



# *Chandra* Helpdesk Ticket Examples

with **Commentary** & **Editorial Notes**



## Questions that are too General...

- I am doing analysis by counting counts to obtain the density of the circumstellar mass by obtaining luminosity and then flux. I am already familiar with doing this with *Swift*, but I am now having trouble with *Chandra*. I was wondering if based on my needs could you instruct me on how to use CIAO for my purpose?
- How do you remove a double source if it's contaminating the flux from the target source? **The obvious answer is to build a rocket ship and go turn off the source! This seemingly simple question is a really non-trivial, general, observational astronomy problem that's better discussed with an advisor or colleagues.**

Can only point the user to broad analysis categories without having more specific information about the analysis direction being taken.

## ... or Beyond the Scope of the Helpdesk

- I can only see the abstracts of accepted proposals, can the entire proposal be made public? **Legal issues involving the confidentiality of intellectual property and non-disclosure.**
- I am currently studying supernovae listed on the ChaSeR catalog and I need information to evaluate them. I was wondering if there would be a list of all these supernovae where more information (like the redshift or the explosion time) about these objects would be listed. **This will require a search of the literature.**
- I am fitting a spectrum but the nature of the source is unknown. I have tried many common models but the result is not good enough. The aim is to get a good fit to constrain the nature of the source, is there any way to tell which is the best model?
- How do I use HEASoft/FTools, XSpec, SAS, or ACIS Extract.  
**Each has its own helpdesk/support: FTools/XSpec by NASA HEASARC; SAS by the XMM-Newton Science Operations Centre, and AE by the ACIS group at Penn State University.**

This is too general; a "just doing science" question. There is no tool that will tell if one random model is any better or worse than another, beyond the returned fit statistic. Which model to pick is entirely science driven—with a thousand Gaussians or high-order polynomial any spectrum can be perfectly fit, but it will not provide any physical insight and have no scientific meaning.



# Real Life Example (good) — I

April 7, 2016 10:39

I was wondering whether there are any tools etc for dealing with correcting an off-axis point source for pileup.

I have been following the pileup guide on the CIAO and Sherpa pages using the jdpileup model, but this seems to be based around an on-axis point source, where all the photons are spread over relatively few pixels. Is there any analogue or guidance for the case where the point source is off-axis, and photons are spread over many pixels (but still with significant pileup)?

A related, probably dumb question (but I am coming to this from particle physics so I am not an expert):

If I reduce the pileup fraction for a source by choosing a region with a central area of high pile-up excluded, (i.e. to extract from the wings of the point spread function), does specextract know about how the point spread function behaves well off-axis, and the way the higher energy photons are spread out than the lower energy ones? I presume the answer is yes, but like I said this is a new subject for me :)



# Real Life Example (good) — I — comments

- I was wondering whether there are any tools etc for dealing with correcting an off-axis point source for pileup.

*Clear question that's to the point.*

- I have been following the pileup guide on the CIAO and Sherpa pages using the jdpileup model, but this seems to be based around an on-axis point source, where all the photons are spread over relatively few pixels. Is there any analogue or guidance for the case where the point source is off-axis, and photons are spread over many pixels (but still with significant pileup)?

*Puts question into context, and for the case that he's interested in.*

- If I reduce the pileup fraction for a source by choosing a region with a central area of high pile-up excluded, (i.e. to extract from the wings of the point spread function), does specextract know about how the point spread function behaves well off-axis, and the way the higher energy photons are spread out than the lower energy ones?

*Puts forward an analysis idea in clear terms and asks for verification that a script can account for this case.*

There's no such documentation, but you can get a feel of the off-axis pileup by simulations and judgement call of what is acceptable. Main reason is that there aren't really any highly off-axis sources observed that have exhibited the extreme behavior of cratering. If you don't see the readout streak on the off-axis source, then pileup typically isn't a concern.

Using an annulus to exclude pileup is a good idea, but there's murkiness on the affects of the calculated responses. The responses that contain the mapping between effective area & energy and the line spread function are well-calibrated, but it's unclear what the effects of an annulus—instead of a circular or elliptical region—has on the net responses, particularly if you're after an integrated flux or model normalization.



# Real Life Examples (bad) — I

- August 15, 2016 13:42

Good morning I am new to CIAO, and when loading the file of SN2015G just as shown in the introduction of ciao I get an error message saying it was unable to download the fits. Do you know why this could happen?

- October 30, 2015 14:11

Hi, I am trying to make a nicer image for publication using the following thread. ([http://asc.harvard.edu/ciao/threads/diffuse\\_emission/](http://asc.harvard.edu/ciao/threads/diffuse_emission/)). I made a merged image by combining 3 ObsIDs using merge\_obs tool. I then used exposure corrected image and followed above thread. It either gives "# dmfilth (CIAO 4.7): WARNING: Skipping bkg region #51 - no data (region outside image boundary?)." error or the output image (diffuse.img) is not fill the point sources.



# Real Life Examples (bad) — I — comments

- Good morning I am new to CIAO, and when loading the file of SN2015G just as shown in the introduction of ciao I get an error message saying it was unable to download the fits. Do you know why this could happen?

No, more information is needed. What ObsID is the user looking at? What file is he using? Which introductory page is he referring to and what tools and commands are being used? What is the actual error message that's seen?

- I made a merged image by combining 3 ObsIDs using merge\_obs tool. I then used exposure corrected image and followed above thread. It either gives "# dmfilth (CIAO 4.7): WARNING: Skipping bkg region #51 - no data (region outside image boundary?)." error or the output image (diffuse.img) is not fill the point sources.

While a description of steps are provided, what were the actual commands used? No files provided to test on to see the problem the user's concerned about.



# Real Life Examples (good) — II

January 27, 2015 18:29

Hello, I am following the HETGS grating spectra thread  
([http://cxc.harvard.edu/ciao/threads/spectra\\_hetgacis/index.html](http://cxc.harvard.edu/ciao/threads/spectra_hetgacis/index.html))

I am encountering a SIGSEGV error

===

```
-bash-4.1$ ciao
```

```
ERROR: The current environment is configured for:
```

```
CIAO 4.6 Monday, December 2, 2013
```

```
bindir : /nfs/cxc/a1/linux-x86_64/opt/packages/ciao-4.6/bin
```

```
CALDB : 4.5.9
```

Variables used:

```
i=13850
```

```
SPECOUT=hetgs_spectra
```

```
flt=13850/secondary/acisf13850_000N001_flt1.fits.gz
```

```
-bash-4.1$ dmcoppy "$SPECOUT/$i\_evt1a_flt.fits[EVENTS][@$flt][cols -phas]"
```

```
$SPECOUT/$i\_evt2.fits
```

```
# 5961: Received error signal SIGSEGV-segmentation violation.
```

```
# 5961: An invalid memory reference was made.
```

```
# 5961: segmentation fault: DMCOPY (1) is: exit_upon_error->NULL
```

===

I am attaching the evt1a and the flt file.



# Real Life Examples (good) — II — comments

- I am encountering a SIGSEGV error  
*The user describes the problem encountered.*
- CIAO 4.6 Monday, December 2, 2013  
 bindir : /nfs/cxc/a1/linux-x86\_64/opt/packages/ciao-4.6/bin  
 CALDB : 4.5.9  
*Provides the software and CalDB version used.*
- -bash-4.1\$ dmcoppy  
 "\$SPECOUT/\$i\ evt1aflt.fits[EVENTS][@\$flt][cols -phas]" \$SPECOUT/\$i\\_evt2.fits  
 # 5961: Received error signal SIGSEGV-segmentation violation.  
 # 5961: An invalid memory reference was made.  
 # 5961: segmentation fault: DMCOPY (1) is:  
 exit\_upon\_error->NULL  
*She defines the files and variables used; the command executed; and the entire error message returned by the tool.*
- I am attaching the evt1a and the flt file.  
*Includes all the files used leading to the problem.*

The user provides a link to the document she's looking at; fortunately it's not necessary for this ticket.

The attached evt1a file was corrupted for some unknown reason and only the file header could be read, while opening the tables with the DM tools caused a core dump. Running the user-supplied script on a local system completed successfully and after letting the user know, she tried on a different system successfully as well. As it turns out, the bad file write was a precursor to a catastrophic hard drive failure that occurred on the system shortly afterwards.





# Real Life Examples (bad) — II

- December 1, 2014 14:58

I saw a chandra specialist did wavdetect in an unique way. He used dmcopy to make fits file for every single CCD, then he ran wavdetect for every fits file. Do you know that is for what? Is it better to run wavdetect on a single ccd?

- July 6, 2010 14:51

Hi,

I've attached a script for you, i need help with the sherpa script...

thank you



# Real Life Examples (bad) — II — comments

- I saw someone use `wavdetect` in an unique way. He used `dmcoppy` to make FITS files for each CCD, then he ran `wavdetect` for each file. Do you know why he did this?

Without context and seeing exactly how he filtered the data, it's impossible to say why he did what he did. The user is better off asking the person directly. Be explicit!

Is it better to run `wavdetect` on a single CCD?

Too general of a question that's a judgement call which only the user can answer. "Better" is relative, with the trade offs that come with any computational problem.

- I've attached a script for you, I need help with the Sherpa script...

What does the user think is wrong with the script? What result does it return that's wrong?

Rewritten to be easier to understand.

If we were to make a guess as to the motivation of using `wavdetect` in this manner, the user probably wanted to do source detection on an image with a low binning factor. Since `wavdetect` is memory intensive, doing it on a per CCD basis may avoid system limitations that may be encountered if performing the source detection on an entire chip array that hasn't been split up, and using the same bin factor. This memory limitation was of particular concern with older 32-bit operating systems and CIAO builds. Another possibility, but less likely, is that depending on how the image's sky range is restricted, it could reduce the total number of image pixels that is required to be evaluated while preserving the binning factor to speed up the detection process.



# Real Life Examples (good) — III

June 5, 2013 13:06

CIAO version 4.5

CALDB version 4.5.5.1

Trying on both a Macbook Pro (OS 10.8.3) and Linux (Ubuntu 12)

=====

I am trying to take a general survey of quasars Chandra archive. I have been going through a list of obsids, but am finding some issues with determining which chip the target point source is on. I have noticed in the past that the CCD\_ID listed in the evt2 file fits header does not always agree with the actual chip id that the target is on.

For example, with ObsID 3472 (and HETGS observation):

```
>> evt2=`ls primary/*evt2*`  
>> dmkeypar $evt2 CCD_ID echo+  
4
```

But I know the zeroth order of the source is centered on chip 7.

If I open the evt2 file in ds9, I can overlay a region centered on the point source. When I then use the Analysis -- CIAO -- Coords -- Chip tool, it returns chip 7.

However, if I move the region to a different part of the image that is clearly a different chip, the Coords--Chip tool still returns 7. This makes it very difficult to check what is printed as CCD\_ID in the header, making it very difficult to automate the process. Please help!



# Real Life Examples (good) — III — comments

- CIAO version 4.5

CALDB version 4.5.5.1

Trying on both a Macbook Pro (OS 10.8.3) and Linux (Ubuntu 12)

*The user provides software information and shows which platforms she's encountered the issues on.*

- I have noticed in the past that the CCD\_ID listed in the evt2 file fits header does not always agree with the actual chip id that the target is on.

*Primary concern concisely stated.*

- >> `evt2=`ls primary/*evt2*``  
>> `dmkeypar $evt2 CCD_ID echo+`  
4

But I know the zeroth order of the source is centered on chip 7.

*Shows what she did, given a specific ObsID, and what is returned by the tool, which contradicts what she knows about the observation.*

- If I open the evt2 file in ds9, I can overlay a region centered on the point source. When I then use the Analysis -- CIAO -- Coords -- Chip tool, it returns chip 7. However, if I move the region to a different part of the image that is clearly a different chip, the Coords--Chip tool still returns 7.

*The user also describes another problem she sees in DS9: what was done, what was returned, and what she finds confusing.*

This can be automated using `dmcoords` and the `RA_TARG /DEC_TARG` or `RA_PNT/DEC_PNT` header keywords from the input file.

The underlying issue is how the `CCD_ID` header keyword (which is extraneous, and never should have been included in the data product—especially since there's already a `CCD_ID` event's column) is determined with the Level 0 `acis_format_events` tool. The order of the FEPs activating (which affects the order that the chips are turned on) determines the `CCD_ID` keyword value. In principle, the back-illuminated chips should always be turned on first, but the activation order is occasionally mucked up.

DS9/dax needs to use the "crosshair" cursor to get the correct `CCD_ID` of a chip with the statistics tool.



# Real Life Examples (bad) — III

- November 26, 2009 10:47

Hello

I use dmextract to get the light curve for a point source in ACIS data, and I have been received these warnings:

```
# dmextract (CIAO 4.1): WARNING: Input file,  
"acis_dstrk_evt2.fits[ccd_id=2,sky=region(source.reg)]", has no rows in it.
```

```
# dmextract (CIAO 4.1): WARNING: Input file,  
"acis_dstrk_evt2.fits[ccd_id=2,sky=region(back.reg)]", has no rows in it.
```

I am sure about the ccd id and source.reg, back.reg. I don't know what my mistake is .

- July 8, 2010 15:43

You know what I'm doing, it's Cassiopeia A, all I need is to get the energy spectrum... The way u said worked... I used specextract and got the files i needed... but then something seems to be not right with sherpa script. I thought i was supposed to get a clear one like the ones from Mrk 421, but I don't understand it...



# Real Life Examples (bad) — III — comments

- "acis\_dstrk\_evt2.fits[ccd\_id=2,sky=region(back.reg)]", has no rows in it. I am sure about the `ccd_id`, `source.reg`, and `back.reg`. I don't know what my mistake is.

The files named in the error/warning messages aren't provided. The problem is that with generic file names, an ObsID is needed to begin an investigation. This problem is compounded if generic region names are also used in the command-line syntax, in which case the contents of the region files need to be provided too.

- You know what I'm doing, it's Cassiopeia A. All I need is the energy spectrum... the way you said worked... I used `specextract` and got the files I need...

The user assumes the ticket will be assigned to the same support staff member, so she doesn't provide any details for the question.

something seems not to be right with the Sherpa script. I thought I was supposed to get a clear one like the ones from Mrk 421, but I don't understand it...

What seems wrong with the Sherpa results? What does "clear one" mean? What doesn't the user understand?

After suggesting that the user talk to her supervisor, learned that she just completed her first or second year of undergrad and that her advisor was not replying back to her emails while travelling. The user eventually clarified what she meant by "a clear one". She had been shown the non-thermal power-law spectrum extracted from Mrk 421, but was confused by seeing the complex thermal and emission line spectrum she extracted from Cas A. She thought that the spectra would be similar, not knowing that they were two very different classes of astrophysical objects—one a blazar and the other a supernova remnant with embedded neutron star—with different emission mechanisms.

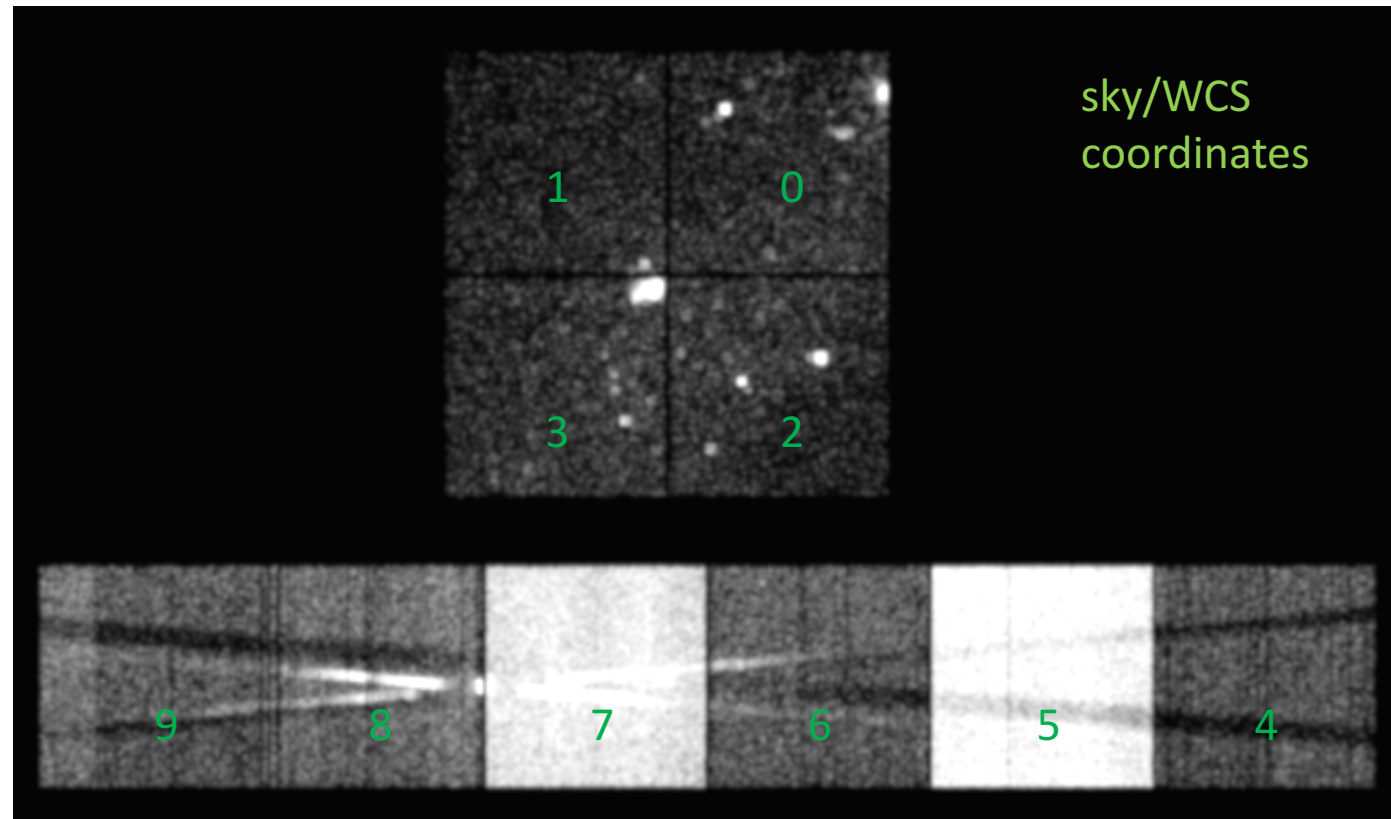
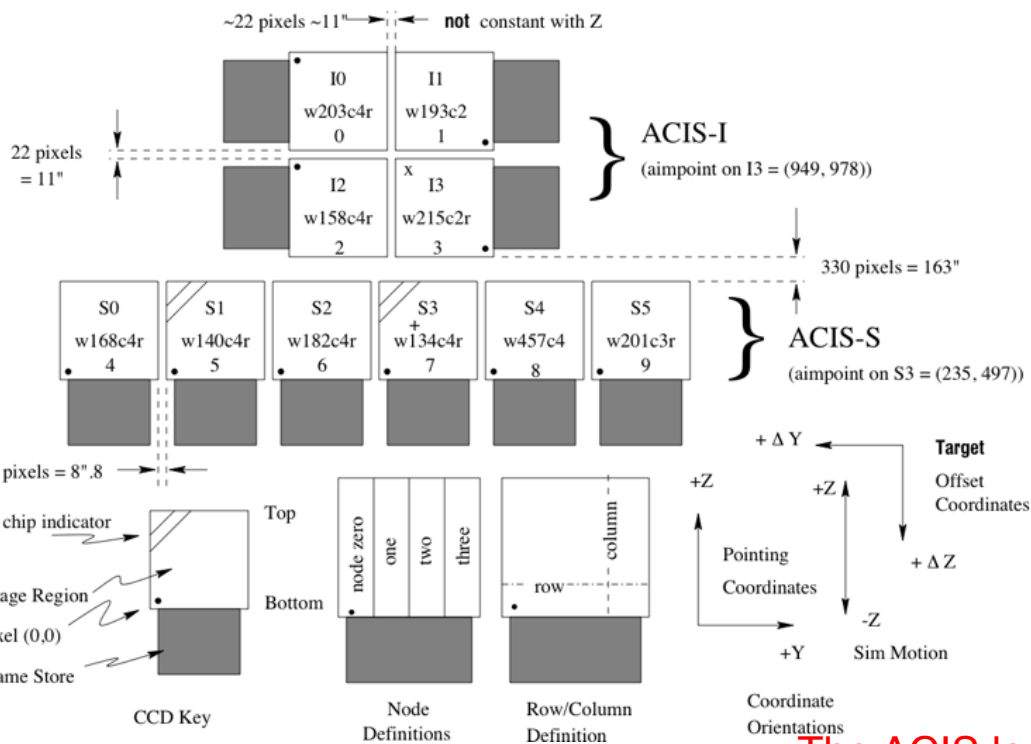
Turned out that the source of interest was on ACIS-3, not on ACIS-2. By filtering out all the CCDs except for ACIS-2, an extraction region intersecting where the ACIS-3 field was will encompass zero counts.



# An aside on the Previous dmextract Ticket

How can the CCD\_ID be mistaken in an observation?  
It's really easy to, especially if only the ACIS-I array is used...

## ACIS FLIGHT FOCAL PLANE



The ACIS layout in the POG or TDet coordinates can be thought of as looking at the detector through the telescope's aperture, down towards the primary lens/mirror while the layout in sky and WCS coordinates is as if looking through the telescope's eyepiece.



# Collated Real Life Example

This is an example, compiled from the iterations throughout a single ticket, of the questions and responses to clarification requests. This example has been edited to make things anonymous, as the science isn't important for this case.

July 2016

I am currently reading the paper “X-ray Study of Sources in Incognito with *Chandra*” by Zaphod, et al 2008 (MNRAS) and I am trying to generate the lightcurve for Incognito data. In the paper they have identified  $N$  different sources within the galaxy and plotted the lightcurves for source  $x$  and source  $y$ .

I did everything and got the result. I downloaded the data and plotted the light curve for the single evt2 file available for HRC-I. The two plots do not match. Is my method correct?

How do I find out about the energy range the source is emitting? Is there any command or something to specify the energy range or know the energy range of the source? I also searched the analysis guides on the website and found the command under the topic energy filter, [`energy=2000:3000`], and when I used it, I got an error saying: “`IOError: Error: Could not find identifier energy.`” In the paper, why do they filter the energy value? Can I use the other observation, which uses ACIS-S data, to generate a lightcurve?

We ask users to please bear with us and the tedious back-and-forths that may occur at the start of a ticket—we interact with users from around the world, with varying levels of experience and astronomy backgrounds.

Whether the user is an eager primary school student; experienced scientist delving into a different energy regime for the first time; or an instrument Principal Investigator or Project Scientist of an operational high-energy mission—clarifying issues and questions early on, before providing an answer, mitigates pointing the user in the wrong direction and helps tailor answers to an appropriate level of detail. This occasionally also provides an opportunity to help steer the user into asking ‘the correct’/ ‘a better’ question than the one initially posed.





# Real Life Example — comments

- I am currently reading the paper “X-ray Study of Sources in Incognito with *Chandra*” by Zaphod, et al 2008 (MNRAS) and I am trying to generate the lightcurve for Incognito data.

The user is clear about wanting to create lightcurves, but what is the full journal reference to the article? It's probable the reference will be found after querying ADS, but occasionally the title provided is the pre-print title found in “astro-ph” that differs from the published version, making the search tougher.

- I did everything and got the result. I downloaded the data and plotted the light curve for the single `evt2` file available for HRC-I.

What does “I did everything” mean? Need more information about what's actually done before being able to move forward.

- The two plots do not match.

What plots? Is it that the lightcurves extracted don't match each other, or do the extracted lightcurves not match the lightcurves in a figure in the paper? If the latter, what are the figure numbers?

This is related to the: “Is my method correct?” question found later. The user's method was to follow the referenced paper and purportedly do everything described in the text.

Just because the user believes s/he is doing what's described in the paper doesn't mean s/he's actually doing it in exactly the same manner as the paper's authors and using exactly the same extraction regions and data products. This is why providing the information about what the paper says to do, and how the user interprets and executes the directions, with the command-line syntax used, is so critical.



## Real Life Example — comments [cont.]

- Is my method correct? {Please see the note on the previous page.

Did some of the text get lost? Some information and context is missing about the "method" used. That is, between downloading the data and plotting the light curve, what data processing was done? What commands were used to extract the lightcurve? What are the defined regions? Which ObsIDs are used?

- How do I find out about the energy range the source is emitting? Is there any command or something to specify the energy range or know the energy range of the source?

Knowing the basic characteristics of the instrument used for an observation is important.

- In the paper, why do they filter the energy value? {Presumably, they're using the energy band that ACIS is most sensitive to.

Is it explained somewhere in the paper? At the very least, provide the information about the range the authors filtered on, so an educated guess can be made.

- Can I use the other observation, which uses ACIS-S data, to generate a lightcurve?

Understanding the capabilities of the instrument of interest is useful. Looking at the paper's text and figures referenced in the ticket, the authors used ACIS data to generate the lightcurves.

The only thing that can be said is that HRC can detect photons of energies between 0.08-10 keV—with varying levels of energy sensitivity—originating from the source. Without gratings, HRC essentially has no energy resolution, so distinguishing a 0.5 keV photon from a 5 keV photon is virtually impossible.

ACIS performs timing, with varying degrees of temporal resolution, depending on instrument configuration. Timing is part of the intrinsic nature of all X-ray detectors currently in operation. As a user, you don't need to know how the instrument works, but you should know what its performance capabilities and characteristics are prior to digging in and analyzing the observation to help inform you of the limitations the data has on the science you're able to do.