

ChART

Chandra Ray Tracer

(Web interface to SAOSac)

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What is SAOsac?

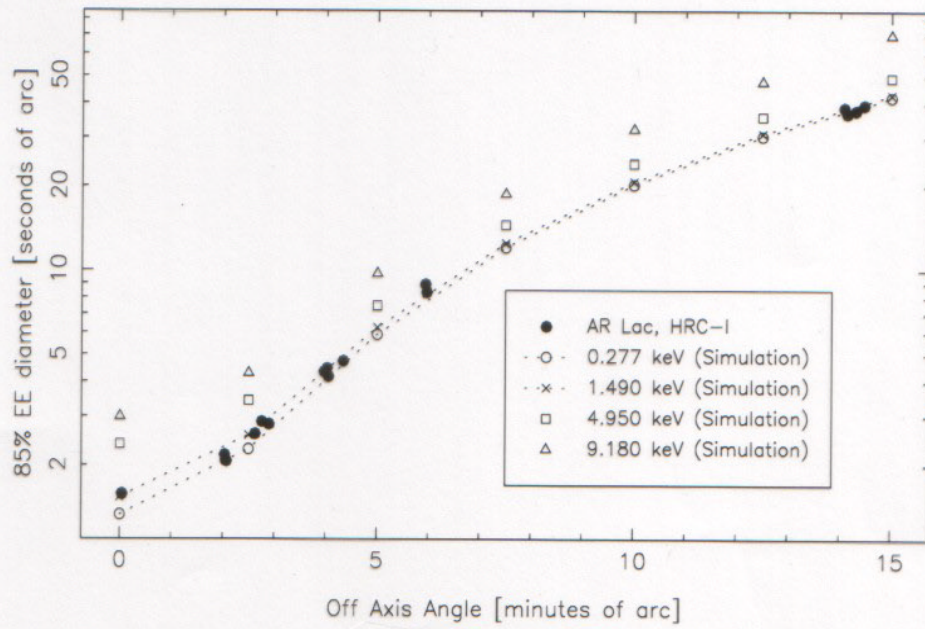
saosac is a generic term for modified versions of programs from the osac suite of optics raytracing programs. snodrat (which determines the intersection of rays with the optics' surfaces) is the program which we most use; it is a modified form of the osac drat program. saosac has come to also refer to the complete suite of programs which we have constructed to create a full raytrace simulation.

Generally, users will use one of three front-ends to the raytrace suite: trace-shellz or trace-nest. In actual use, the program names have a major version number attached, such as trace-shellz4, or trace-nest3. See the [Current release](#) section for the names of the current supported release versions. For most purposes, trace-nest will suffice (even for a single mirror).

The programs differ from their predecessors, trace-shellz, in a number of important ways:

- The ray generator is **very** different. It uses a different coordinate system and a different manner of specifying the source characteristics. Incomplete [documentation](#) for the ray generator (raygen) is available. The current ray generator generates sources according to a description written in the [Lua](#) language. This makes it easy to generate complicated sources, but makes the learning curve a little steeper.
- The configuration file format has changed, removing many restrictions (such as number of mirrors).
- A more optimized version of snodrat ([surface interference](#)) is used.

Because the front ends call many other programs to perform the raytrace, documentation for a particular aspect of the raytrace is generally found under the name of the program doing that job, rather than under the name of the front end. Additionally, parameters names may be different between the front ends and these other programs. This can be confusing, but is unavoidable given the architecture of the system. The front ends are designed to hide almost all of the details, so this is normally not a problem. Essentially the only program other than the front end that the user will need to be aware of and deal with almost directly is the ray generator.

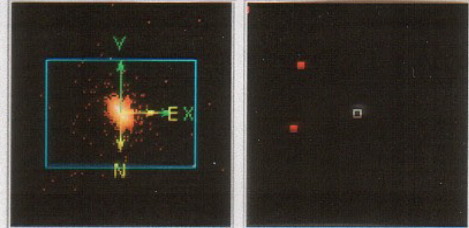


— Observed and simulated 85% encircled energy diameters from Jerius et al 2000 .

HRMA PSF VARIABILITY vs. φ

File Edit Frame Bin Zoom Scale Color Region Analysis Help

File	HRMA_theta5_phi180_en1.5im512.f			
Value	0			
FK5	α	18:09:06.663	δ	+00:04:41.88
Physical	X	14247.500	Y	16299.500
Image	X	396.000	Y	172.000
Frame1	Zoom	1.000	Ang	0.000

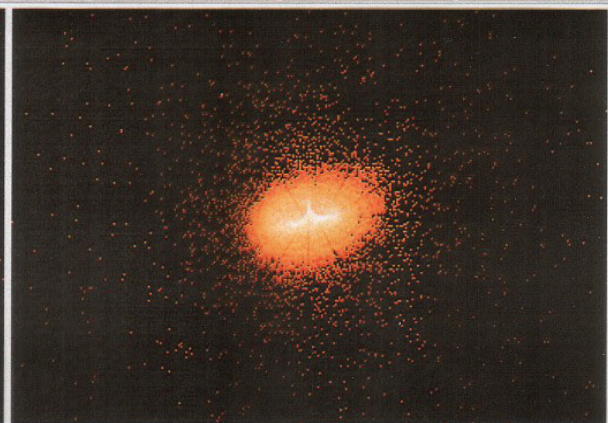


File Edit Frame Bin Zoom Scale Color Region
about open save header source print exit

$\varphi=135^\circ$



$\varphi=45^\circ$



$\varphi=180^\circ$

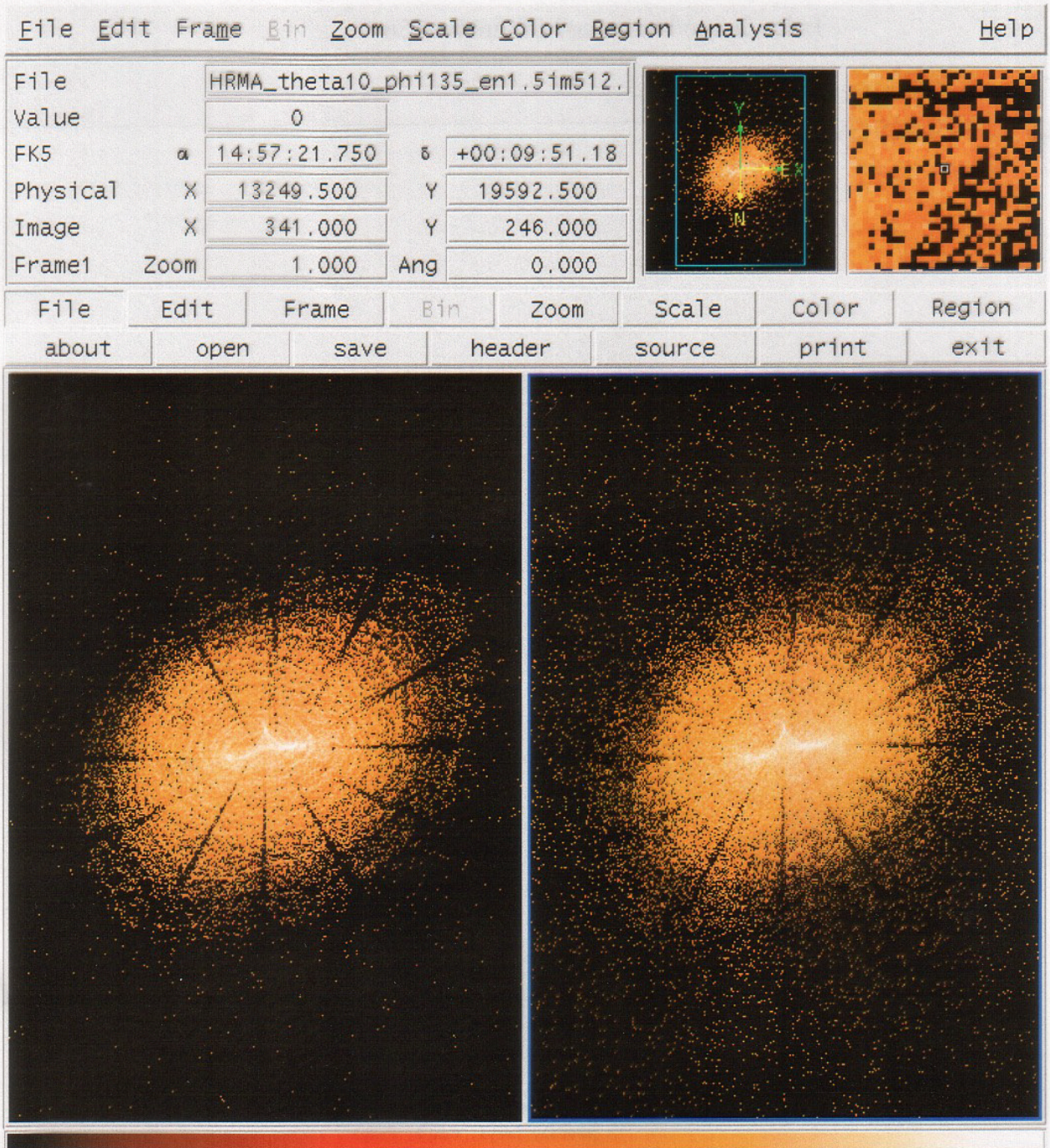


$\theta=5'$

$\varphi=0^\circ$

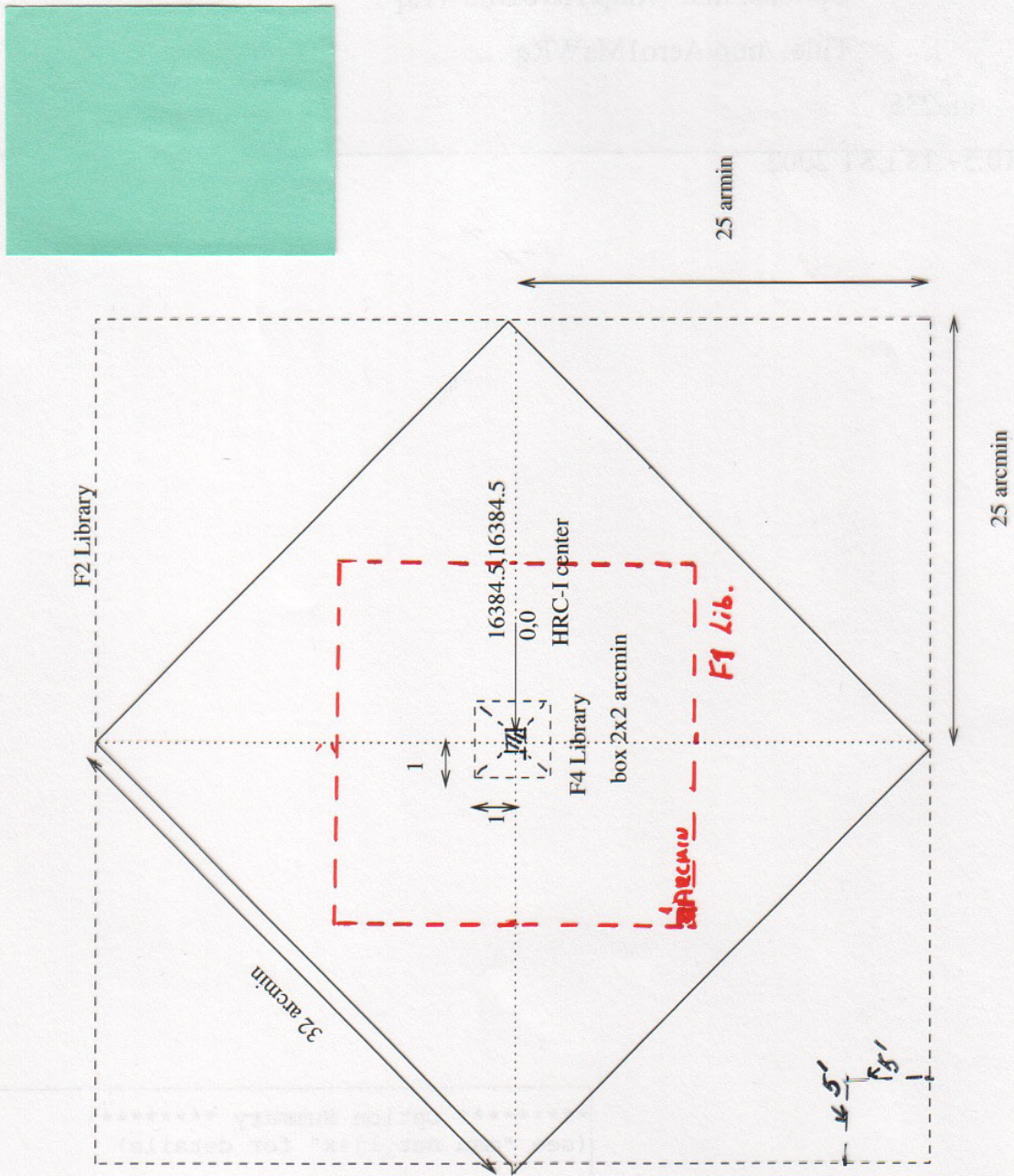
$E=1.5\text{ KeV}$

HRMA PSF vs. color (energy)

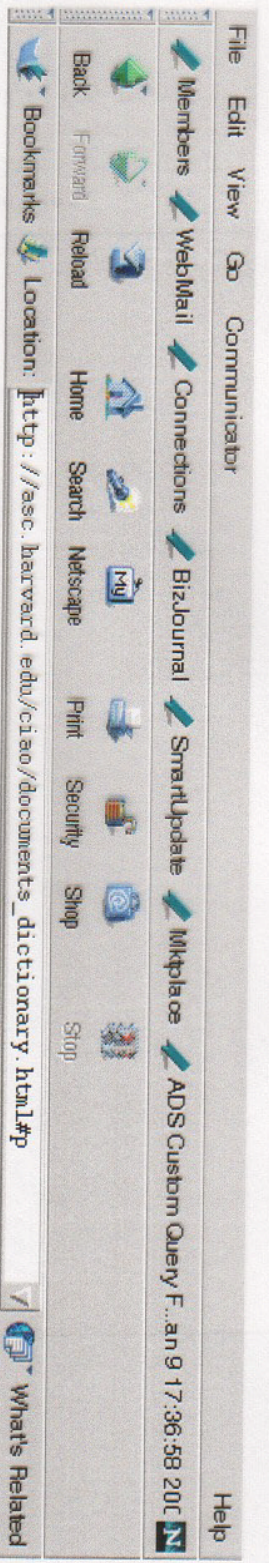


$\theta = 10'$, $\psi = 135^\circ$

PSF standard Libraries used in
MKPSF



— A schematic diagram of HRC-I detector. This diagram is NOT TO SCALE!! The aimpoint is marked with a cross. The pixel size is 0.006429 mm, corresponding to 0.13175 arcsec.



PSF: Point Spread Function

Describes the shape of the image produced by a delta function (point) source on the detector. Also known as 'Point Response Function' or PRF, the information is stored in the [PSF Library](#). For more info view the [mkpsf](#) (Standard OGIP file format).

PSF Libraries

The Chandra [PSFs](#) vary strongly with source location in the telescope field of view, as well as somewhat with the energy, and so with the spectrum of the source. Standard sets of simulated Chandra PSFs covering the field of view of the [ACIS-I](#), [ACIS-S](#), [HRC-I](#) and [HRC-S](#) detectors are available via the standard PSF library files. The CIAO tool [mkpsf](#) reads one of these libraries (at the users choice) and interpolates. Naturally this interpolation is more accurate for the finer grids.

There are 4 standard PSF libraries provided per instrument:

- Medium res library (file No. 1)** 1 arcmin step size between images. 6 micron pixel images. Grid about the optical axis covering:
 - ACIS-I** and **HRC-I**: a -10 to +10 arcmin square grid (21x21);
 - ACIS-S** and **HRC-S**: a -10 to +10 arcmin in azimuth and -5 to +5 arcmin in elevation grid (21x11).
 - Low res library (file No. 2)** 5 arcmin step size between images. 12 micron pixel images. Grid about the optical axis covering:
 - ACIS-I**: a -25 to +10 arcmin in elevation and -10 to +10 arcmin in azimuth (8x5) grid.
 - ACIS-S**: a -25 to +25 arcmin in azimuth and -5 to +5 arcmin in elevation (11x3) grid.
 - HRC-I**: a -25 to +25 arcmin in elevation and -25 to +25 arcmin in azimuth (11x11) grid.
 - HRC-S**: a -30 to +30 arcmin in azimuth and -5 to +5 arcmin in elevation (13x3) grid.
 - High res library (file No. 3)** 1 arcmin step size between images. 2 micron pixel images. Grid covering a -6 to +6 arcmin (11x11) in azimuth and elevation about the optical axis.
 - High res library (file No. 4)** 1 arcmin step size between images. 1 micron pixel images. Grid covering a -1 to +1 arcmin (3x3) about the optical axis.
- [NB: ACIS pixel size is 24 microns, HRC pixel size is 6 microns.]

See also:
[PSF Manual](#)
[Chandra's HRMA PSF Page](#)



File Edit View Go Communicator Help

Members WeclMail Connections BizJournal SmartUpdate Marketplace ADS Custom Query F..an 9 17 :36:58 2000

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Bookmarks Location: <http://icxc.harvard.edu/pipeline/www-saosc/cgi-bin/www-saosc.cgi> What's Related

Step 2 (of 3): Verify request

You've submitted the following request:

Name: Margarita Karovska
Email Address: karovska@cfa.harvard.edu
Random Seed: 1012667247

Source 1 :

- Theta: 0.18
- Phi: 24
- Spectrum File: **object.sp**

Problem: We have detected an improper input. The file that you uploaded did not contain the information that we'd expected it to contain. Please make sure that the file name is correct (the Browse button can help with this) and, if so, that it indeed contains the information which you believe it should. You must correct this problem before we can continue. (Error 4)

- Exposure time in kiloseconds: 10

Source 2 :

- Theta: 11
- Phi: 135
- Energies: You must specify one or more energies.
- Exposure time in kiloseconds: 1

Please review this information and, when you're certain that it's correct, click the 'Proceed' button. If you'd like to make any changes, just click the 'Go Back' button.



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RUN CHART

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Bookmarks Location: http://icxc.harvard.edu/pipe/www-saosac/cgi-bin/www-saosac.cgi

What's Related

Step 1 (of 3): Enter information about request

Name: Your name.

Email Address: Your email address.

Random Seed: A random integer. You may use yours, or you may supply your own. **2147483647**

Src #

Location

Energies: [keV]

Spectrum File:

Coordinate System:
 1 Theta [arcmin] (1) & Phi [deg] (2)

Coordinates:
 1: 2:

Limit: Exposure Time [ksec]

Coordinate System:
 2 Theta [arcmin] (1) & Phi [deg] (2)

Coordinates:
 1: 2:

Energies: [keV]

Spectrum File:

Limit Type: Density Exposure Time [ksec]

Limit:



100%

Spectrum File: ([close this window](#))

Help: For information (including what file names are allowed) see the file `myfile.dat` in the directory `myfile.dat`. This file must contain a definition of the spectrum at the entrance aperture of the HRMA for which you would like a PSF to be simulated.

The easiest way to create this file is to instruct `shepsa` to write a source output file with the following command:

```
shepsa> write source myfile.dat asoii
```

where 'myfile.dat' is the name of the file which you'd like the spectrum written to. *Note:* due to inconsistencies among terminals and the potential to introduce syntax errors, it is recommended that you do NOT simply cut and paste the spectrum from `shepsa` into a file. Furthermore, if you specify a spectrum file, there is no need to specify an `energy`.

Format: This is a simple ASCII file consisting of two columns separated by spaces or tabs. The first column is the energy (in keV) at the center of the bin and other columns is the flux (in photons/cm²/sec) of the bin.

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Bookmarks Location: <http://icxc.harvard.edu/pipeline/www-saosc/cgi-bin/www-saosc.cgi>

Help

Step 2 (of 3): Verify request

You've submitted the following request:

Name: Margarita Karovska
Email Address: karovska@cfa.harvard.edu
Random Seed: 1012667247

Source 1 :

- Theta: 0.18
- Phi: 24
- Spectrum File: **object.sp**

Problem: We have detected an improper input. The file that you uploaded did not contain the information that we'd expected it to contain. Please make sure that the file name is correct (the Browse button can help with this) and, if so, that it indeed contains the information which you believe it should. You must correct this problem before we can continue. (Error 4)

- Exposure time in kiloseconds: 10

Source 2 :

- Theta: 11
- Phi: 135
- Energies: You must specify one or more energies.
- Exposure time in kiloseconds: 1

Please review this information and, when you're certain that it's correct, click the 'Proceed' button. If you'd like to make any changes, just click the 'Go Back' button.



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100%

Taskbar icons: Start, Run, Network, Volume, System Clock

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Bookmarks Location: <http://cxc.harvard.edu/pipe/www-saosac/cgi-bin/www-saosac.cgi> What's Related

Chandra

WWW Ray Generator

Step 2 (of 3): Verify request

You've submitted the following request:

Name: Margarita Karovska
Email Address: karovska@cfa.harvard.edu
Random Seed: 1012657247

Source 1 :

- Theta: 0.18
- Phi: 24
- Spectrum File: ar1casc
- Exposure time in kiloseconds: 10

Source 2 :

- Theta: 11
- Phi: 135
- Energies: 1.5
- Exposure time in kiloseconds: 1

Please review this information and, when you're certain that it's correct, click the 'Proceed' button. If you'd like to make any changes, just click the 'Go Back' button.

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MS HTML 4.01

-Path: cxc_rays@head-cfa.harvard.edu
ry-Date: Thu Jun 13 20:38:47 2002
-Path: <cxc_rays@head-cfa.harvard.edu>
ed: from cfa.harvard.edu (cfa.harvard.edu [131.142.10.1])
by head-cfa.harvard.edu (8.11.1/8.11.1) with ESMTTP id g5E0cln27284
for <mkarovska@head-cfa.harvard.edu>; Thu, 13 Jun 2002 20:38:47 -0400 (E
ed: from head-cfa.harvard.edu (head-cfa [131.142.41.8])
by cfa.harvard.edu (8.9.2/8.9.2/cfunix Mast-Sol 0.5) with ESMTTP id UAA18
for <karovska@cfa.harvard.edu>; Thu, 13 Jun 2002 20:38:47 -0400 (EDT).
ed: from young.harvard.edu (young.harvard.edu [131.142.52.43])
by head-cfa.harvard.edu (8.11.1/8.11.1) with ESMTTP id g5E0ckn27280
for <karovska@cfa.harvard.edu>; Thu, 13 Jun 2002 20:38:46 -0400 (EDT)
ed: (from cxc_rays@localhost)
by young.harvard.edu (8.9.1a/8.9.1) id UAA03300
for karovska@cfa.harvard.edu; Thu, 13 Jun 2002 20:38:46 -0400 (EDT)
Thu, 13 Jun 2002 20:38:46 -0400 (EDT)
Account to run ray simulator <cxc_rays@head-cfa.harvard.edu>
e-Id: <200206140038.UAA03300@young.harvard.edu>
rovkska@cfa.harvard.edu
t: WWW-SAOSAC: Job Complete

Your job has completed. You may retrieve your files from our
ous ftp data server, where they will be stored for no more than
. Pertinent information is listed below. Thank you.

is an automated email; Please do not respond directly.]

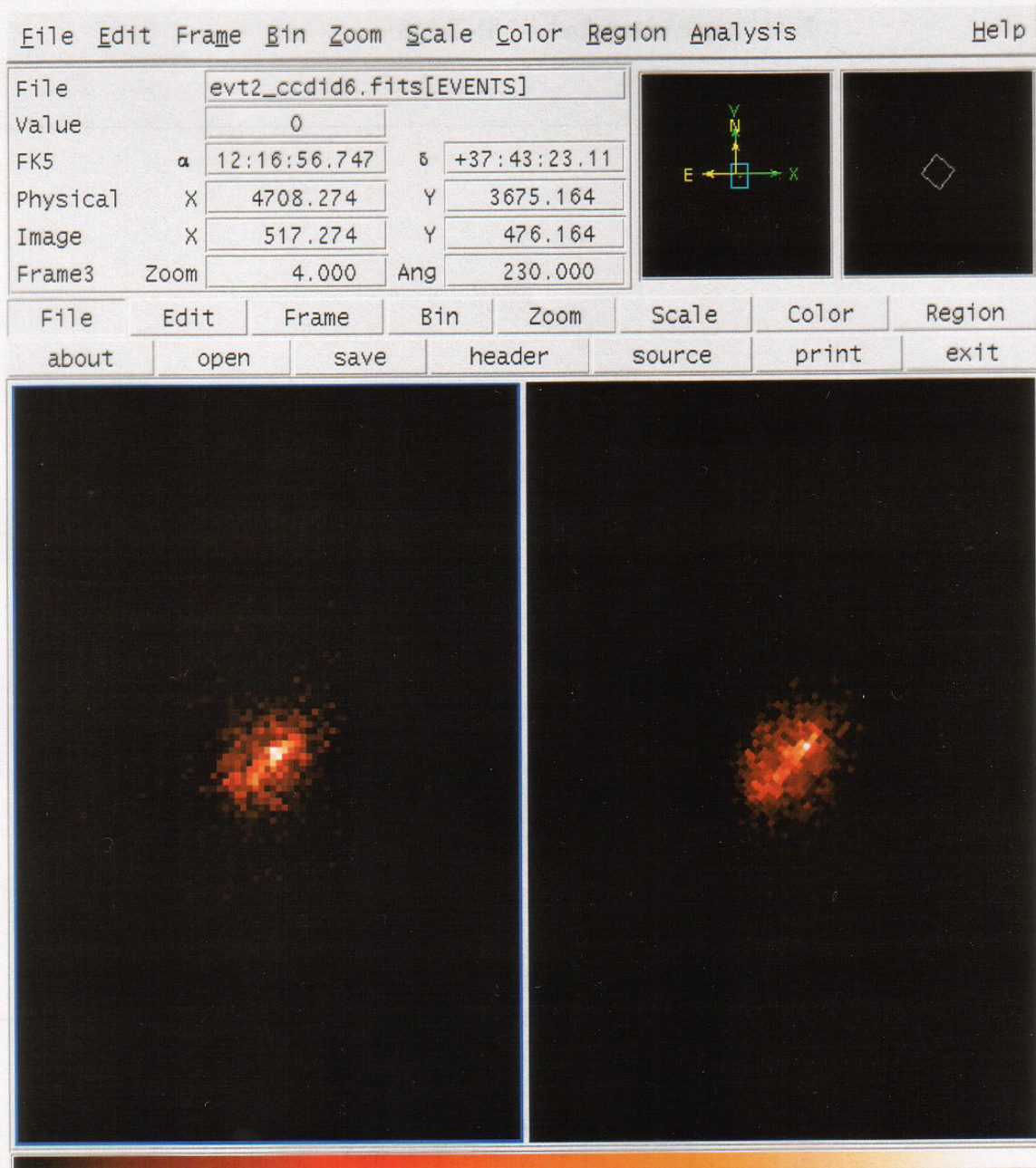
Host: cda.harvard.edu
Username: anonymous
Password: karovska@cfa.harvard.edu
Directory: /pub/traceftp
Filename: karovska-20020613-203127.tar.gz
File size (approx, untarred, [MiB]): 160
URL: ftp://cda.harvard.edu/pub/traceftp/karovska-20020613-203127.tar.gz
Job Parameters:

Seed = Margarita Karovska
Source 1 = karovska@cfa.harvard.edu
= 1012667247

Sys = Theta/Phi
[arcmin] = 0.18
egree] = 24
am = arlac.asc
ime [ksec] = 10
Source 2

Sys = Theta/Phi
[arcmin] = 11
egree] = 135
es [keV] = 1.5
ime [ksec] = 1

ACIS-S obs. ~6' off-axis



image

CHART PSF

point source!