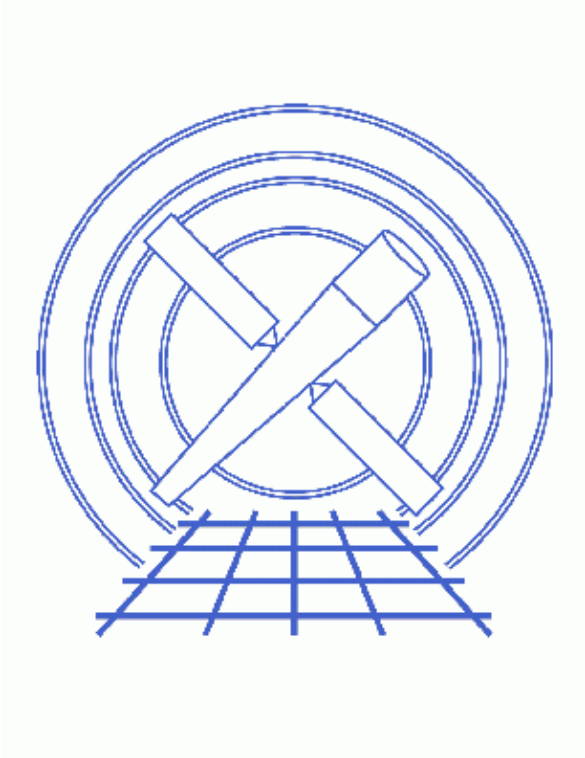
HETG/ACIS-S Grating Spectra



CIAO 4.1 Science Threads

Table of Contents

URL: http://cxc.harvard.edu/ciao/threads/spectra_hetgacis/ Last modified: 16 June 2009

HETG/ACIS-S Grating Spectra

CIAO 4.1 Science Threads

Overview

Last Update: 16 Jun 2009 - added About the Chandra Grating Data Archive and Catalog section

Synopsis:

Generate a new PHA2 spectrum file for any HETG/ACIS-S grating observation to ensure that consistent calibration is used throughout the analysis.

If your data have gone through Reprocessing III, you **do not** have to run this thread. Get Started shows how to check the software version used in processing your data.

Read this thread if:

you are working with an ACIS/HETG dataset and want to create a new level=2 event file and extract a Type II PHA grating spectrum file.

Related Links:

- Analysis Guide for Chandra High Resolution Spectroscopy: an in-depth discussion of grating analysis.
- Continuous Clocking Mode why topic: additional information for users working with CC-mode data.
- Why topic: Desteaking ACIS Data

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

About the Chandra Grating Data Archive and Catalog

The Chandra Grating Data Archive and Catalog (TGCat) is a browsable interface to analysis-quality spectral products (binned spectra and corresponding response files). TGCat makes it easy to find observations of a particular object, type of object, or type of observation, to quickly assess the quality and potential usefulness of the spectra with pre-computed graphics or custom-generated plots of binned and combined counts or fluxe spectra. Spectra, responses, event files, and summary products may be downloaded as a package.

TGCat runs standard CIAO tools, but also includes customized extractions for non-standard cases to refine the zeroth order position or to use regions appropriate for extended sources. Non-standard extractions details are provided in "verification and validation" comments for users.

Most public grating observations are available and new ones are added soon after they are released. See the list of of observations not included for exceptions. Many of the observations currently in this list will be included when we add enhanced processing for more difficult cases (multiple sources, very extended sources).

Please consider using the spectrum and responses (PHA, ARF, and RMF files) from TGCat in your analysis.

Data Preparation

This analysis thread starts with the level 1 event file. Before beginning, users may wish to reprocess the data to create a new event file with the most recent calibration applied. Users may also choose to create a new level=1 event file by rerunning `acis_process_events` with different processing options. Instructions on how to reprocess your data are available in the ACIS Data Preparation Analysis Guide.

It is also suggested that users set the observation-specific bad pixel files, as described in the Setting the Observation-specific Bad Pixel Files thread.

ACIS CTI_APP Keyword Required

CIAO 4.1 and CALDB 4.1 require that ACIS event files have a `CTI_APP` header keyword to indicate whether the CTI correction has been applied. The older `CTI_CORR` keyword is no longer used.

To check for `CTI_APP`:

```
unix% dmkeypar input.fits CTI_APP echo+
# dmkeypar (CIAO 4.1): ERROR: Keyword 'CTI_APP' was not found in file 'input.fits'.
```

If `CTI_APP` is not found, follow the instructions in the ACIS CTI_APP Keyword Required section of the ACIS CTI Correction why topic to add the keyword before continuing.

This thread may produce incorrect results **without issuing an error** if the keyword is missing.

Get Started

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

File types needed: evt1; flt1; asol1

In this thread, we assume that all relevant files are in the same working directory.

To find the software version that was used on the data, check the ASCDSVER keyword in the header:

```
unix% dmkeypar acisf00459_000N002_evt1.fits ASCDSVER echo+
R4CU5UPD11.1
```

Since these data have not gone through Reprocessing III, e.g. the `ASCDSVER` is lower than DS 7.6.7, it is necessary to run this thread. Note that the version numbering changed after version R4CU5UPD14 to the "DS" system, starting with DS 6.0.0.

If you do not need to run this thread, go directly to the ACIS-S Grating RMFs thread.

Generate a New Level=1.5 Event File

1. Get position of zero-order image (tgdetect)

To find the zero-order location, the tool tgdetect is run:

```
unix% punlearn tgdetect
unix% pset tgdetect infile=acisf00459_000N002_evt1.fits
unix% pset tgdetect outfile=acis_459_src1a.fits
unix% tgdetect
Input L1 event file (acisf00459_000N002_evt1.fits):
Input source position(s) file from previous OBI or NONE (NONE):
Output source position(s) file name (root_src1a.fits) (acis_459_src1a.fits):

# DMCOPY (CIAO 4.1): Bad data type in filter string formatting
```

The warning may be ignored; it is due to a minor bug in the Data Model and does not affect the output of tgdetect.

The contents of the parameter file may be checked using plist tgdetect.

The source list may be viewed over the event file using ds9:

```
unix% ds9 acisf00459_000N002_evt1.fits &
```

Overlay the source list: Region Load Regions acis_459_src1a.fits.

The following special cases require manual intervention in order to create a new PHA file. **If these problems affect your data, it will be obvious when the source list is displayed on the event file.**

- If the zero order of the source is outside of the default search area (e.g. **far from the aimpoint**), tgdetect will not find it. In this case, run the Correcting a Misplaced Zero-order Source Position thread to identify the correct source position.
- If the zero-order source is **piled**, there is the potential for the centroid to be incorrect due to the "hole" created in the data. Additionally, the zero-order region may have been **blocked** via on-board software to avoid telemetry problems when observing bright sources. For either of these cases, refer to the Source Position for Grating Data with a Piled or Blocked Zero Order thread for instructions on how to proceed.

2. Get region mask (tg_create_mask)

The location of the HEG and MEG "arms" needs to be found next, via the tool tg_create_mask.

```
unix% punlearn tg_create_mask
unix% pset tg_create_mask infile=acisf00459_000N002_evt1.fits
unix% pset tg_create_mask outfile=acis_459_evt1_L1a.fits
unix% pset tg_create_mask input_pos_tab=acis_459_src1a.fits
unix% tg_create_mask
Input event file or stack (acisf00459_000N002_evt1.fits):
Output region file or stack (acis_459_evt1_L1a.fits):
Input table with zero order positions or stack (acis_459_src1a.fits):
Observed grating type (header_value|HETG|HEG|MEG|LETG) (HETG|HEG|MEG|LETG|header_value|HEADER_VA
```

The region file, acis_459_evt1_L1a.fits, will be used to mask the event file. The regions may be viewed over the event file using ds9:

```
unix% ds9 acisf00459_000N002_evt1.fits &
```

Overlay the region file: Region Load Regions acis_459_evt1_L1a.fits. Figure 1 shows the regions on the event file.

The contents of the parameter file may be checked using plist tg_create_mask.

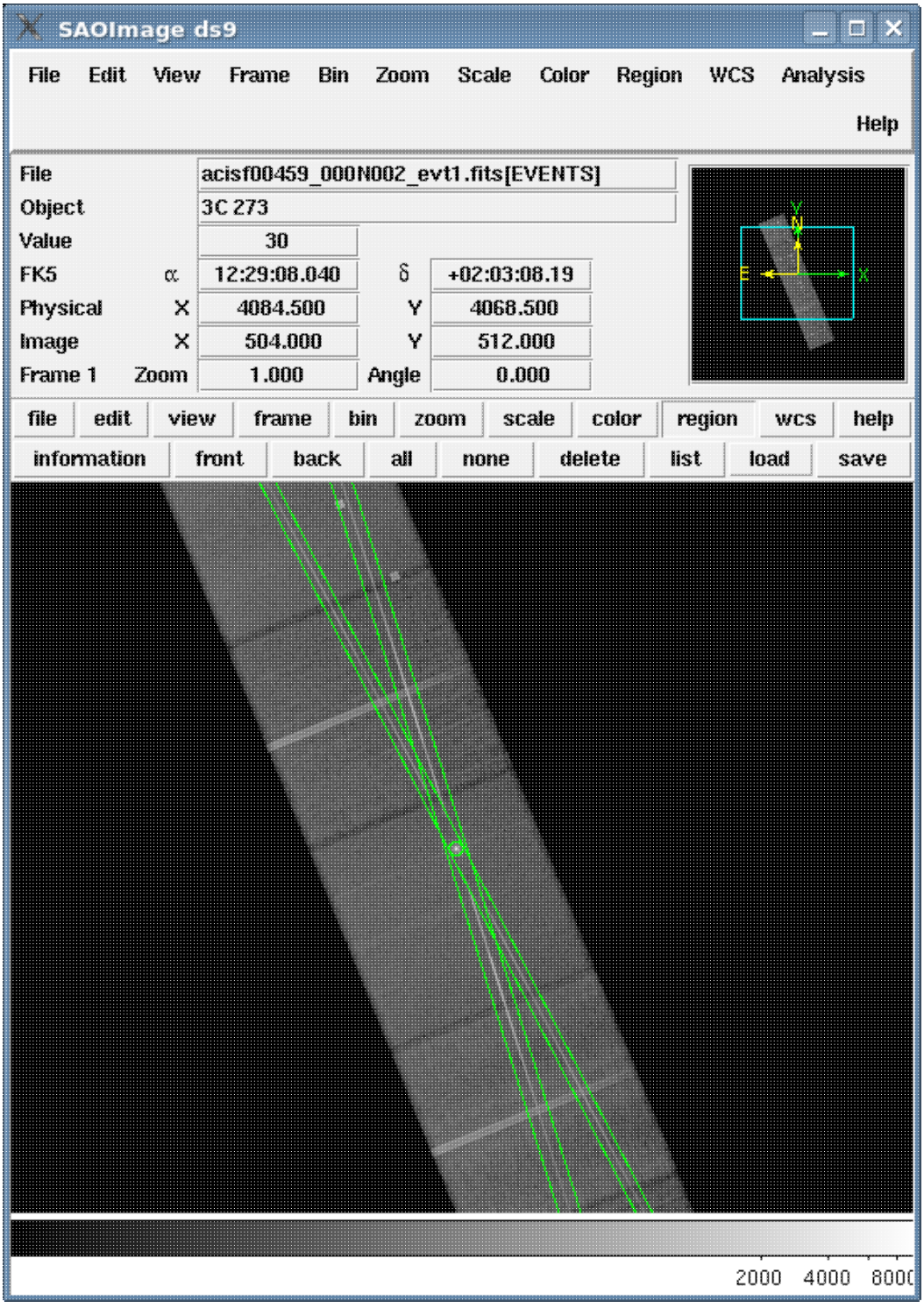


Figure 1: Event file with region file overlaid

The regions are loaded from the L1a.fits file, which was made by `tg_create_mask`.

---

3. Run tg_resolve_events

The tool `tg_resolve_events` is now used to assign grating events to spectral orders, using the detector energy resolution for order separation:

```
unix% punlearn tg_resolve_events
unix% pset tg_resolve_events infile=acisf00459_000N002_evt1.fits
unix% pset tg_resolve_events outfile=acis_459_evt1a.fits
unix% pset tg_resolve_events regionfile=acis_459_evt1_L1a.fits
unix% pset tg_resolve_events acaofffile="@pcad_asol1.lis"
unix% tg_resolve_events
Input event file or stack (acisf00459_000N002_evt1.fits):
Input region file or stack (acis_459_evt1_L1a.fits):
Output event file or stack (acis_459_evt1a.fits):
Input aspect offset file (@pcad_asol1.lis):
```

It is important to note several things here:

- In some cases, there will be more than one asol1.fits file for an observation. ***All*** the files must be input to the `acaofffile` parameter **in chronological order** (the time is in the filename, so "`ls`" lists them in order), either as a comma-separated list or as a stack. For example, here we used:

```
unix% more pcad_asol1.lis
pcadf063874624N002_asol1.fits
pcadf063875522N002_asol1.fits
pcadf063902942N002_asol1.fits
```

The contents of the parameter file may be checked using plist tg_resolve_events.

Generate a New Level=2 Event File

1. Apply grade/status filters (dmcopy)

Filter for bad grades and for a "clean" status column (i.e. all bits set to 0):

```
unix% punlearn dmcopy
unix% dmcopy "acis_459_evt1a.fits[EVENTS][grade=0,2,3,4,6,status=0]" \
      acis_459_flt1_evt1a.fits opt=all
```

---

2. Apply GTI filters (dmcopy)

The Good Time Intervals (GTIs) supplied by the pipeline now need to be applied. We simultaneously eliminate an unnecessary column from the output:

```
unix% punlearn dmcopy
unix% dmcopy \
      "acis_459_flt1_evt1a.fits[EVENTS][@acisf00459_000N002_flt1.fits][cols -phas]" \
```

```
      acis_459_evt2.fits opt=all
```

Be sure to include the **@ symbol** in the filter expression; the command will not be executed properly if it is omitted.

Users at this stage may wish to apply other filters via additional `dmcopy` calls. For example, this would be the appropriate point to apply a time filter to the data.

Run destreak

There is a flaw in the serial readout of the ACIS chips, causing a significant amount of charge to be randomly deposited along pixel rows as they are read out. Although not much coincidence is expected for low-rate/low-exposure sources, ACIS-S4 (ccd_id=8) is significantly affected by this problem. The `destreak` tool detects coincidence of events in adjacent pixels along a row, flags probable streak events, and removes them. For details on how the tool works, see the Destreaking ACIS Data why topic and "`ahelp destreak`".

Note that there is some evidence that for bright, continuum-dominated sources observed with the gratings, applying `destreak` removes more source events than streak events. Furthermore, spectral order sorting alone will greatly reduce the amount of streak data present in any extracted spectrum. Therefore destreaking should be considered optional for bright, continuum dominated sources. (This effect is still being studied, and more quantitative recommendations will be developed and eventually posted here.)

```
unix% punlearn destreak
unix% pset destreak infile=acis_459_evt2.fits
unix% pset destreak outfile=acis_459_dstrk_evt2.fits
unix% destreak
Input dataset/block specification (acis_459_evt2.fits):
Output dataset/block specification (acis_459_dstrk_evt2.fits):
```

The contents of the parameter file may be checked using plist destreak.

Extract a Grating Spectrum (tgextract)

The CIAO tool `tgextract` produces a PHA2 spectrum file from the level=2 event file:

```
unix% punlearn tgextract
unix% pset tgextract infile=acis_459_dstrk_evt2.fits
unix% pset tgextract outfile=acis_459_pha2.fits
unix% tgextract
Input event file (output event file from L1.5 processing) (acis_459_dstrk_evt2.fits):
If typeII, enter full output file name or '.'; if typeI, enter output rootname (acis_459_pha2.fits):
Input ancillary response file name (none):
Input redistribution file name (none):
Source ID's to process: 'all', comma list, @file (all):
Grating parts to process: HETG, HEG, MEG, LETG, header_value (HETG|HEG|MEG|LETG|header_value) (header_v
Grating diffraction orders to process: 'default', comma list, range list, @file (default):
Ouput file type: typeI (single spectrum) or typeII (multiple spectra) (pha_typeI|pha_typeII) (pha_typeI
```

The contents of the parameter file may be checked using plist tgextract.

Summary

This thread is complete; the PHA2 grating spectrum file is named acis_459_pha2.fits. You should now proceed to the ACIS-S Grating RMFs thread.

In order to use Gaussian statistics to fit a model to a dataset, it is often necessary to "group" the data - i.e. combine channels until you have enough counts. Before fitting the data in *Sherpa*, read the Grouping a Grating Spectrum thread for more information.

```
Parameters for /home/username/cxcds_param/tgdetect.par


##
## TGDETECT -- Create filter; run celldetect; narrow down detected
##             'zero order' source list; set source id's; match
##             sources to previous OBI source list.
##
## Note: if either "infile" or "OBI_srclist_file" are @lists, only
## the first item on the list is read in;  this tool only works on
## one set of input files;  if more than one file is listed,
## everything but the first are ignored.
##
        infile = acisf00459_000N002_evt1.fits   Input L1 event file
OBI_srclist_file = NONE             Input source position(s) file from previous OBI or NONE
       outfile = acis_459_src1a.fits  Output source position(s) file name
#
#   output file naming
#
     (temproot = )                Path and root file name to be given to temporary files
     (keeptemp = no)              Keep temporary files?
     (keepexit = no)              Keep exit status file?
#
#
#
     (zo_pos_x = default)         Center GZO filter sky X position (default=pixel(ra_nom))
     (zo_pos_y = default)         Center GZO filter sky Y position (default=pixel(dec_nom))
 (zo_sz_filt_x = default)         Size of GZO filter in X pixels (ACIS=400; HRC=1800)
 (zo_sz_filt_y = default)         Size of GZO filter in Y pixels (ACIS=400; HRC=1800)
   (snr_thresh = 40)              SNR threshold to select the detected sources
#
#   celldetect parameters
#
       (expstk = none)            list of exposure map files
       (thresh = )celldetect.thresh -> 3) celldetect source threshold
     (ellsigma = 3.0)             Size of output source ellipses (in sigmas)
     (expratio = 0)               cutoff ratio for source cell exposure variation
    (findpeaks = yes)             find local peaks for celldetect
(celldetect_log = )celldetect.log -> no) make a celldetect log file?
     (psftable = )celldetect.psftable -> /soft/ciao/data/psfsize20010416.fits) table of PSF size
    (fixedcell = 15)              celldetect fixed cell size to use
(fixedcell_cc_mode = 15)              celldetect fixed cell size to use for CC mode ACIS data
      (bkgfile = none)            background file, for celldetect
     (bkgvalue = )celldetect.bkgvalue -> 0) background count/pixel, for celldetect
  (bkgerrvalue = )celldetect.bkgerrvalue -> 0) background error, for celldetect
        (eband = )celldetect.eband -> 1.4967) energy band, for celldetect
      (eenergy = )celldetect.eenergy -> 0.8) encircled energy of PSF, for celldetect
      (snrfile = none)            celldetect snr output file (for convolution only)
     (convolve = )celldetect.convolve -> no) use convolutions for celldetect
      (xoffset = INDEF)           celldetect offset of x axis from optical axis
      (yoffset = INDEF)           celldetect offset of y axis from optical axis
```

```
     (cellfile = none)            output cell size image file
     (centroid = yes)             compute source centroids in celldetection?
#
#   tgidselectsrc parameters
#
(snr_ratio_limit = )tgidselectsrc.snr_ratio_limit -> 1) Value of SNR ratio to use as lower limit
     (setsrcid = )tgidselectsrc.setsrcid -> yes) Set src ids in output file?
#
#   tgmatchsrc parameters
#
(max_separation = )tgmatchsrc.max_separation -> 3) Maximum allowed separation (arcsec) for sources to ma
#
#
      (clobber = no)              OK to overwrite existing output file(s)?
      (verbose = 0)               Verbosity level (0 = no display)
         (mode = ql)
```

```
Parameters for /home/username/cxcds_param/tg_create_mask.par


##
## TG_CREATE_MASK -- Calculates the mask regions of the grating arms
##    for AXAF flight L1 grating data files.  The output is a region
##    file(s) in sky coordinates.
##
        infile = acisf00459_000N002_evt1.fits   Input event file or stack
       outfile = acis_459_evt1_L1a.fits Output region file or stack
 input_pos_tab = acis_459_src1a.fits  Input table with zero order positions or stack
   grating_obs = header_value     Observed grating type (header_value|HETG|HEG|MEG|LETG)
     sA_zero_x = 1                Source A - x position of zero order
     sA_zero_y = 1                Source A - y position of zero order
     sB_zero_x = 1                Source B - x position of zero order
     sB_zero_y = 1                Source B - y position of zero order
     sC_zero_x = 1                Source C - x position of zero order
     sC_zero_y = 1                Source C - y position of zero order
     sD_zero_x = 1                Source D - x position of zero order
     sD_zero_y = 1                Source D - y position of zero order
     sE_zero_x = 1                Source E - x position of zero order
     sE_zero_y = 1                Source E - y position of zero order
     sF_zero_x = 1                Source F - x position of zero order
     sF_zero_y = 1                Source F - y position of zero order
     sG_zero_x = 1                Source G - x position of zero order
     sG_zero_y = 1                Source G - y position of zero order
     sH_zero_x = 1                Source H - x position of zero order
     sH_zero_y = 1                Source H - y position of zero order
     sI_zero_x = 1                Source I - x position of zero order
     sI_zero_y = 1                Source I - y position of zero order
     sJ_zero_x = 1                Source J - x position of zero order
     sJ_zero_y = 1                Source J - y position of zero order
(input_psf_tab = CALDB)           Calibration file with mirror psf vs off-axis angle
     (detector = header_value)    Detector type: ACIS | HRC-I | HRC-S | header_value
(radius_factor_zero = 50)              A scale factor which multiplies the app. calculation of the one-s
(width_factor_hetg = 35)              A scale factor which multiplies the one-sigma width of the heg/meg
(width_factor_letg = 40)              A scale factor which multiplies the one-sigma width of the letg ma
(r_astig_max_hetg = 0.5600000000000001) Max grating r coord (deg, along the dispersion) for HETG astigma
(r_astig_max_letg = 1.1)             Max grating r coord (deg, along the dispersion) for LETG astigmatis
(r_mask_max_hetg = 0.992)           Max grating r coord (deg) for HETG mask (to support offset pointing,
(r_mask_max_letg = 2.1)             Max grating r coordinate (deg) for LETG mask (to support offset poin
# ------------------------------------------------------------------------
# The parameters below are to be set ONLY if the user wants to use their
# own grating mask sizes instead of having the masks automatically generated.
# Only ONE input file, with up to 10 soures, can be processed using the user
# params.  @ lists of multiple files can only be done with automated mask
```

```
# processing, or by running each file individually with hand set mask sizes.
# To start, you MUST set the following parameters:
#
# > pset tg_create_mask use_user_pars=yes last_source_toread=[letter A -> J]
#
# The parameter last_source_toread should be set to the last source letter
# for which you will enter parameters.  If you want to input 2 sources
# (regardless of their source id's), the last_source_toread=B. Sections
# A -> J are for (upto) 10 user specified sources.  In each sections,
# each source must have an ID, a zero order center position specified,
# as well as the grating mask width(s).  An example with 2 HETG sources,
# with src_id's 6 and 3:
#
# > pset tg_create_mask use_user_pars=yes last_source_toread=B
# > pset tg_create_mask sA_id=6 sA_zero_x=4762.34 sA_zero_y=2344.29
# > pset tg_create_mask sA_zero_rad=35 sA_width_heg=25 sA_width_meg=28
# > pset tg_create_mask sB_id=3 sB_zero_x=4063.54 sB_zero_y=6346.62
# > pset tg_create_mask sB_zero_rad=45 sB_width_heg=50 sB_width_meg=75
#              (units are all in sky pixels)
#
# NOTE: for Continuous Clocking data (CC mode), the HETG mask does not
# require the s#_width_heg, since the meg mask will encompase the entire
# data set.  HEG event processing in CC mode is done using the next
# tool tg_resolve_events.
# ------------------------------------------------------------------------
(use_user_pars = no)              Use the user defined mask parameters below: yes or no?
(last_source_toread = A)               Last source name to be read; character A->J.
# ------------------------------------------------------------------------
#                        Source A parameters
# ------------------------------------------------------------------------
        (sA_id = 1)               Source A - source id number
   (sA_zero_rad = )               Source A - radius of zero order mask
  (sA_width_heg = )               Source A - width of heg mask in sky pixels
  (sA_width_meg = )               Source A - width of meg mask in sky pixels
  (sA_width_leg = )               Source A - width of leg mask in sky pixels
# ------------------------------------------------------------------------
#                        Source B parameters
# ------------------------------------------------------------------------
..(through Source J)..
       (geompar = geom)           Parameter file for Pixlib Geometry files
       (verbose = 0)              Verbose level: 0 - no output, 5 - max verbosity
       (clobber = no)             Clobber existing outfile?
          (mode = ql)
```

```
Parameters for /home/username/cxcds_param/tg_resolve_events.par


#-------------------------------------------------------------------------
#
#   tg_resolve_events.par: Parameter file for the tg_resolve_events program
#
#-------------------------------------------------------------------------
        infile = acisf00459_000N002_evt1.fits   Input event file or stack
       outfile = acis_459_evt1a.fits  Output event file or stack
    regionfile = acis_459_evt1_L1a.fits Input region file or stack
    acaofffile = @pcad_asol1.lis  Input aspect offset file
(alignmentfile = )acaofffile -> @pcad_asol1.lis) Input sim offset file
      (logfile = stdout)          Output log (NONE|<filename>|stdout)
# The osipfile contains position dependent energy limits based on
# the CCD resolution, used for order-sorting.
# A value of "NONE" means that the file will not be used, and
# that the parameters, osort_hi and osort_lo will be used.
     (osipfile = CALDB)           Lookup table for order resolving (for acis data only)
```

```
#sort_hi, osort_lo specify fractional deviations from the integer
#order which will be included in order-sorting via CCD ENERGY values (PHA).
#eg. osort_lo-0.3, osort_hi=0.2 means that photons with real-valued
#orders between 0.7 < order <= 1.2 will be included in first order,
#1.7 < order <= 2.2 will be second order, etc.
     (osort_lo = 0.3)             Order-sorting lower bound fraction; order > m - osort_lo
     (osort_hi = 0.3)             Order-sorting high bound fraction; order <= m + osort_hi
  (grating_obs = header_value)    Observed grating type (header_value|HETG|HEG|MEG|LETG)
     (detector = header_value)    Detector type: ACIS | HRC-I | HRC-S | header_value
(energy_lo_adj = 1.0)             Lower Energy limit factor
(energy_hi_adj = 1.0)             Upper Energy limit factor
  (time_offset = 0)               Offset to add to event time to synch w/ alignment data
    (rand_seed = 1)               Random seed (for pixlib), 0 = use time dependent seed
(rand_pix_size = 0.0)             pixel randomization width (-size..+size), 0.0 = no randomization
     (eventdef = )stdlev1_ACIS ->{d:time,i:expno,f:rd,s:chip,s:tdet,f:det,f:sky,s:ccd_id,l:pha,s:pi,f:en
s:grade,s:fltgrade,s:node_id,s:tg_m,f:tg_lam,f:tg_mlam,s:tg_srcid,s:tg_part,s:tg_smap,x:status})
Output format definition
      (stdlev1 = )eventdef ->{d:time,i:expno,f:rd,s:chip,s:tdet,f:det,f:sky,s:ccd_id,l:pha,s:pi,f:energy
s:grade,s:fltgrade,s:node_id,s:tg_m,f:tg_lam,f:tg_mlam,s:tg_srcid,s:tg_part,s:tg_smap,x:status})
 (stdlev1_ACIS = {d:time,i:expno,f:rd,s:chip,s:tdet,f:det,f:sky,s:ccd_id,l:pha,s:pi,f:energy,s:grade,
s:fltgrade,s:node_id,s:tg_m,f:tg_lam,f:tg_mlam,s:tg_srcid,s:tg_part,s:tg_smap,x:status})
ACIS event format definition string
  (stdlev1_HRC = {d:time,f:rd,s:chip,l:tdet,f:det,f:sky,s:chip_id,s:pha,s:pi,s:tg_m,f:tg_lam,f:tg_mlam,
s:tg_srcid,s:tg_part,s:tg_smap,x:status})
HRC event format definition string
# ------------------------------------------------------------------------
      (geompar = geom)            Parameter file for Pixlib Geometry files
      (verbose = 0)               Verbosity level of detail (0=none, 5=most)
      (clobber = no)              Clobber outfile if it already exists?
         (mode = ql)
```

```
Parameters for /home/username/cxcds_param/destreak.par


        infile = acis_459_evt2.fits   Input dataset/block specification
       outfile = acis_459_dstrk_evt2.fits Output dataset/block specification
          (max = )                 streak threshold  syntax:  m  OR  m:m:m:m
(max_rowloss_fraction = 5.0e-5)          Maximum fraction of avg streaks/node/frame
    (num_sigma = 1.0)              Sigma value for determining streak threshold
       (filter = yes)              Discard tagged events
         (mask = [status=0,grade=0,2:4,6]) Filter to select candidate streak events
      (ccd_id = 8)                 CCD ID to filter
     (ccd_col = ccd_id)            CCD ID column name
    (node_col = node_id)           Node ID column name ('none' for single node)
     (exptime = -1)                frame time (s) (reads EXPTIME if no pos. value given)
    (countfile = )                 filename for event row-count distribution
     (fracfile = )                 filename for cumulative streak contam function
     (timefile = )                 filename for exposure time lost per row
      (verbose = 0)                Debug Level(0-5)
      (clobber = no)               Clobber existing file
         (mode = ql)
```

```
Parameters for /home/username/cxcds_param/tgextract.par


##
## TGEXTRACT -- create 1D spectrum(a) table file(s) from the
##              L1.5 output event list
##
        infile = acis_459_dstrk_evt2.fits Input event file (output event file from L1.5 processing)
```

```
       outfile = acis_459_pha2.fits   If typeII, enter full output file name or '.'; if typeI, en
#
# tg_srcid_list parameter explanation...
#  - "all" will process all the sources id's found in the event list
#  - a comma list is a comma separated string list of all the
#    sources to process, ie:
#       "1,2,5,7"
#  - @file is a pointer to an ascii file which contains a comma
#    separated list of the id's to process
#
 tg_srcid_list = all              Source ID's to process: 'all', comma list, @file
  tg_part_list = header_value     Grating parts to process: HETG, HEG, MEG, LETG, header_value
#
# tg_order_list parameter explanation...
#  - "default" is set to process the following:
#       if ACIS:  1, 2, 3, -1, -2, -3
#       if HRC:   -1, 1
#  - a comma list is a comma separated string list of the orders
#    the user wants to process, ie:
#       "-5, -1, 1, 3"
#  - a range list sets the min and max of the orders to process;
#    all the orders in between, will be processed, ie:
#       "-1..5"  will do orders from -1 to +5th order
#    a range list can be mixed with comma separated list
#  - @file is a pointer to an ascii file which contains a comma
#    separated list and/or range list of the orders to process
#
 tg_order_list = default          Grating diffraction orders to process: 'default', comma list, r
      ancrfile = none             Input ancillary response file name
      respfile = none             Input redistribution file name
  outfile_type = pha_typeII       Ouput file type: typeI (single spectrum) or typeII (multiple sp
(inregion_file = none)            Input region file.
     (backfile = none)            Input background file name
        (rowid = )                If rowid column is to be filled in, enter name here
    (bin_units = angstrom)        Bin units (for bin parameters below): angstrom, eV, keV
  (min_bin_leg = compute)         Minimum dispersion coordinate for LEG, or 'compute'
  (max_bin_leg = compute)         Maximum dispersion coordinate for LEG, or 'compute'
 (bin_size_leg = compute)         Bin size for binning LEG spectra, or 'compute'
 (num_bins_leg = compute)         Number of bins for the output LEG spectra, 'compute'
  (min_bin_meg = compute)         Minimum dispersion coordinate for MEG, or 'compute'
  (max_bin_meg = compute)         Maximum dispersion coordinate for MEG, or 'compute'
 (bin_size_meg = compute)         Bin size for binning MEG spectra, or 'compute'
 (num_bins_meg = compute)         Number of bins for the output MEG spectra, or 'compute'
  (min_bin_heg = compute)         Minimum dispersion coordinate for HEG, or 'compute'
  (max_bin_heg = compute)         Maximum dispersion coordinate for HEG, or 'compute'
 (bin_size_heg = compute)         Bin size for binning HEG spectra, or 'compute'
 (num_bins_heg = compute)         Number of bins for the output HEG spectra, 'compute'
     (min_tg_d = default)         Minimum tg_d range to include in histogram, or use 'default'
     (max_tg_d = default)         Maximum tg_d range to include in histogram, or use 'default'
(extract_background = yes)             Extract the local background spectrum?
(min_upbkg_tg_d = default)          Minimum value of tg_d for the background up spectrum.
(max_upbkg_tg_d = default)          Maximum value of tg_d for the background up spectrum.
(min_downbkg_tg_d = default)          Minimum value of tg_d for the background down spectrum.
(max_downbkg_tg_d = default)          Maximum value of tg_d for the background down spectrum.
      (geompar = geom)            Parameter file for Pixlib Geometry files
      (clobber = no)              OK to overwrite existing output file(s)?
      (verbose = 0)               Verbosity level (0 = no display)
         (mode = ql)
```

History

16 Dec 2004	updated for CIAO 3.2: minor changes to parameter files
14 Jan 2005	created the Data Preparation section
05 Dec 2005	updated for CIAO 3.3: output filenames include ObsID; parameter file changes (`kernel` parameter removed from all "tg" tools; several changes to the `destreak` parameter file, including a new default value for the `mask` parameter)
05 Jan 2006	information on reprocessing included in Data Preparation section
04 Apr 2006	expanded information on special cases in the Get position of zero-order image (tgdetect) section
18 Dec 2006	updated for CIAO 3.4: new calibration files in CALDB 3.3.0; change to wording of `tgdetect`/`dmcopy` warning
11 Jan 2008	updated for CIAO 4.0: ds9 now automatically looks for the "`[REGION]`" or "`[SRCLIST]`" extension in the region file, so it doesn't have to be specified; removed outdated calibration updates; check if data have gone through Reprocessing III
21 Jan 2009	updated for CIAO 4.1: image converted to inline; `tg_resolve_events` no longer prints the "dsTREUNKNOWNINCOLERR -- WARNING: Not loading data from unrecognized level 1.5 input column." message, as it does not affect data analysis; input data must have a CTI_APP keyword
19 Feb 2009	added grouping information to the Summary
13 Mar 2009	added more information to the Data Preparation section; note on other filtering added to end of Generate a New Level=2 Event File section; note added to to run destreak section that this step may be considered optional for gratings
16 Jun 2009	added About the Chandra Grating Data Archive and Catalog section

---

URL: http://cxc.harvard.edu/ciao/threads/spectra_hetgacis/ Last modified: 16 June 2009