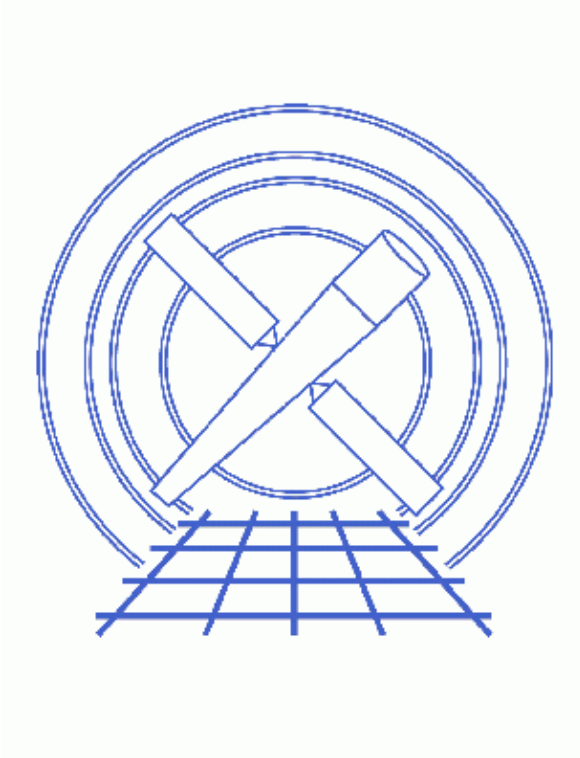
Create PHA Background File for Use in XSPEC



CIAO 3.4 Science Threads

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Create PHA Background File for Use in XSPEC

CIAO 3.4 Science Threads

Overview

Last Update: 1 Dec 2006 − updated for CIAO 3.4: corrected a filename

Synopsis:

The grating threads show how to create a PHA spectrum file for grating observations. The files can then be read into *Sherpa*, and analyzed as desired. However, if you wish to use *XSPEC*, the file needs to be in a format that it can read.

Purpose:

Run the `tg_bkg` script to take the output from the grating threads and produce a PHA background file suitable for use in *XSPEC*.

Read this thread if:

you prefer to do your grating analysis in *XSPEC*. If you do all your fitting and modeling in *Sherpa*, you ***DO NOT*** need to complete this thread.

Related Links:

- Analysis Guide for Chandra High Resolution Spectroscopy: an in−depth discussion of grating analysis.

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

Background Information

`tg_bkg` makes a background file that is compatible with *XSPEC*. *Sherpa* will be able to use it, but it can already read the arrays directly from the PHA file. The script sums the `BACKGROUND_UP` and `BACKGROUND_DOWN` columns and adjusts the scale factor keyword (`BACKSCAL`) accordingly. Since it is designed to keep the same format as the PHA file, i.e. the rows in both files correspond to one another, it is a more convenient way of inspecting the background.

It is important to note that these are ***estimates*** to the background. Since they are binned adjacent to the spectrum source region, they will have a contribution from the wings of the PSF. They also have a contribution from signal aliased in chipy during the frame shift at the level of (usually) 41 ms frame shift / 3200 ms integration / 1024 rows, or 1.25e−5 times the source rate (HEG+MEG or LEG, all orders). The source count rate at that diffraction angle gets smeared during the frame shift.

Get Started

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

File types needed: pha2

This thread uses the `tg_bkg` script. The most recent version of `tg_bkg` is v1.1 (22 July 2005):

```
unix% grep Id `which tg_bkg`
# Id: tg_bkg,v 1.1 2005/07/22 dph
```

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.

It is assumed that you have already completed the HETG/ACIS−S, LETG/ACIS−S, LETG/HRC−S, or LETG/HRC−I grating spectra thread and therefore have a PHA spectrum file.

Run the tg_bkg Script

The only input required is the PHA file, so we are now ready to run `tg_bkg`. Executing the script without any input shows the syntax:

```
unix% tg_bkg

USAGE: /soft/ciao/contrib/bin/tg_bkg  tg_pha_in  [tg_bkg_pha_out]

    Sum BACKGROUND_UP, BACKGROUND_DOWN from CXC TG PHA file
    Write out background PHA file (of same type as input)
     Adjust BACKSCAL

  Input file may be compressed.  Output is never compressed.
  If output filename is omitted, the ouput file has the input name with _bkg appended.

EXAMPLES:

tg_bkg  acisf0145N003_pha2.fits acisf0145N003_bkg_pha2.fits
tg_bkg  acisf0145N003_pha2.fits
tg_bkg  acisf0145N003_pha2.fits.gz acisf0145N003_bkg_pha2.fits
tg_bkg  acisf0145N003_pha2.fits.gz

 (This is a shell script; you can alter it to suit your own tastes.)
```

First, make sure the input file has write permission (since the script updates the `BACKFILE` keyword), then run the script:

```
unix% chmod +w acisf00459N002_pha2.fits

unix% tg_bkg acisf00459N002_pha2.fits
Input file has been changed, BACKFILE keyword has been added
```

The newly created file may be examined with `dmlist`:

```
unix% dmlist acisf00459N002_pha2.fits_bkg cols

________________________________________________________________________________
Columns for Table Block SPECTRUM
```

```
--------------------------------------------------------------------------------

ColNo  Name                 Unit        Type            Range
   1   SPEC_NUM                          Int2          1:32767             Spectrum Number
   2   TG_M                              Int2          −62:62              Diffraction order (
   3   TG_PART                           Int2          0:99                Spectral component
   4   TG_SRCID                          Int2          1:32767             Source ID, output by
   5   X                    pixel        Real4         0.50:    65534.50   X sky coord of sourc
   6   Y                    pixel        Real4         0.50:    65534.50   Y sky coord of sourc
   7   CHANNEL[8192]                     Int2(8192)    1:32767             Vector of spectral
   8   BIN_LO[8192]         angstrom     Real8(8192)   0:      400.0       Bin boundry, left ed
   9   BIN_HI[8192]         angstrom     Real8(8192)   0:      400.0       Bin boundry, right e
  10   COUNTS[8192]                      Int2(8192)    −                   User defined column
```

The COUNTS column is the sum of the BACKGROUND_UP and BACKGROUND_DOWN columns from the original pha2.fits file.

Summary

This thread is now complete; the file can be read into *XSPEC* and used for grating analysis.

History

04 Jan 2005	reviewed for CIAO 3.2: no changes
28 Jul 2005	tg_bkg script updated to v1.1: fixed Mac OS X awk syntax problem
06 Dec 2005	reviewed for CIAO 3.3: no changes
01 Dec 2006	updated for CIAO 3.4: corrected a filename

URL: http://cxc.harvard.edu/ciao/threads/xspec_phabackground/ Last modified: 1 Dec 2006