

New & Updated Gratings Analysis Threads

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Threads - CIAO 4.1
http://asc.harvard.edu/ciao/threads/index.html

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Science Threads for CIAO 4.1

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All threads

A list of all the threads on one page.

Introduction

NEW UPDATED

Beginners should start here. The Introductory threads provide an overview of the main components (GUI applications, parameter files) and concepts (the Data Model, filtering) in the CIAO data analysis software.

Data Preparation

UPDATED

When Chandra data goes through [Standard Data Processing](#) (SDP), the most recently available calibration is applied to it. Since this calibration is continuously being improved, one should check whether there are newer files available. Similarly, some science decisions are made during SDP; every user has the option to reprocess the data with different parameters.

Imaging

NEW UPDATED

The Imaging threads cover a wide range of topics that include source detection, creating exposure maps and normalized images, and calculating image statistics. How to create color images for publication is addressed, as well as merging data from multiple observations.

Imaging Spectroscopy

UPDATED

After extracting source and background PI or PHA spectra from an imaging observation, the appropriate response files (ARE, RMF) are created so that the data may be modeled and fit. In the case of multiple or extended sources, a weighted ARF and RMF are built for the spectral analysis.

Grating Spectroscopy

UPDATED

If new calibration has been applied to the event file, the grating spectrum should be re-extracted as well. It is then possible to build grating response files (gARF, gRMF) in order to model and fit the data.

Timing Analysis

UPDATED

In order to perform absolute timing analysis on a dataset, a barycenter correction must first be applied to the data. One may then create lightcurves and phase-binned spectra to look for variability in the source. These threads also provide information on working with data taken in the ACIS continuous clocking (CC) mode.

Datasets

Links to the datasets used in the threads.

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CALDB

- Existing “Science Threads” already had numerous, detailed gratings threads.
- Here we’ve moved “Grating Spectroscopy” up a spot to be more prominent.
- Threads are reasonably complete, but might seem daunting for a novice.



Grating Spectroscopy Threads - CIAO 4.1
<http://asc.harvard.edu/ciao/threads/gspec.html>

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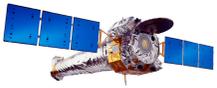
Grating Spectroscopy

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If new calibration has been applied to the event file, the grating spectrum should be re-extracted as well. It is then possible to build grating response files (gARF, gRMF) in order to model and fit the data.

- [Chandra Grating Analysis Page](#)
- [WebGUIDE](#): Interactive GUIDE for ATOMDB version 1.3
- **General:**
 - [Examining Grating Spectra and Regions: PHA2 files \(S-Lang or Python\)](#)
UPDATED: (6 Feb 2009)
 - [Create a Color Spectrum](#)
- **Problems with the Zero Order:**
 - [Correcting a Misplaced Zero-order Source Position](#)
UPDATED: (12 Feb 2009)
 - [Source Position for Grating Data with a Piled or Blocked Zero Order](#)
- **HETG/ACIS:**
 - [HETG/ACIS-S Grating Spectra](#)
 - [Grating Spectra for Multiple Sources - ACIS](#)
UPDATED: (19 Feb 2009)
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Uses: the fullgarf script
UPDATED: (19 Feb 2009)
 - [Grouping a Grating Spectrum](#)
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UPDATED: (19 Feb 2009)
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 - [Higher-order Responses for HRC-S/LETG Spectra](#)
 - [HRC Grating RMFs](#)
UPDATED: (4 Mar 2009)
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- **LETG/HRC-I:**
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UPDATED: (4 Mar 2009)
 - [LETG/HRC-I Grating ARFs](#)
 - [Grouping a Grating Spectrum](#)
- **Combining Spectra & Preparation for Fitting:**

- Following these threads, a user should be able to complete a gratings analysis from start to finish.
- But this list is rather long, and does not transparently indicate what is the “bare bones”, minimal path through them.
- We added a gratings analysis thread guide, modeled after the existing successful CCD spectra and imaging guides.



Analysis Guides - CIAO 4.1

<http://asc.harvard.edu/ciao/guides/>

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Analysis Guides

[ACIS](#) | [HRC](#) | [Analysis Techniques](#)

Since the number of [CIAO Science Threads](#) is always increasing, there is a great demand for a roadmap on how to apply them to the data. The Analysis Guides presented here were written for that purpose.

Each guide takes a certain instrument configuration (ACIS, for example) or type of analysis (e.g., extended sources) and lists the relevant threads. Along with the listing is a brief explanation of the purpose of each task. The goal is to help the user complete the analysis without requiring that every thread be read.

ACIS

- [ACIS Data Preparation](#)

HRC

- [HRC Data Preparation](#)
- [HRC Imaging](#)

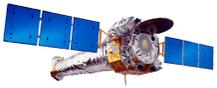
Analysis Techniques

- [Extended Sources](#)
- High Resolution Spectroscopy
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- Analysis Guides now broken up into Data Preparation (e.g., ACIS/HRC), and Analysis Techniques (e.g., extended sources, gratings spectra).
- Gratings guides are broken up into separate guides for specific combinations of gratings and detector.
- Pointer to (older), detailed overview remains. We plan to update this with new references to TGCat tools and scripts.



Analysis Guide: High Resolution Spectroscopy - HETG/ACIS-S - CIAO 4.1
http://asc.harvard.edu/ciao/guides/gspec_acishetg.html

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Analysis Guide: High Resolution Spectroscopy HETG/ACIS-S Observations

[Analysis Guide Index](#)

It is possible to analyze any Chandra gratings dataset almost straight out of the box (only response files need to be created). However, to get scientifically accurate results, there are a number of data processing questions that should be considered. When Chandra data goes through [Standard Data Processing](#) (SDP, or the pipeline), the most recently available calibration is applied to it. Since this calibration is continuously being improved, one should check whether there are currently newer files available. Similarly, some science decisions are made during SDP; every user has the option to reprocess the data with different parameters.

For gratings observations, there is the additional question of whether the source spectrum extracted during SDP corresponds to the source of interest to the user, and if so, whether the source location was correctly determined.

This analysis guide gives an overview of a subset of the [CIAO threads](#) pertaining to HETG/ACIS-S data analysis. They take the user through the analysis of a single source from a single observation. By following the threads, the user can determine for an HETG/ACIS-S dataset:

1. whether the location of the extracted source was correct,
2. whether the data should be reprocessed and filtered before starting the data analysis stage,
3. how to create response files for the gratings spectrum, and
4. how to begin a simple spectral analysis.

The following threads are referenced:

- Determining source position
 - [Correcting a Misplaced Zero-order Source Position](#)
 - [Source Position for Grating Data with a Piled or Blocked Zero Order](#)
- Reprocessing data
 - [Remove the acis_detect_afterglow Correction](#) (Not necessary for recently-acquired or recently-processed data.)
 - [New ACIS Bad Pixel File: Identify ACIS Hot Pixels and Cosmic Ray Afterglows](#) (Not necessary for recently-acquired or recently-processed data.)
 - [Setting the Observation-specific Bad Pixel Files](#)
 - [HETG/ACIS-S Grating Spectra](#)
- Creating response files
 - [ACIS-S Grating RMFs](#)
 - [HETG/ACIS-S Gratings ARFs](#)
- Simple spectral analysis
 - [Grouping a Grating Spectrum](#)

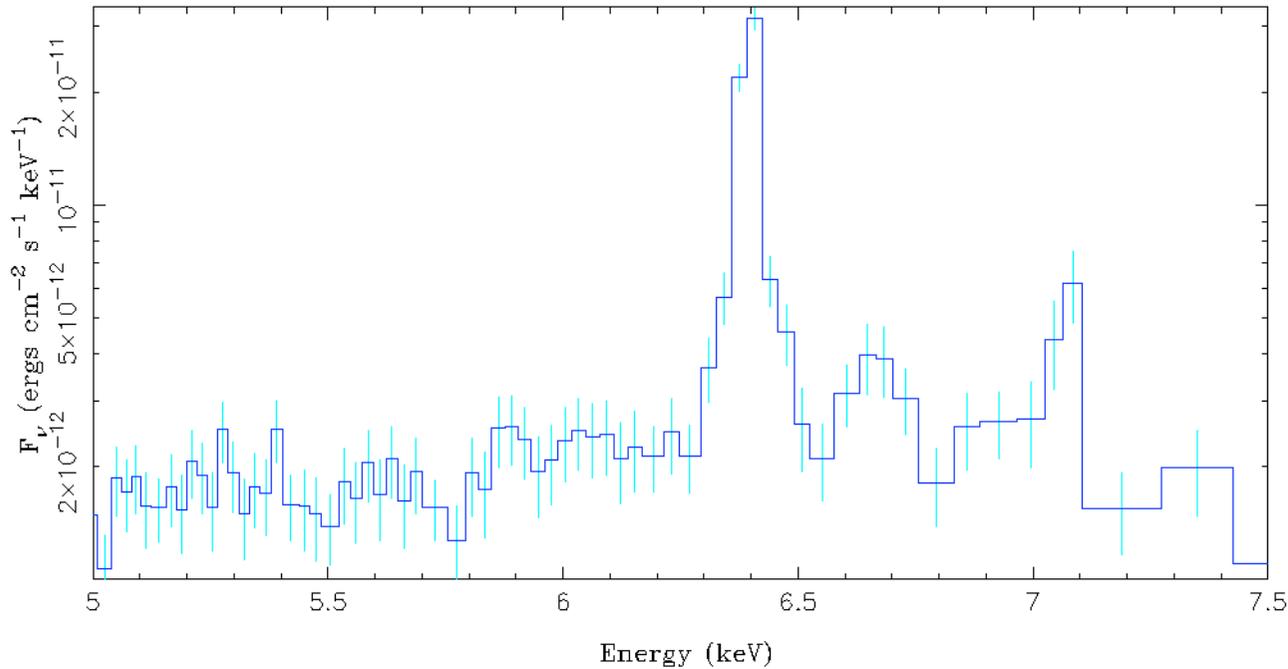
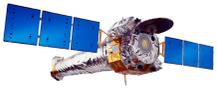
The threads should be run in the order in which they are presented below.

If the user is analyzing archival data, and furthermore is satisfied with the source position and the choices made for SDP, essentially all steps described here can be avoided by using the gratings catalog, [TGCat](#), and downloading the pre-computed spectral products (i.e., spectra and response files). The user can then proceed to the "Simple spectral analysis" threads.

If the user is analyzing data that has yet to be archived, and is satisfied with the source position and standard data processing, they only need to start at the "Creating response files" stage.

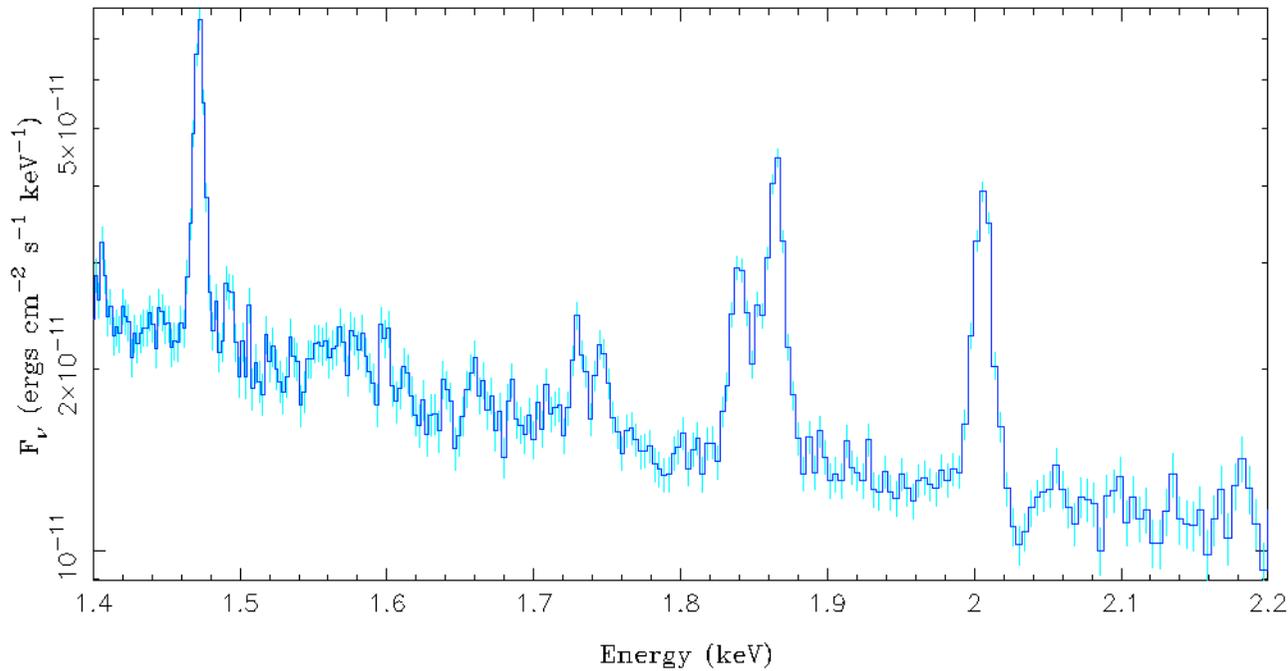
The "Grouping a Grating Spectrum" thread is only necessary for users analyzing their data with [XSPEC](#). Those using [Sherpa](#) or [ISIS](#) also will likely want to group their data; however, they can group their data during spectral analysis itself. Therefore after creating spectra and responses they can proceed directly to "Measuring Line Parameters with a Gratings Spectrum".

- Minimum set of threads required to construct & analyze gratings spectra.
- Comments on most likely scenarios. E.g., reprocessing is not required for recent data, grouping is only required for XSPEC (not Sherpa or ISIS).
- Pointers to TGCat with notes that those data can be analyzed with zero processing.
- New threads outlining simple analysis scenarios: HETG/ACIS & LETG/ACIS.

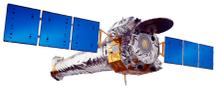


TGCat Spectra:

- HETG/ACIS:Vela X-I



- LETG/ACIS: Sigma Gem



Measuring Line Parameters with an LETG/ACIS-S Spectrum – Sherpa 4.1 (S-Lang)

https://icxc.harvard.edu/sds/sherpa4.1_trial/threads/lines_acisletg/index.sl.html

at: 17:51:50 2009-04-01

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Measuring Line Parameters with an LETG/ACIS-S Spectrum

Sherpa Threads (CIAO 4.1)
[S-Lang Syntax]

Overview

Last Update: 01 Apr 2009 - new for Sherpa 4.1

Synopsis:

After having created or downloaded a set of PHA2 and response files (RMFs and ARFs) for an LETG/ACIS-S observation, perform a simple fit to several of the line features present in the spectra. This thread takes the user through a calculation of the error bars on the line normalizations, positions, and widths, and shows how to calculate the line equivalent widths.

For those wishing to perform their analysis with [XSPEC](#), the PHA2 file must first be split into individual type 1 PHA files, and then grouped to increase the signal-to-noise in each spectral bin. The [Grouping a Grating Spectrum CIAO thread](#) shows how to do this, and the procedure is also included within this thread.

Read this thread if:
you are working with an LETG/ACIS-S data set, and want to begin a simple analysis of the spectrum.

Related Links:

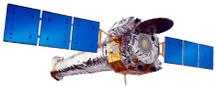
- [Analysis Guide: High Resolution Spectroscopy of LETG/ACIS-S Observations](#)
- [Starting Sherpa thread](#)
- [Fitting Grating Data thread](#)

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

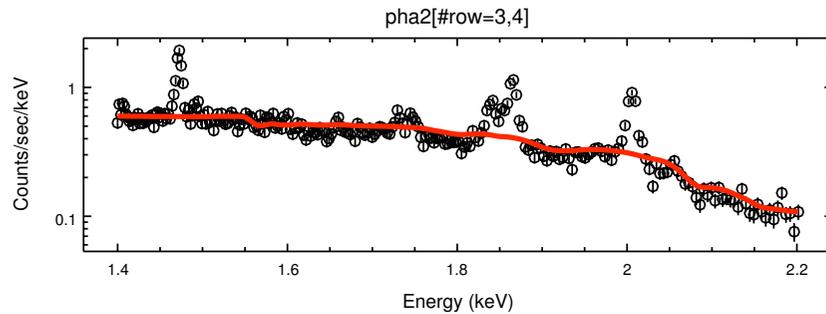
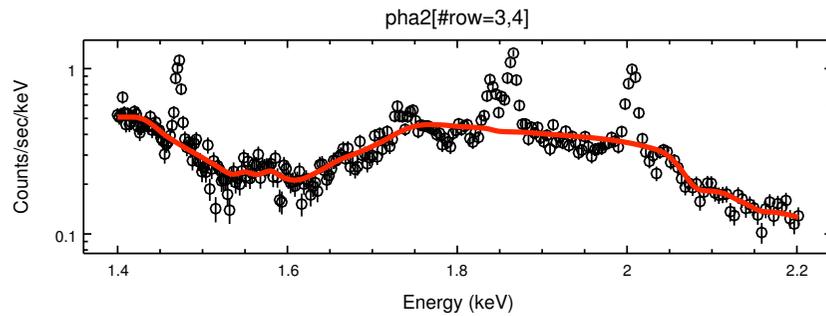
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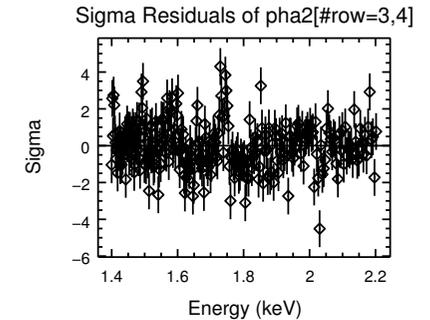
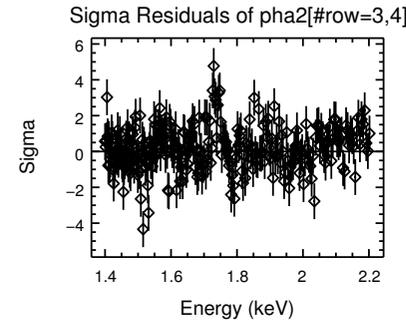
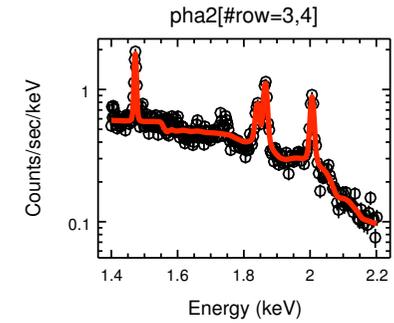
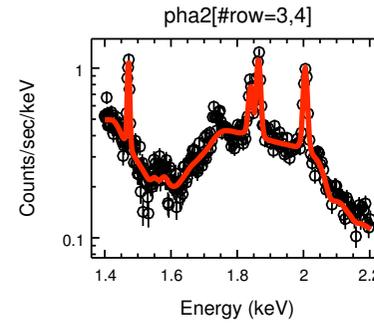
- Both threads can be begun directly from the TGCat downloaded spectra.
- Further processing (splitting into type 1 PHA & grouping) only required with XSPEC.
- Covers the basics: fit a continuum, add lines, measure parameters, calculate equivalent widths.
- Goal is to show that is just the usual, familiar PHA + response paradigm.



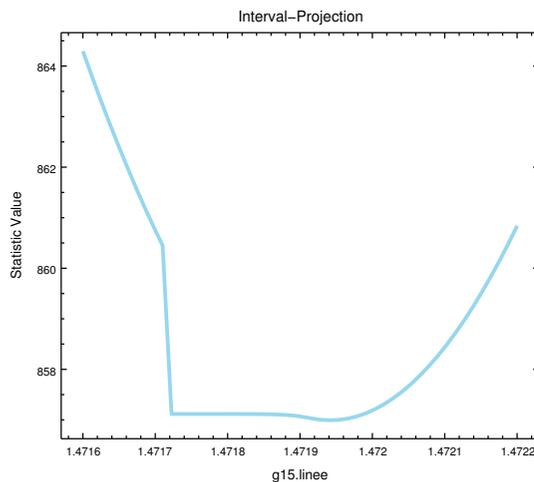
1. Fit Continuum



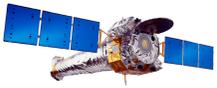
2. Add Lines



3. Look at Error Bars



- 4. Calculate Equivalent Widths
- 5. Calculate flux of line & continuum to verify equivalent width (HETG only)



Thread Plans:

- Revise the existing detailed overview.
 - * Take advantage of TGCat tools and scripts.
 - * Simple break points for more complex analyses:
 - Non-standard extraction windows, time slices
- Include a simple analysis example for LETG/HRC
- Additional analysis scenarios?
 - * Combined data. Gratings + other instruments.
Gratings + zeroth order.