Chip is ACIS-7
# Focal Plane temperature = -110 C
# Number of photons in region = 216
#
#      Region          Num  Fraction
# chipx  chipy  photons
0257:0288 0417:0448      39  0.1806
0289:0320 0321:0352      31  0.1435
0257:0288 0289:0320      25  0.1157
0289:0320 0385:0416      25  0.1157
0289:0320 0417:0448      18  0.0833
0257:0288 0321:0352      16  0.0741
0257:0288 0449:0480      13  0.0602
0321:0352 0321:0352      12  0.0556
0289:0320 0353:0384      11  0.0509
0257:0288 0385:0416       8  0.0370
0289:0320 0289:0320       7  0.0324
0321:0352 0353:0384       3  0.0139
0225:0256 0449:0480       3  0.0139
0321:0352 0385:0416       2  0.0093
0289:0320 0449:0480       2  0.0093
0225:0256 0417:0448       1  0.0046
```

Figure 2  shows the plot.

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## History

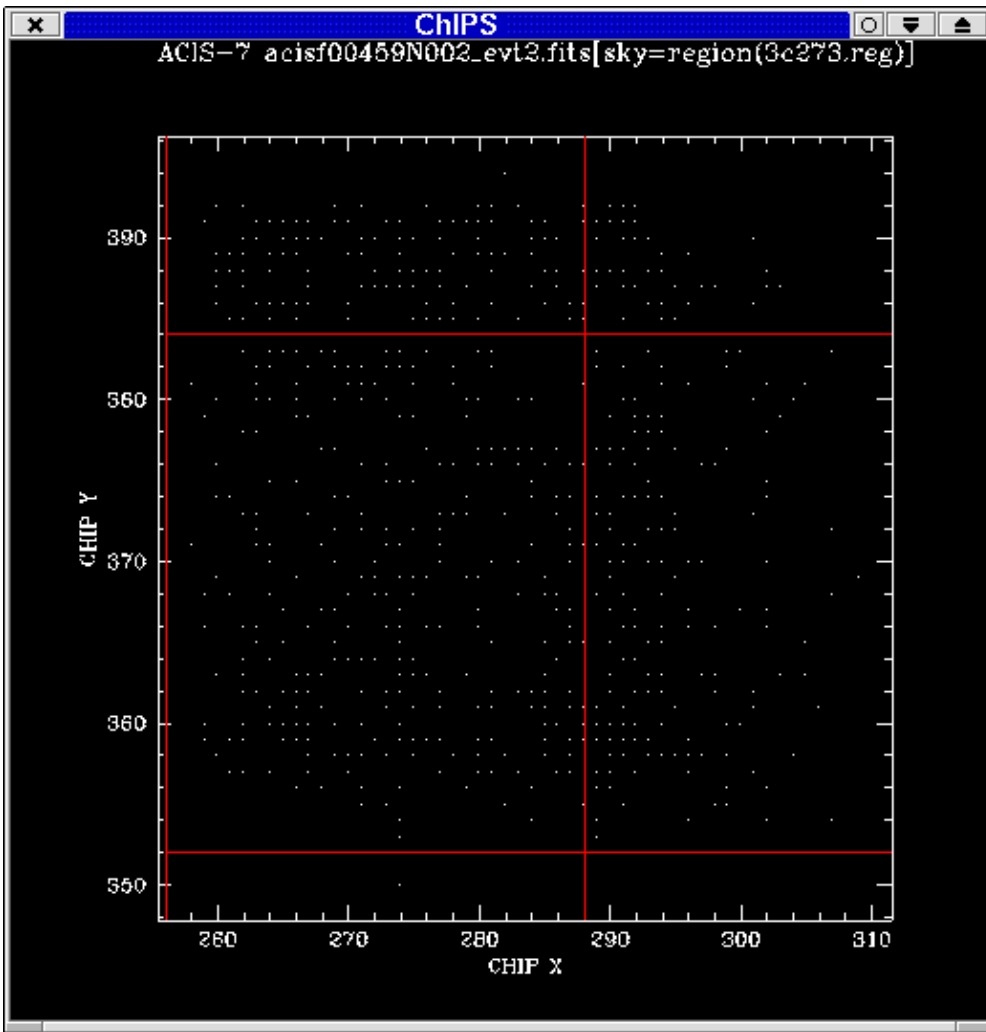
- 04 Jan 2005 updated for CIAO 3.2: this thread does not apply to the mkacisrmf tool
- 16 Dec 2005 reviewed for CIAO 3.3: no changes
- 01 Dec 2006 reviewed for CIAO 3.4: no changes

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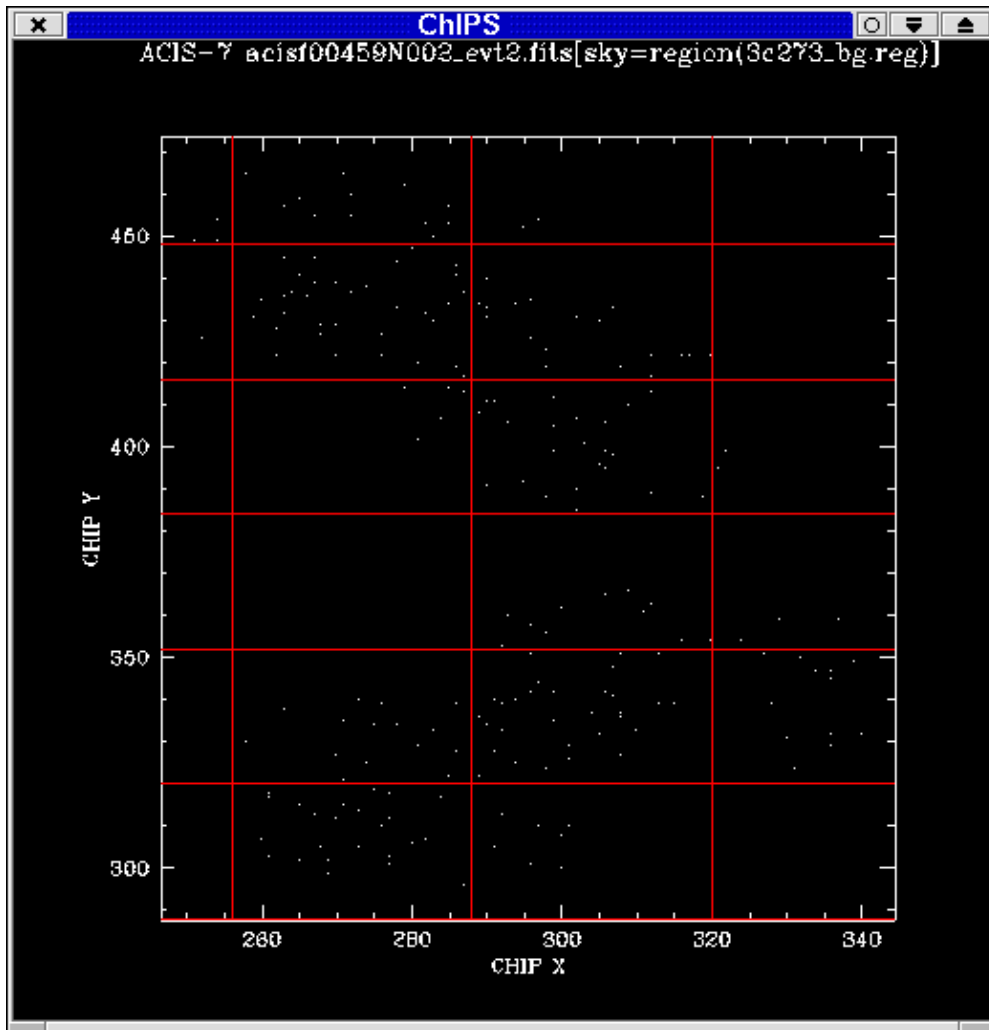
URL: [http://cxc.harvard.edu/ciao/threads/show\\_fef\\_regions/](http://cxc.harvard.edu/ciao/threads/show_fef_regions/)

Last modified: 1 Dec 2006

**Image 1: Source distribution across the FEF tiles**



**Image 2: Background distribution**



## Displaying the FEF Regions Covered by a Source – CIAO 3.4