1 Summary

- Common Name: Cas A
- Distance: 3.4 kpc (Reed et al., 1995)
- Position of Central Source (J2000): (23 23 27.7, 58 48 54.1)
- X-ray size: 5.9'x5.5'
- Description:

1.1 Summary of Chandra Observations

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Obs ID</th>
<th>Instrument</th>
<th>Exposure$_{uf}$ (ks)</th>
<th>Exposure$_{f}$ (ks)</th>
<th>Date Observed</th>
<th>Aimpoint (J2000) (α, δ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500001</td>
<td>114</td>
<td>ACIS-7</td>
<td>49.9</td>
<td>49.9</td>
<td>2000-01-30</td>
<td>(23 23 26.7, 58 49 03.0)</td>
</tr>
</tbody>
</table>

Exposure$_{uf}$ → Exposure time of un-filtered event file
Exposure$_{f}$ → Exposure time of filtered event file

- The whole remnant is covered by chip ACIS-S3( CCD ID=7)
- No background light-curve filtering was done

1.2 Chandra Counts and Fluxes

<table>
<thead>
<tr>
<th>Region</th>
<th>Energy Range (keV)</th>
<th>Signal (counts)</th>
<th>Rate (counts s$^{-1}$)</th>
<th>$F_{X}^{abs}$ (ergs cm$^{-2}$ s$^{-1}$)</th>
<th>$F_{X}$ (ergs cm$^{-2}$ s$^{-1}$)</th>
<th>$L_{X}$ (ergs s$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>total</td>
<td>0.3 - 10.0</td>
<td>1.487e+07</td>
<td>2.978e+02</td>
<td>2.59e-09</td>
<td>2.06e-08</td>
<td>2.84e+37</td>
</tr>
<tr>
<td>(114)</td>
<td>0.3 - 2.1</td>
<td>1.122e+07</td>
<td>2.247e+02</td>
<td>1.07e-09</td>
<td>1.87e-08</td>
<td>2.58e+37</td>
</tr>
<tr>
<td></td>
<td>2.1 - 10.</td>
<td>3.689e+06</td>
<td>7.389e+01</td>
<td>1.53e-09</td>
<td>1.89e-09</td>
<td>2.61e+36</td>
</tr>
</tbody>
</table>

- $N_{H} = 1.51 \times 10^{22} \text{cm}^{-2}$
- Assumed distance: 3.4 kpc (Reed et al., 1995)
- nH was derived with two thermal plasma model

1.3 Nearby Sources

<table>
<thead>
<tr>
<th>Obs ID</th>
<th>Position (J2000)</th>
<th>Size</th>
<th>Net Count</th>
<th>Count rate</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>114</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 SUMMARY

(note) 1. This nearby source list is incomplete.
   All the above sources are originally from the "src2.fits" file
   which is distributed with standard chandra processing.
   Only sources with significant count rate and which are clear to
   visual inspection are included.
2. The size given above is the size of the region used in detecting
   that source.
3. For each source, background was subtracted from annular region
   around the source.

1.4 References

• Reed et al., 1995 ApJ, 440, 706 : Optical Spectra
2 Fit Detail

- See spectrum page for used regions.

2.1 Total:

- Two thermal plasm model

- Abundance of O, Ne, Mg, Si, S, Fe were thawed and linked between two model.

source=(xswabs * (xsvpec + xsvpec))
reduced $\chi^2 = 200.194$
$nh = 1.5058 \times 10^{22}/\text{cm}^2$
Chandra Images : Band Images

- Left: raw image, binned by 1x1 pixel
- Right: gaussian smoothed version of above (σ = 2 pixel)

3.1 Wide Band Images

Total: 300-10000 eV

Soft Band: 300-2100 eV
3.2 Band images used in true color image.

Red: 300-1550 eV
Green : 1550-3340 eV

Blue : 3340-10000 eV
3.3 Misc.

: 726-900 eV

: 900-1180 eV
: 1760-1930 eV

![Image](acis_E1760-1930_FLUXED.fits_0)

![Image](acis_E1760-1930_FLUXED_G2.fits_0)

: 2003-2090 eV

![Image](acis_E2003-2090_FLUXED.fits_0)

![Image](acis_E2003-2090_FLUXED_G2.fits_0)
3 CHANDRA IMAGES: BAND IMAGES

**4300-5950 eV**

![Image of 4300-5950 eV band](acis_E4300-5950_FLUXED.fits_0)

![Image of 4300-5950 eV band](acis_E4300-5950_FLUXED_G2.fits_0)

**6430-6900 eV**

![Image of 6430-6900 eV band](acis_E6430-6900_FLUXED.fits_0)

![Image of 6430-6900 eV band](acis_E6430-6900_FLUXED_G2.fits_0)
4 Chandra Images : True Color

- Individual images are adaptively smoothed.
- Warning: the adaptive smoothing process sometimes produces artifacts.

- Convolution method: fft
- Kernel type: gauss
- Significance (min, max): (3, 5)

RED: 300-1550 eV
GREEN: 1550-3340 eV
BLUE: 3340-10000 eV
5 Chandra Images : Equivalent Width Map

5.1 Equivalent Width Images

- individual images (line and two continuum) are binned by given pixel size and then adaptively smoothed.
- same scale map (from the least count images) was used for all three images.
- continuum at given line position was estimated by linear interpolation of two continuum image in pixel-by-pixel base.

<table>
<thead>
<tr>
<th>Continuum</th>
<th>Line</th>
<th>Continuum</th>
</tr>
</thead>
<tbody>
<tr>
<td>897-963 eV</td>
<td>963-1120 eV</td>
<td>1120-1220 eV</td>
</tr>
<tr>
<td>1580-1650 eV</td>
<td>1650-1960 eV</td>
<td>2110-2280 eV</td>
</tr>
</tbody>
</table>
continuum : 1580-1650 eV  
line : 1960-2110 eV  
continuum : 2110-2280 eV

continuum : 3340-3640 eV  
line : 3640-4120 eV  
continuum : 4120-6250 eV
continuum : 4120-6250 eV
line : 6250-6940 eV
continuum : 6940-7400 eV
6 Chandra Spectrum

- Images show Regions used to extract spectra
- Regions with red strikes are excluded

6.1 ObsID 114

- Background was subtracted from the region around the SNR.
7 Images from Survey Missions

- Left: Chandra Image (0.3-10 keV)
- Center: Images from SkyView with the same scale
- Right: Images from SkyView with a reduced scale

ROSAT PSPC (2.0 deg): X-ray (0.1-2.4 keV)

IRAS 12 micron: Infrared (12 micron)

IRAS 25 micron: Infrared (25 micron)
IRAS 60 micron: Infrared (60 micron)

IRAS 100 micron: Infrared (100 micron)

NRAO VLA Sky Survey (NVSS): Radio (1.4 GHz Continuum)
Westerbork Northern Sky Survey (WENSS): Radio (325 MHz Continuum)

Digitized Sky Survey: Optical (J or E band images with a few exceptions)