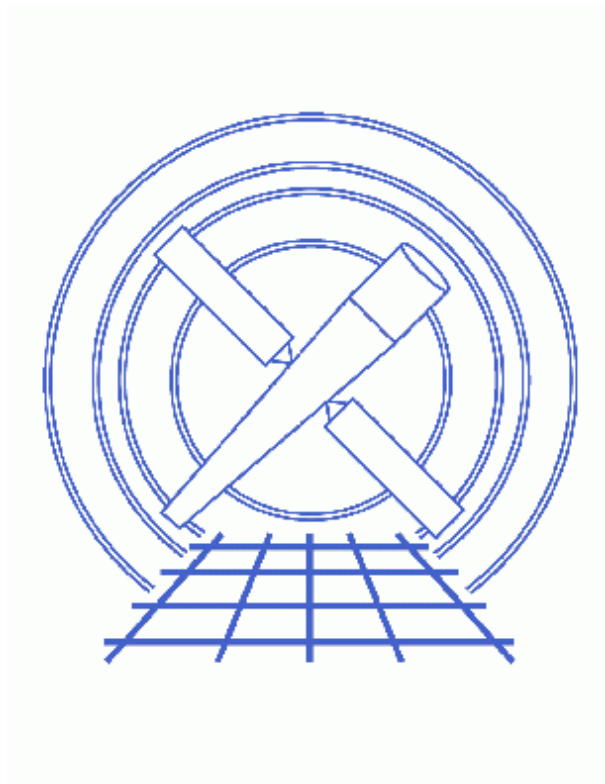


Displaying the FEF Regions Covered by a Source



CIAO 3.4 Science Threads

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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
```

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```
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:

```
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.

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

URL: http://cxc.harvard.edu/ciao/threads/show_fef_regions/

Last modified: 1 Dec 2006

Image 1: Source distribution across the FEF tiles

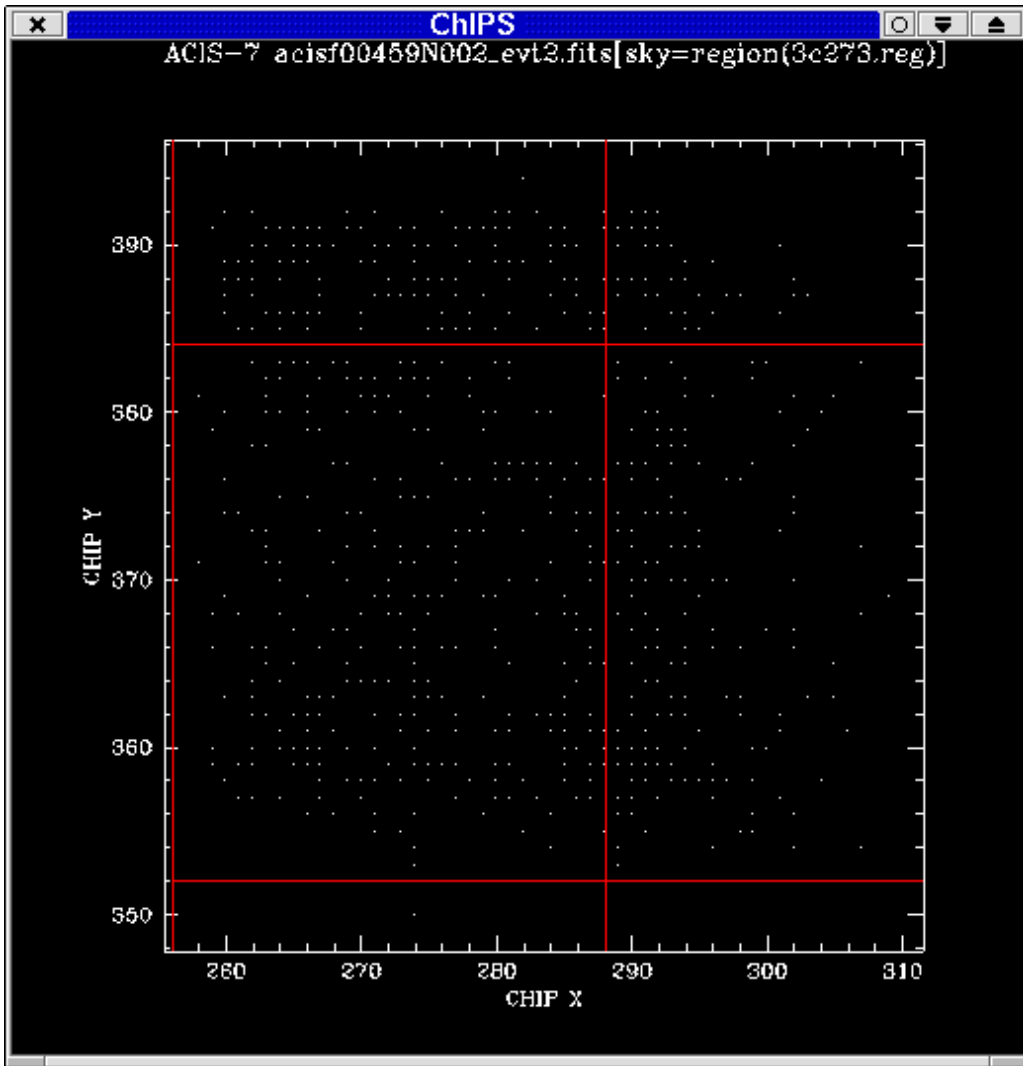
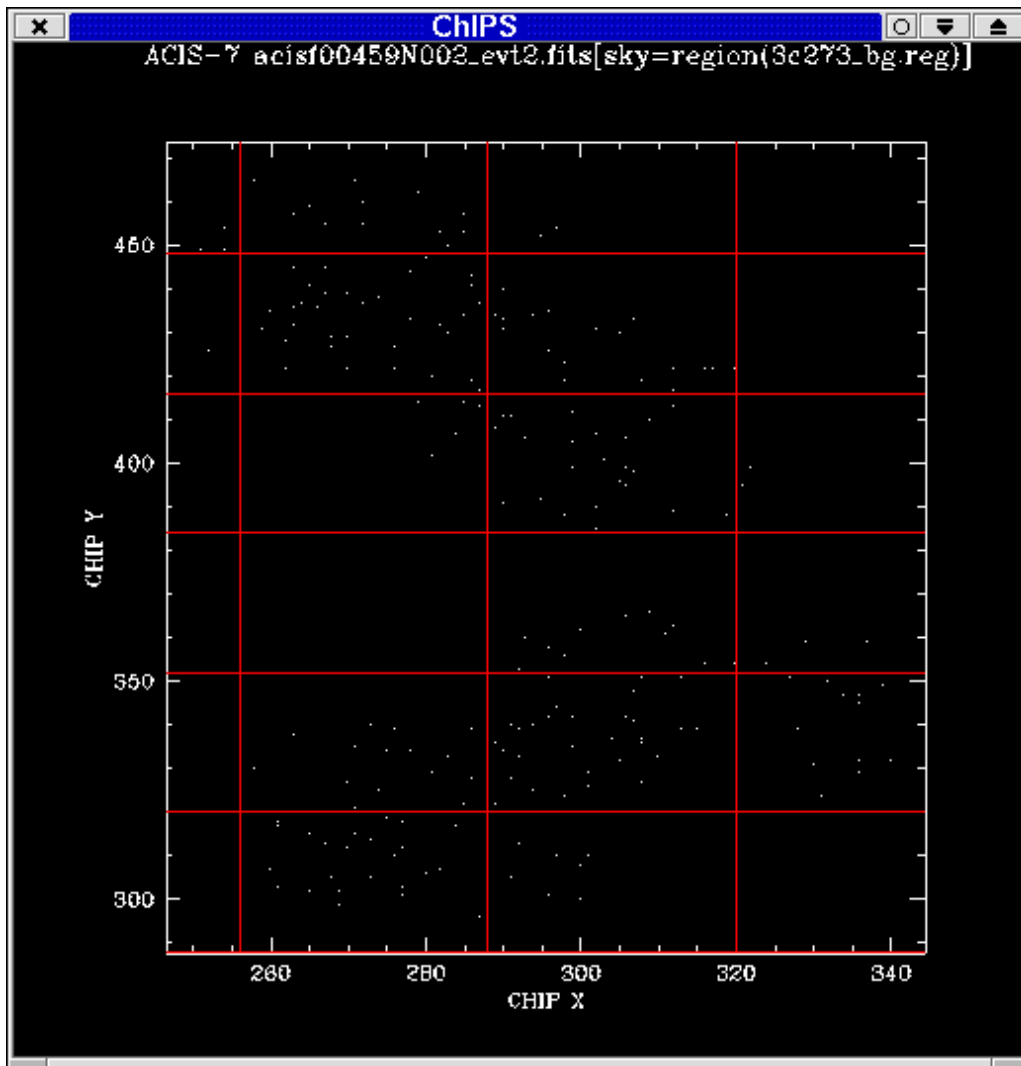


Image 2: Background distribution



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