SNR 0102-72.3

1 Summary

- Common Name: 1E 0102.2-7219
- Distance: 60 kpc (distance to SMC, **Westerlund(1990)**)
- Center of X-ray emission (J2000): (01 04 02.0, -72 01 52.7)
- X-ray size: 46”x42”
- Description:

1.1 Summary of Chandra Observations

Sequence	Obs ID	Instrument	$\text{Exposure}_{\text{uf}}$ (ks)	$\text{Exposure}_{\text{f}}$ (ks)	Date Observed	Aimpoint (J2000) (α, δ)
580373	1423	ACIS-56789	21.6	14.6	1999-11-01	(01 04 02.4, -72 01 55.3)

$\text{Exposure}_{\text{uf}} \rightarrow$ Exposure time of un-filtered event file
$\text{Exposure}_{\text{f}} \rightarrow$ Exposure time of filtered event file

- The whole remnant is covered by chip ACIS-S3(CCD_ID=7)

1.2 Chandra Counts and Fluxes

Region	Energy Range (keV)	Signal (counts)	Rate (counts s^{-1})	F_X^{abs} (ergs cm^{-2} s^{-1})	F_X (ergs cm^{-2} s^{-1})	L_X (ergs s^{-1})
total	0.3 - 10.0	1.394e+05	9.542e+00	2.44e-11	5.90e-11	2.53e+37
(1423)	0.3 - 2.1	1.386e+05	9.489e+00	2.39e-11	5.84e-11	2.51e+37
	2.1 - 10.	8.244e+02	5.643e-02	5.55e-13	5.76e-13	2.47e+35

- N_H = 0.16 ($10^{22} cm^{-2}$)
- Assumed distance: 60 kpc (distance to SMC, **Westerlund(1990)**)
- nH was derived with two thermal plasma model

1.3 Nearby Sources

Obs ID	Position (J2000)	Size	Net Count	Count rate	Note
1423					
	(01 00 00.3, -71 56 13.3)	< 17.7”	751.0	3.47e-02	
	(01 02 19.6, -72 00 50.4)	< 11.1”	43.0	1.99e-03	
	(01 02 48.8, -71 57 59.7)	< 11.4”	44.1	2.04e-03	
	(01 02 58.4, -72 03 01.1)	< 6.1”	33.1	1.53e-03	
	(01 02 58.4, -72 03 47.5)	< 6.8”	88.3	4.08e-03	
	(01 03 35.8, -72 03 21.9)	< 2.4”	43.1	1.99e-03	
	(01 03 37.4, -72 01 32.9)	< 2.2”	742.0	3.43e-02	
	(01 03 37.4, -72 02 14.9)	< 2.0”	14.9	6.89e-04	
	(01 04 15.7, -72 00 04.0)	< 2.0”	20.0	9.25e-04	
	(01 04 27.3, -71 59 17.9)	< 2.4”	52.8	2.44e-03	
	(01 04 37.4, -72 06 31.0)	< 5.9”	29.9	1.38e-03	
	(01 04 38.5, -72 05 36.2)	< 2.1”	27.9	1.29e-03	
	(01 04 59.5, -71 59 48.1)	< 3.4”	29.6	1.37e-03	
	(01 05 39.9, -72 07 27.0)	< 9.8”	49.0	2.27e-03	
	(01 05 55.2, -72 03 50.9)	< 8.2”	95.8	4.43e-03	
	(01 06 02.1, -72 07 14.5)	< 7.9”	23.5	1.09e-03	
	(01 06 16.0, -72 05 29.7)	< 42.1”	677.0	3.13e-02	

(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.

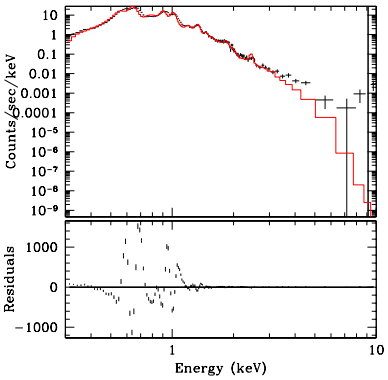
1.4 References

- Amy & Ball, 1993 ApJ, 411, 761 : ATCA
- Westerlund, 1990 A&ARv, 2, 29 : Distance to SMC

2 Fit Detail

- See spectrum page for used regions.

2.1 Total:



- Two thermal plasma model was used.
- Abundaces were set to 1 except O, Ne, Si, Fe which were thawed and linked between two model.

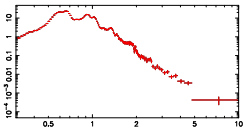
  source=(xswabs * (xsvapec + xsvapec))
  reduced χ^2 = 37.1376
  nh = `0.1616 10^22/cm^2`

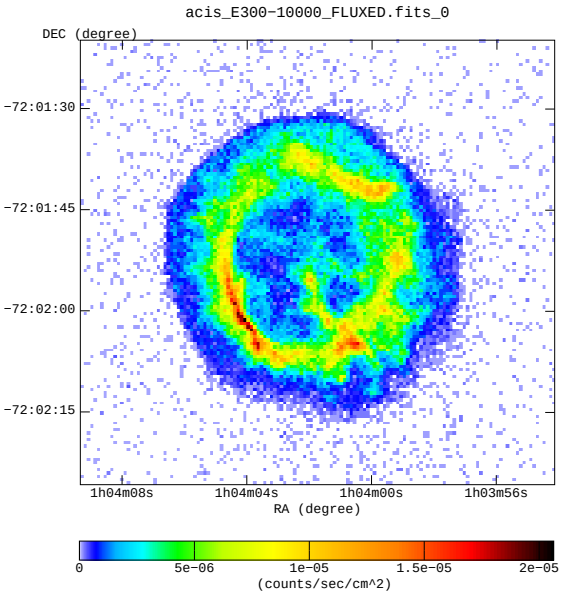
3 Chandra Images : Band Images

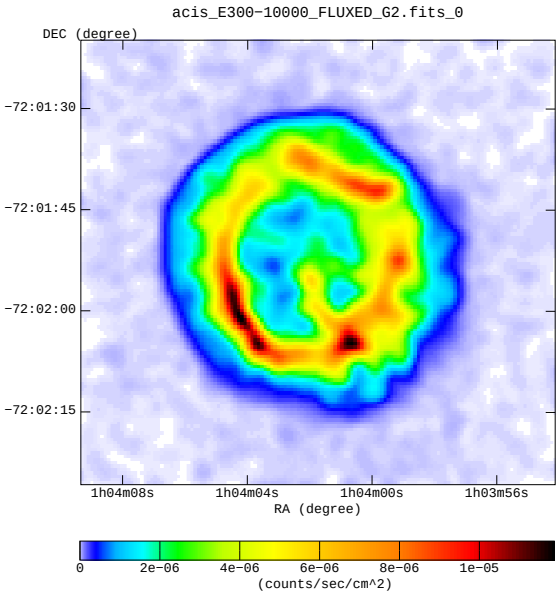
- Left : raw image, binned by 1x1 pixel
- Right : gaussian smoothed version of above (σ = 2 pixel)

3.1 Wide Band Images

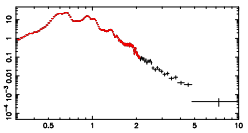
Total : 300-10000 eV

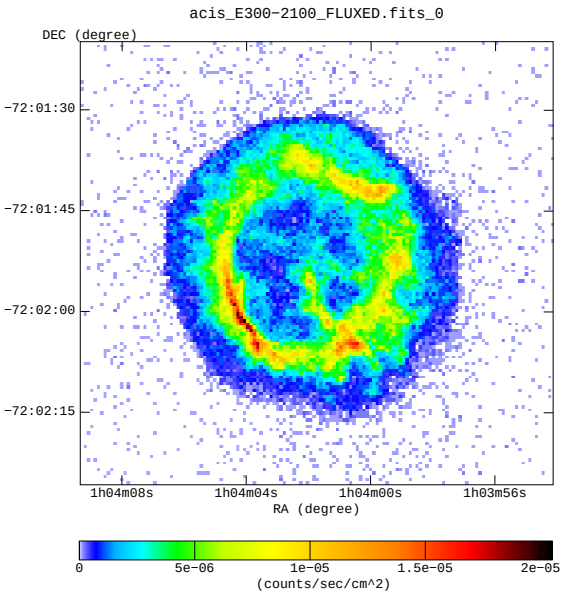


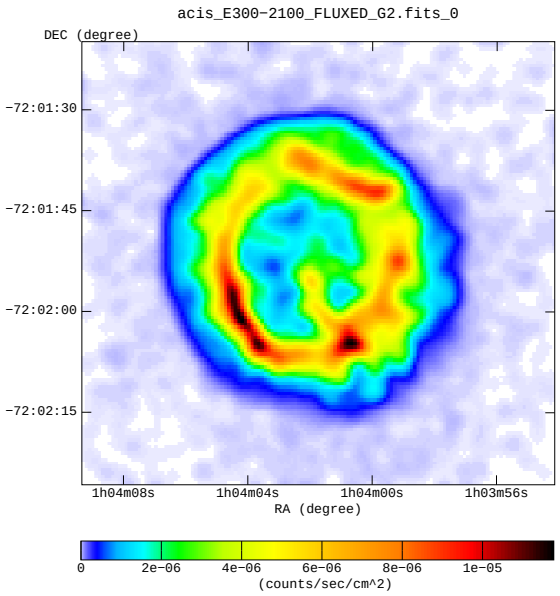




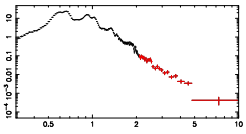
Soft Band : 300-2100 eV

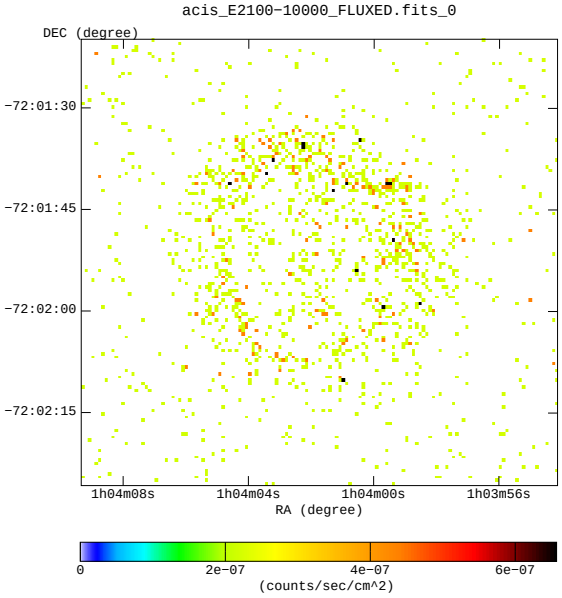


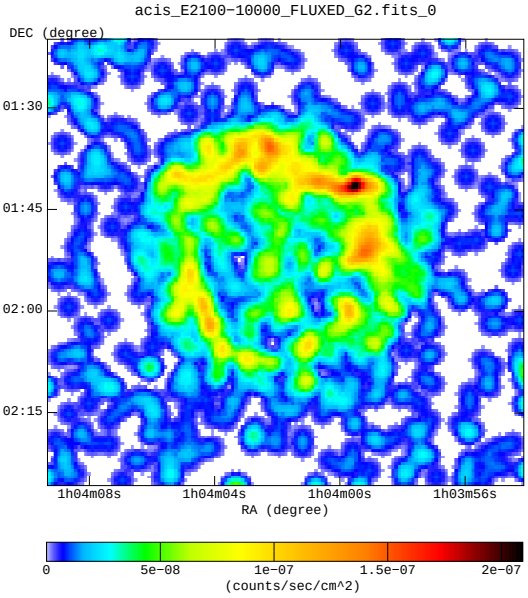




Hard Band : 2100-10000 eV

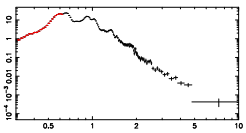


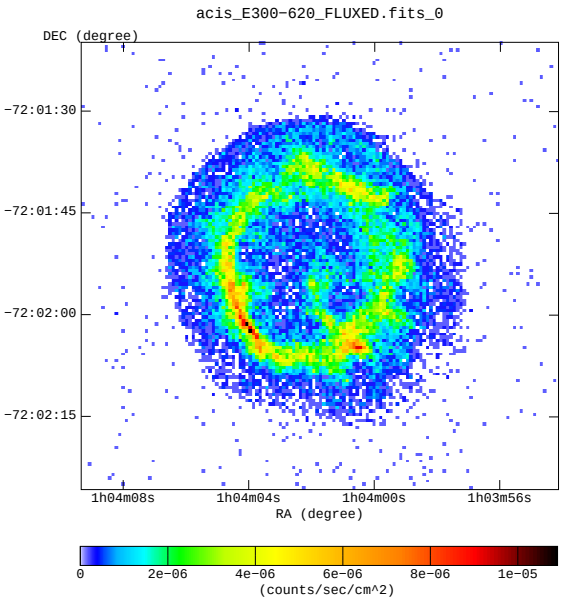


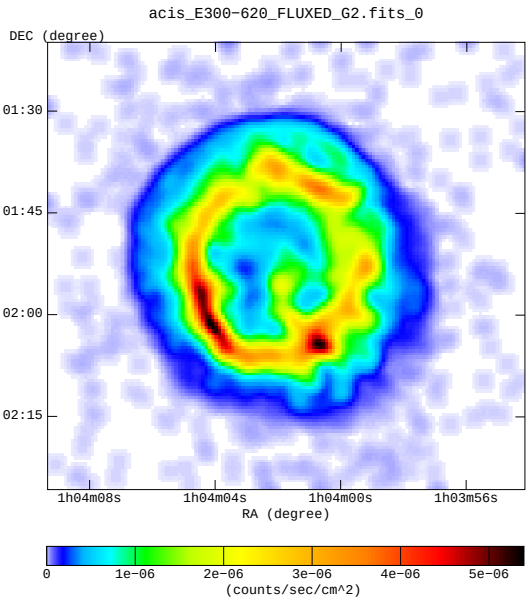


3.2 Band images used in true color image.

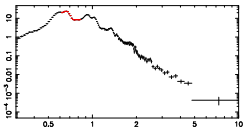
Red : 300-620 eV

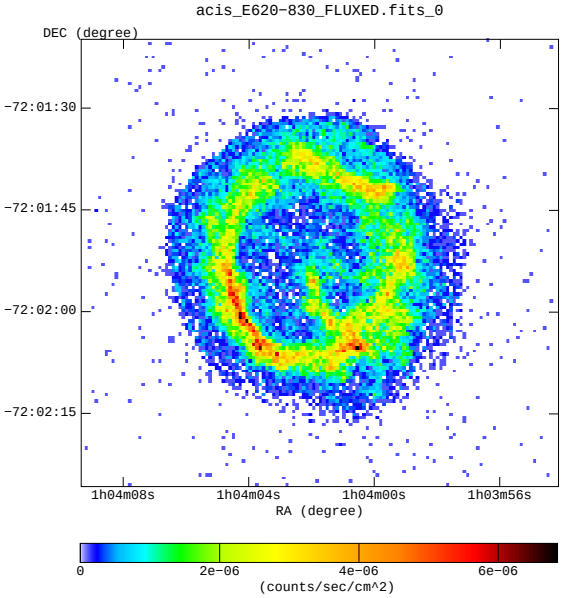


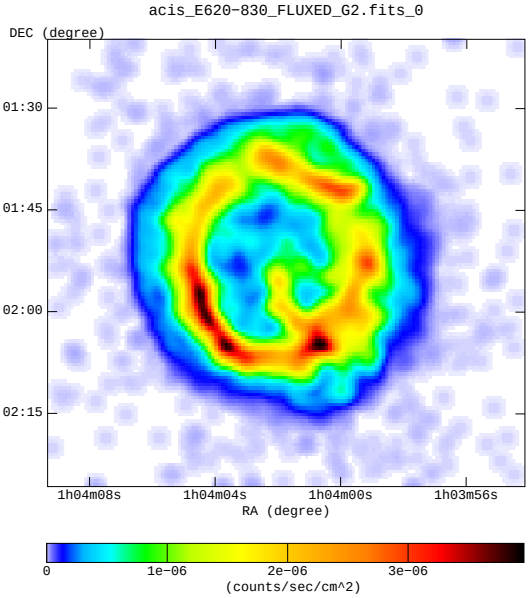




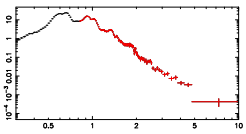
Green : 620-830 eV

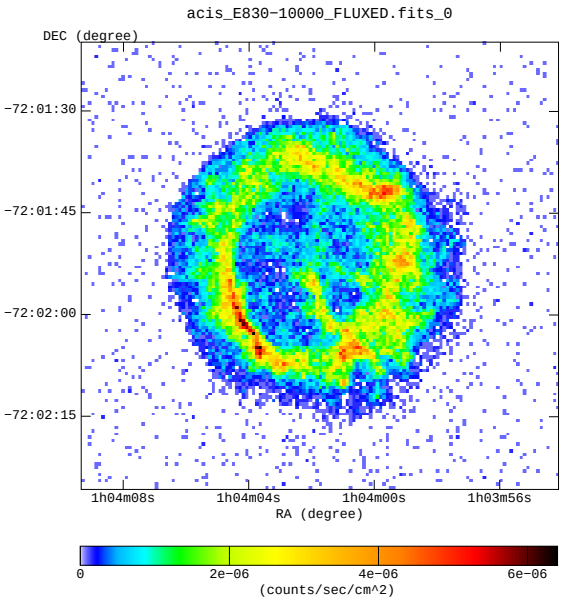


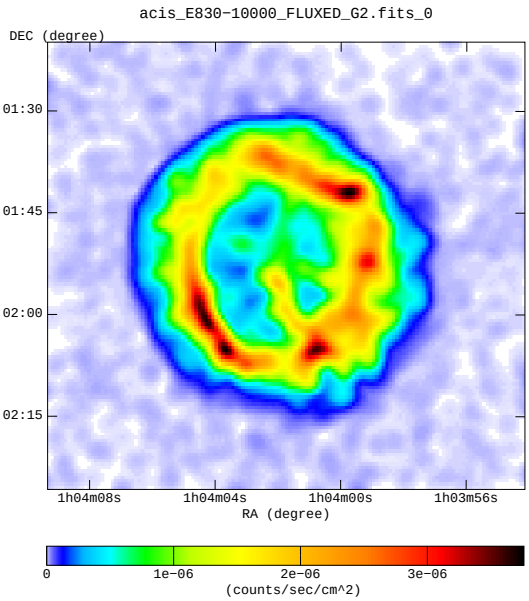




Blue : 830-10000 eV

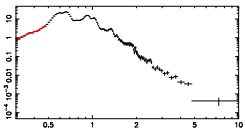


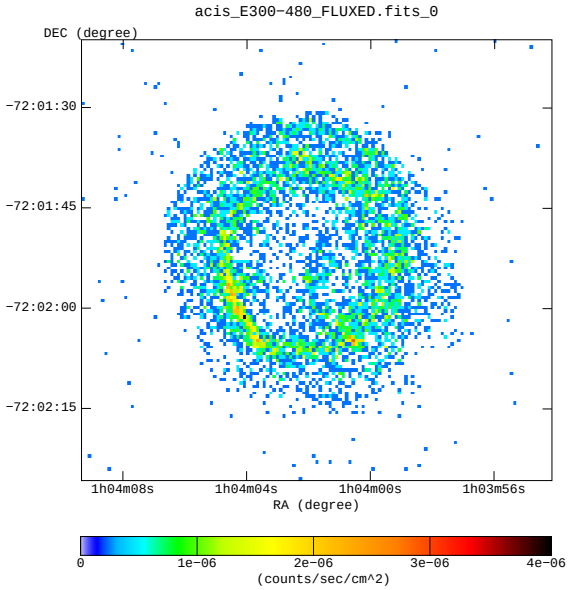


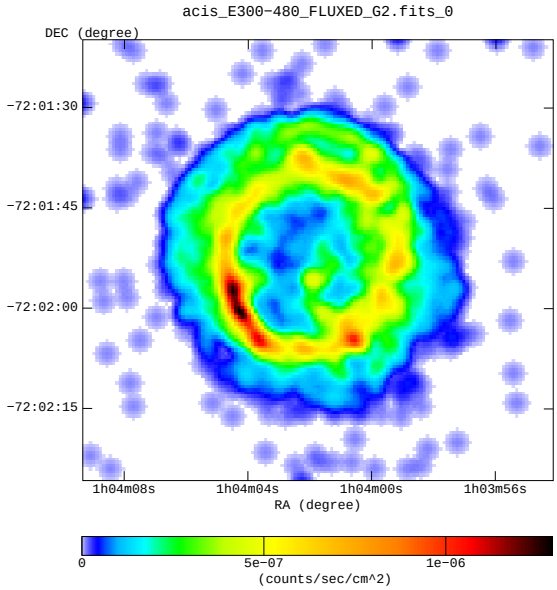


3.3 Misc.

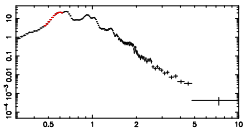
: 300-480 eV

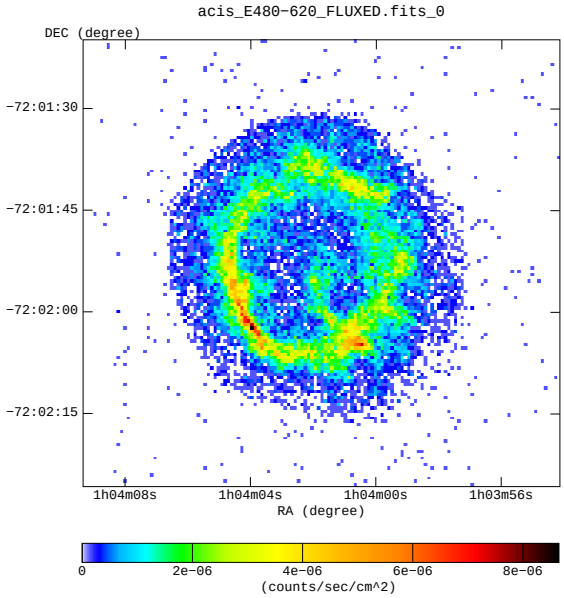


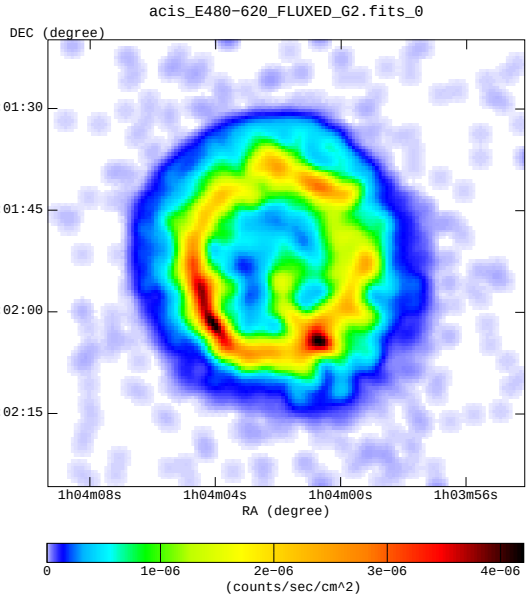




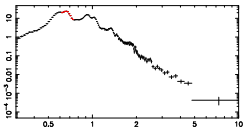
: 480-620 eV

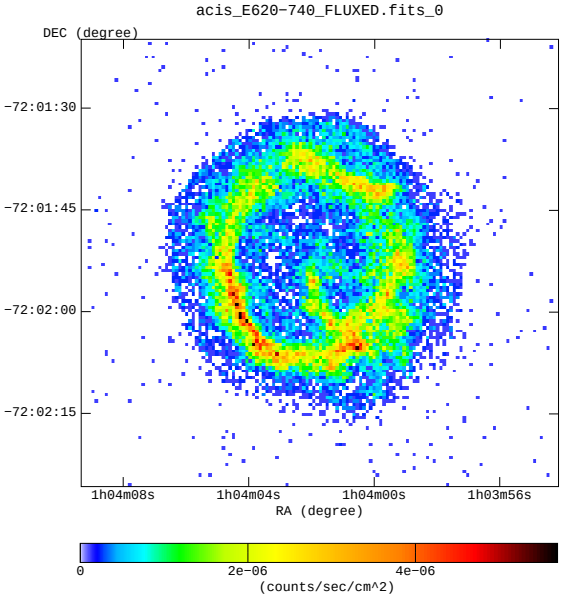


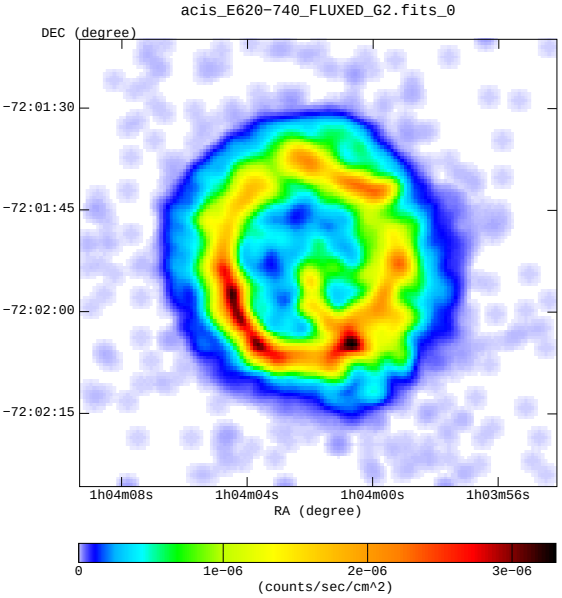




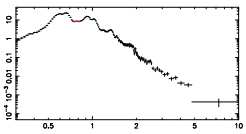
: 620-740 eV

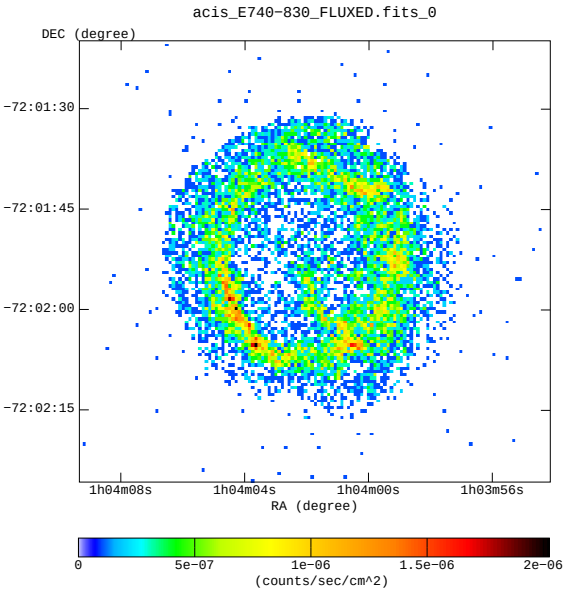


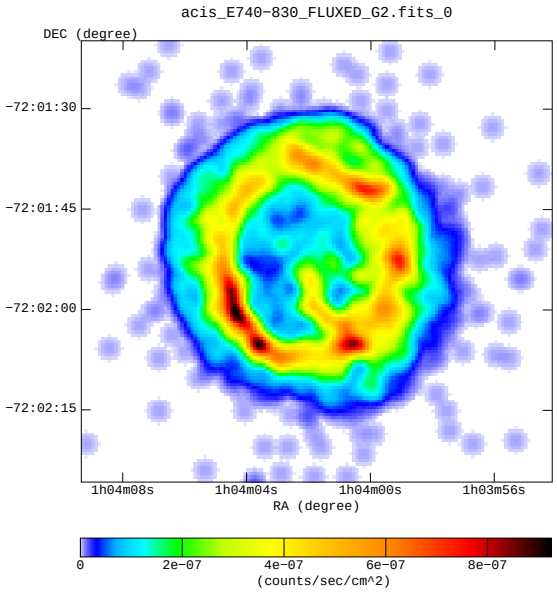




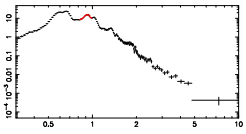
: 740-830 eV

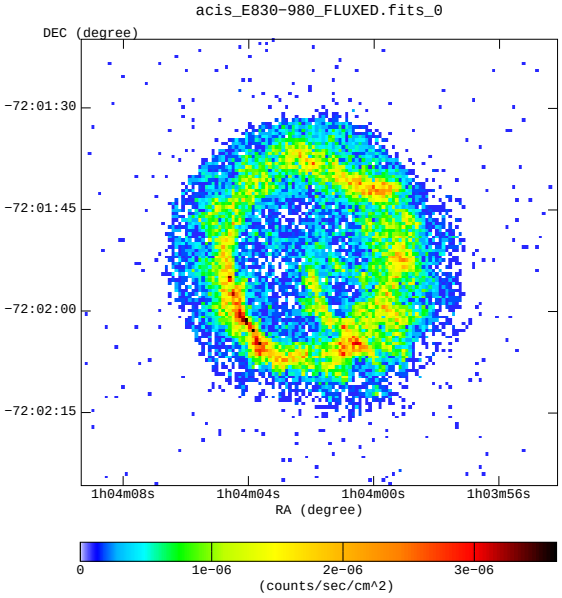


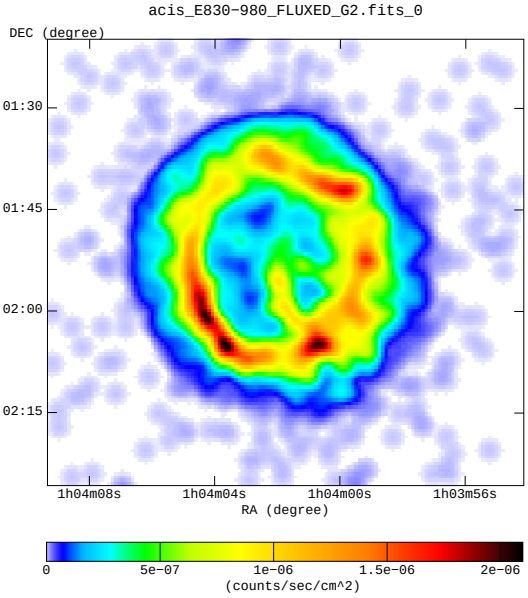




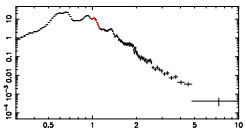
: 830-980 eV

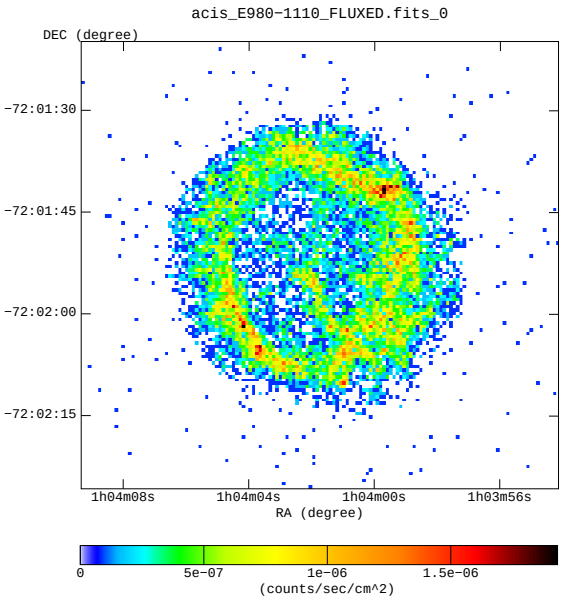


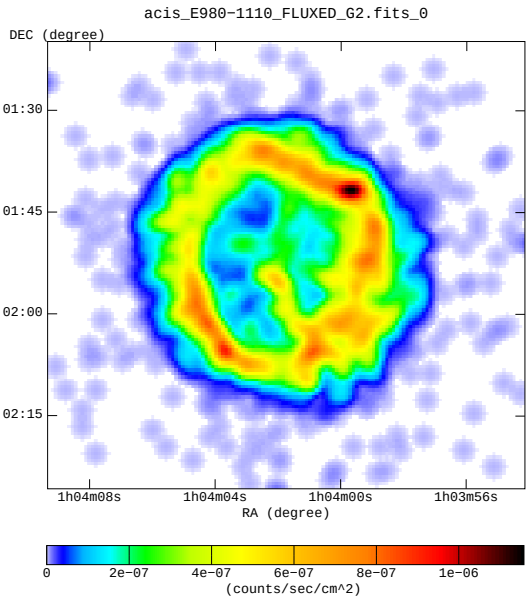




: 980-1110 eV



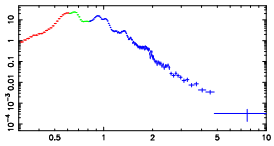


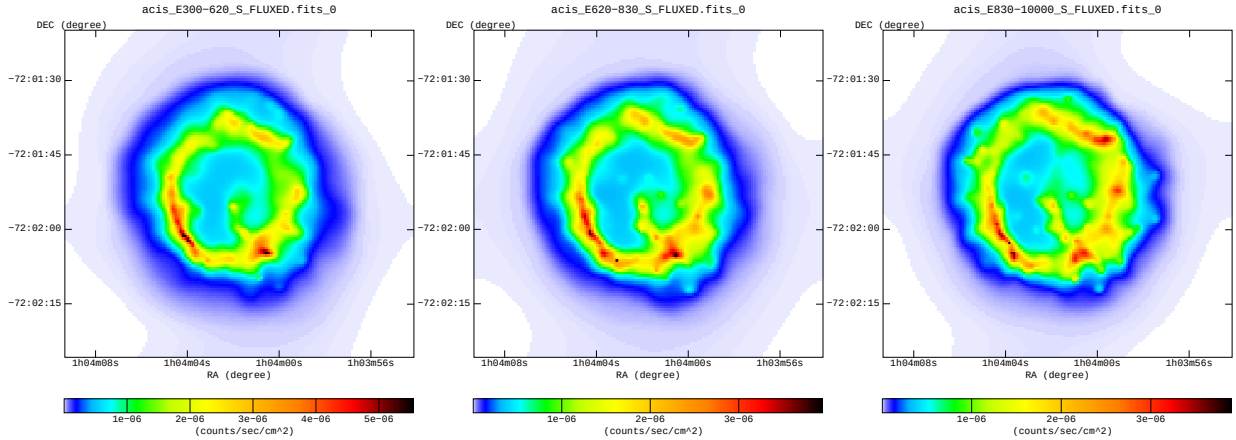


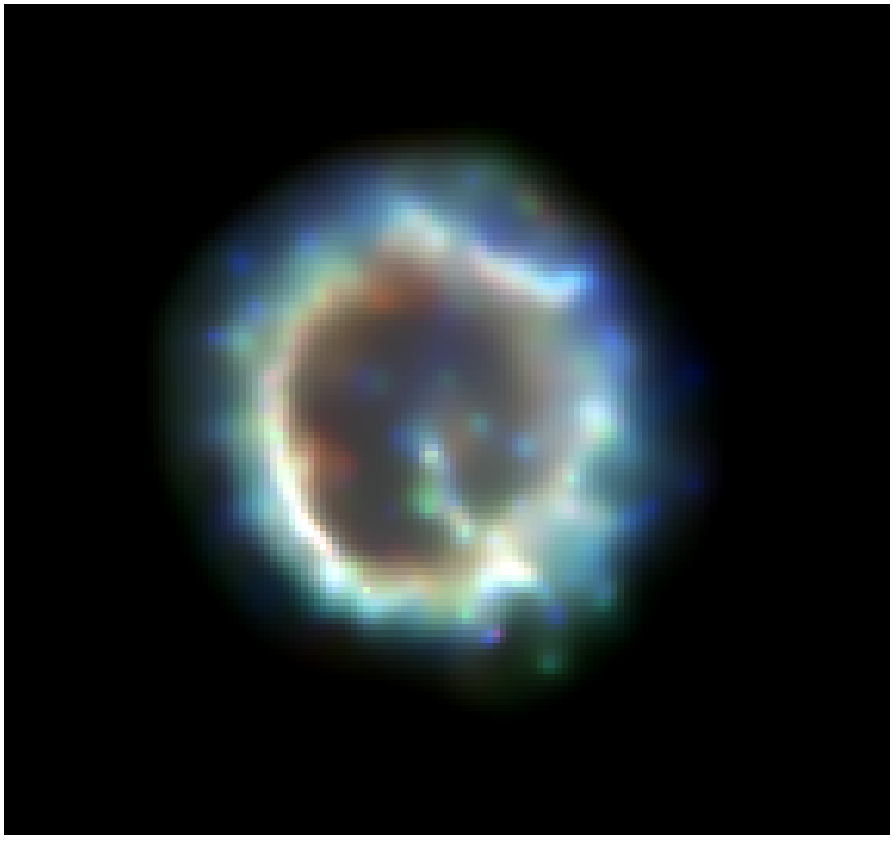
4 Chandra Images : True Color

- 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 : 300-620 eV
GREEN : 620-830 eV
BLUE : 830-10000 eV





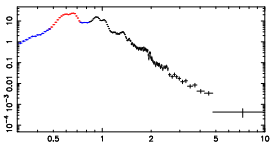


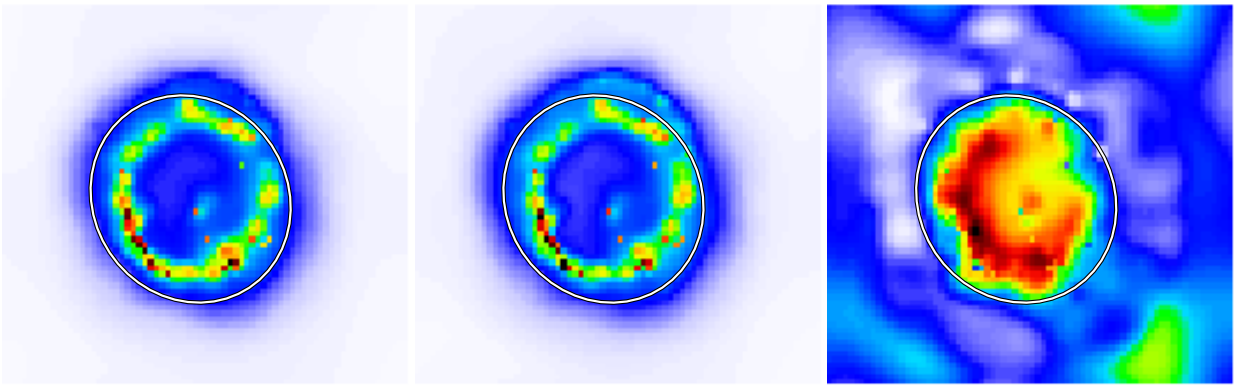
5 Chandra Images : Equivalent Width Map

5.1 Equivalent Width Images

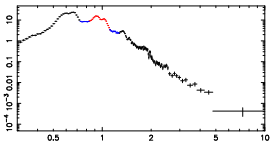
- individual images(line and two continuum) are binned by given pixel size and then adaptively smoothed.
- same scale map (from the least count images) was used for all three images.
- continuum at given line position was estimated by linear interpolation of two continuum image in pixel-by-pixel base.

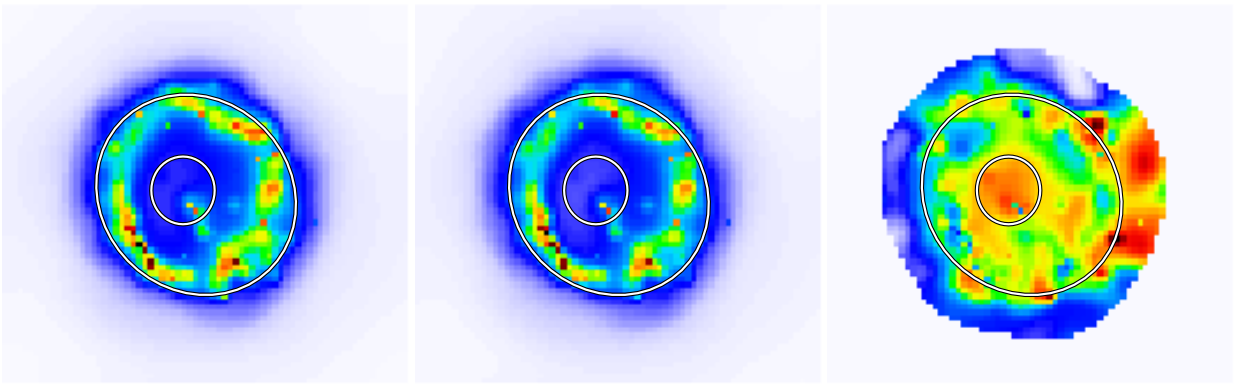
continuum : 300-480 eV
line : 480-740 eV
continuum : 740-830 eV





continuum : 740-830 eV
line : 830-1110 eV
continuum : 1110-1260 eV





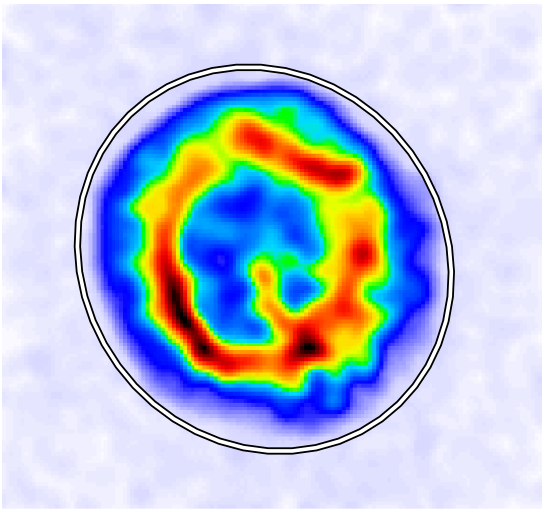
6 Chandra Spectrum

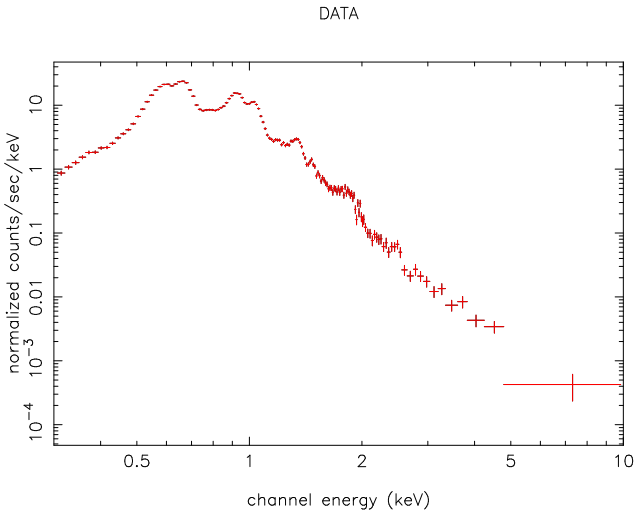
- Images show Regions used to extract spectra
- Regions with red strikes are excluded

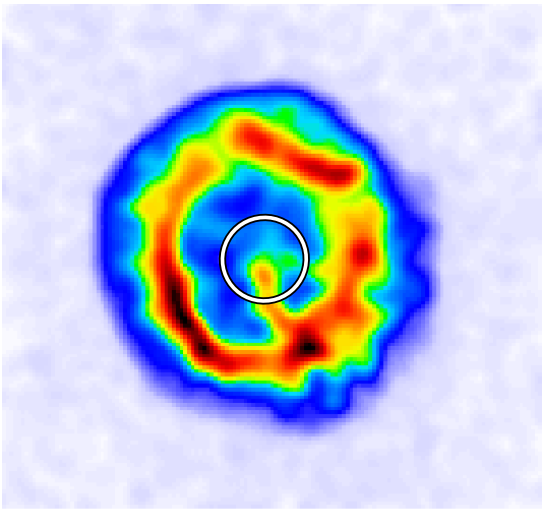
6.1 ObsID 1423

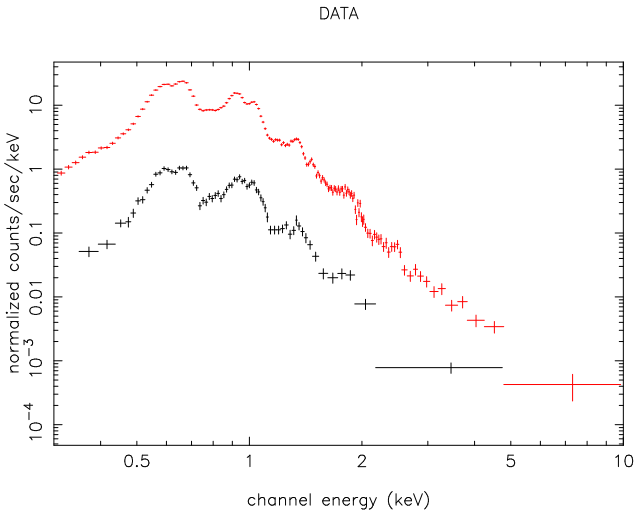
- Background was subtracted from the region around the SNR.

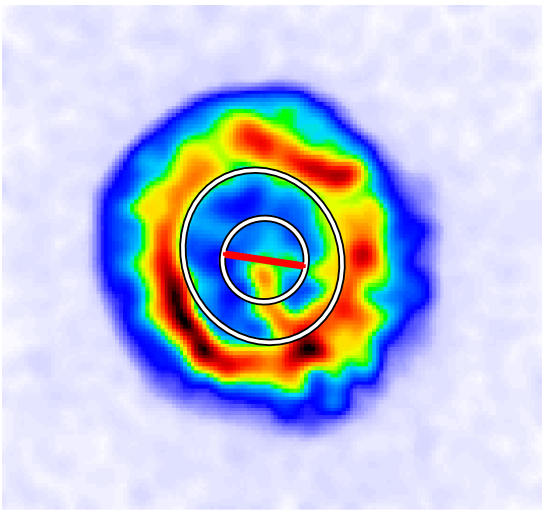
total

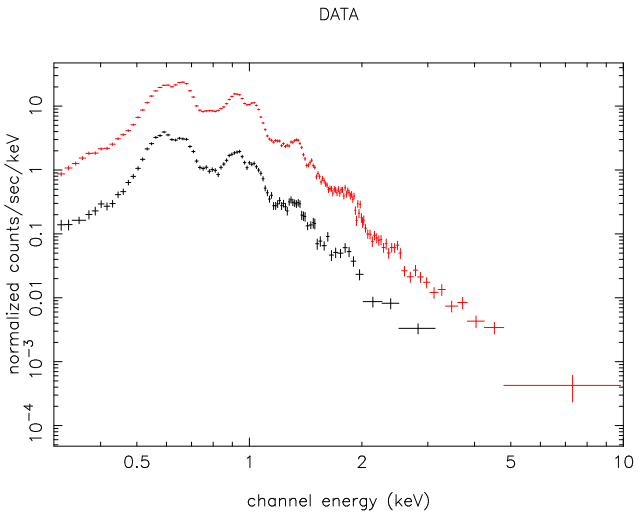


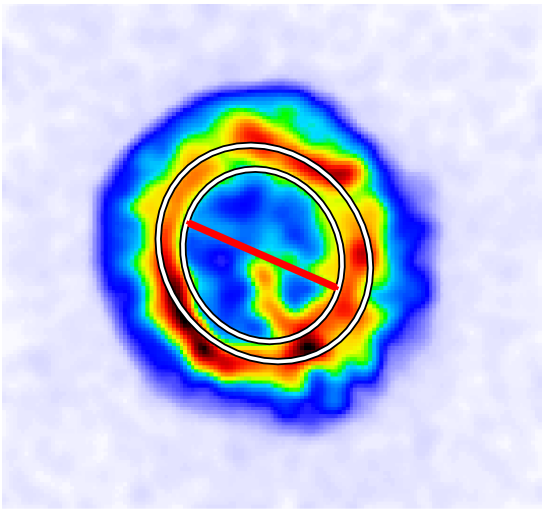


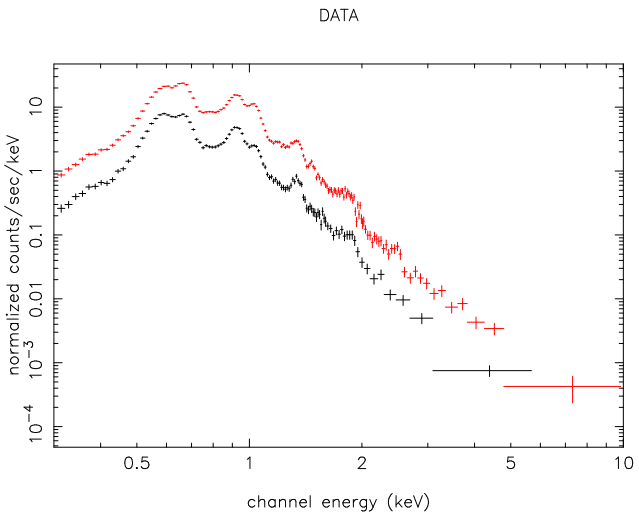


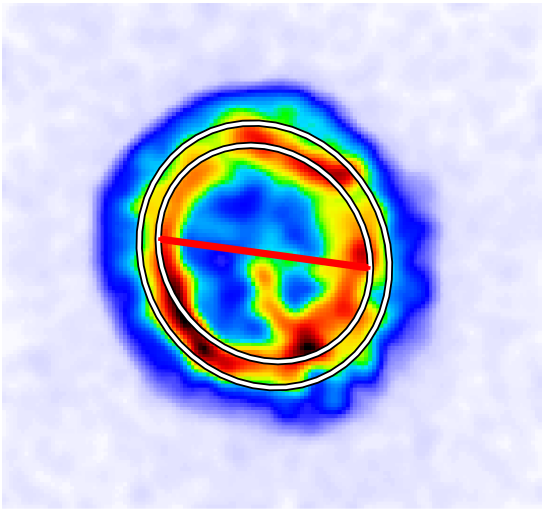


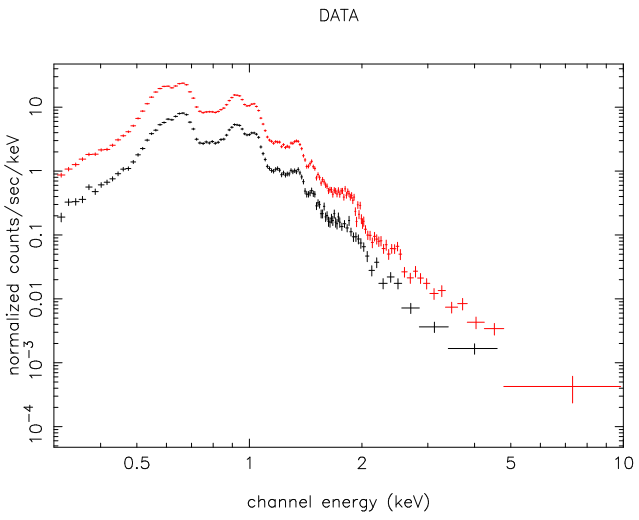


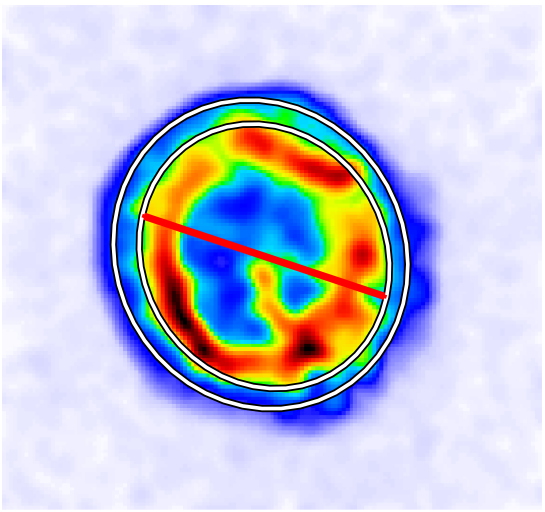

DATA
normalized counts/sec/keV
channel energy (keV)

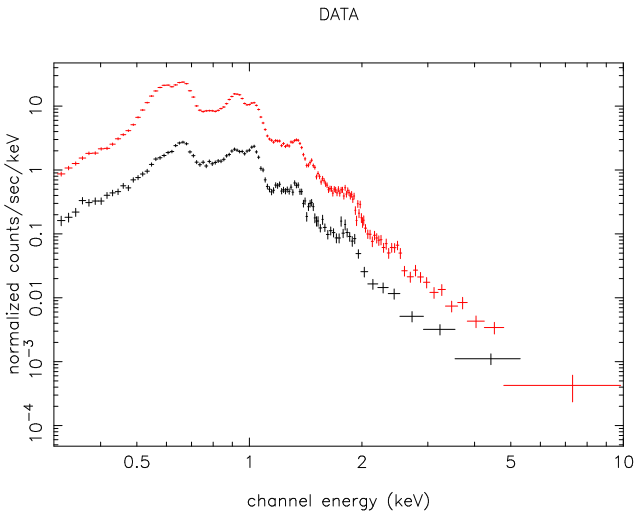


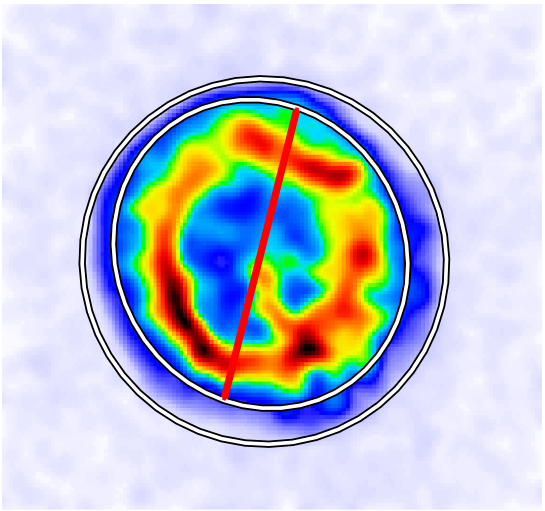

DATA
normalized counts/sec/keV
channel energy (keV)

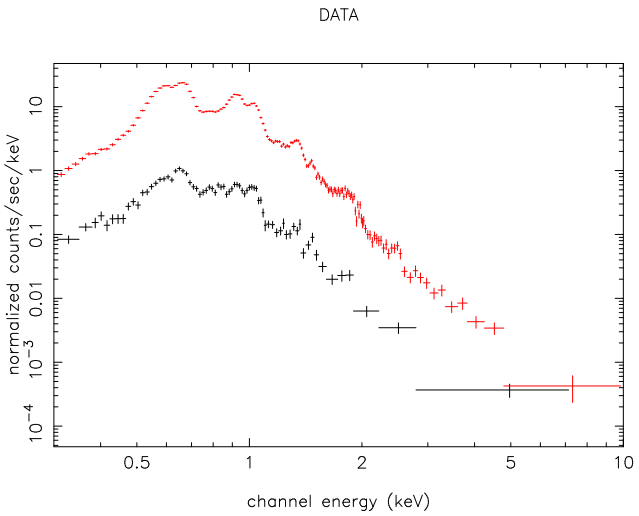



DATA
normalized counts/sec/keV
channel energy (keV)




DATA
normalized counts/sec/keV
10^{-4}
10^{-3}
0.01
0.1
1
10
0.5
1
2
5
10
channel energy (keV)



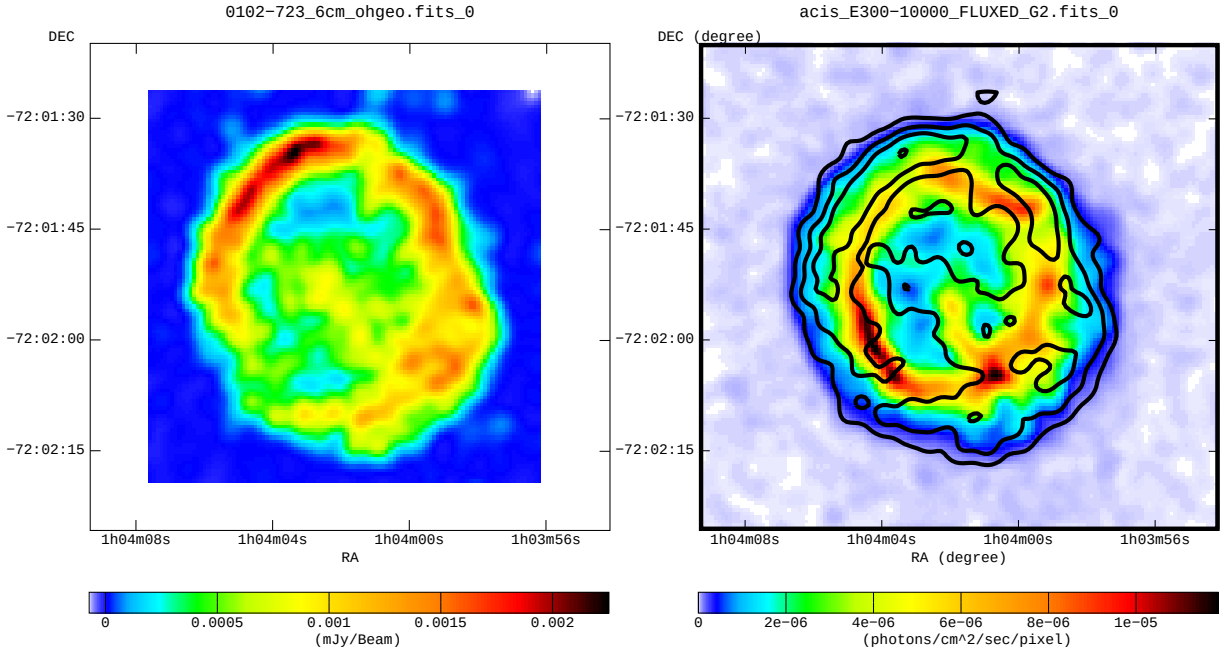

DATA
normalized counts/sec/keV
10^{-4}
10^{-3}
0.01
0.1
1
10
0.5
1
2
5
10
channel energy (keV)

7 Radio Image

- left : radio image
- right : chandra x-ray image with radio contour lines

6-cm

-. Image from **Amy & Ball(1993)**
-. 6-cm flux density: 0.112 Jy

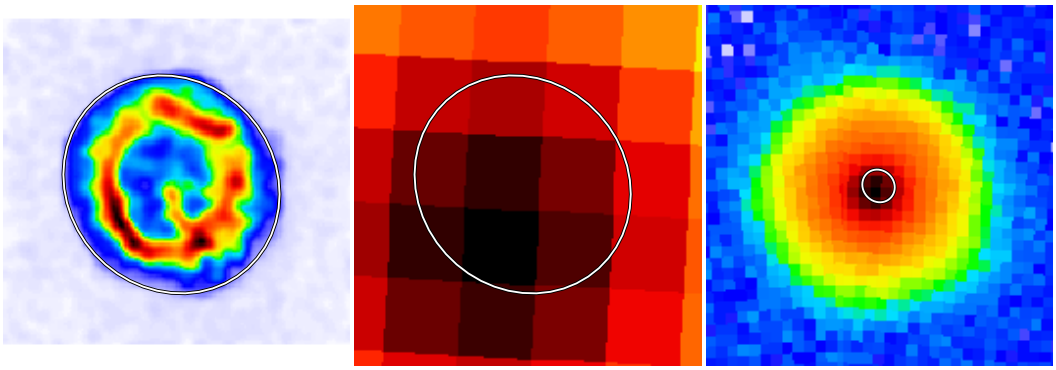


Summary of Observation	
Telescope	Australia Telescope Compact Array
Date	1990 May, Aug, Sep, 1991 Jan, Apr
Frequency	4.790 GHz
Beam size	2.75”x2.96”
1 sigma noise ..	0.075 mJy / beam

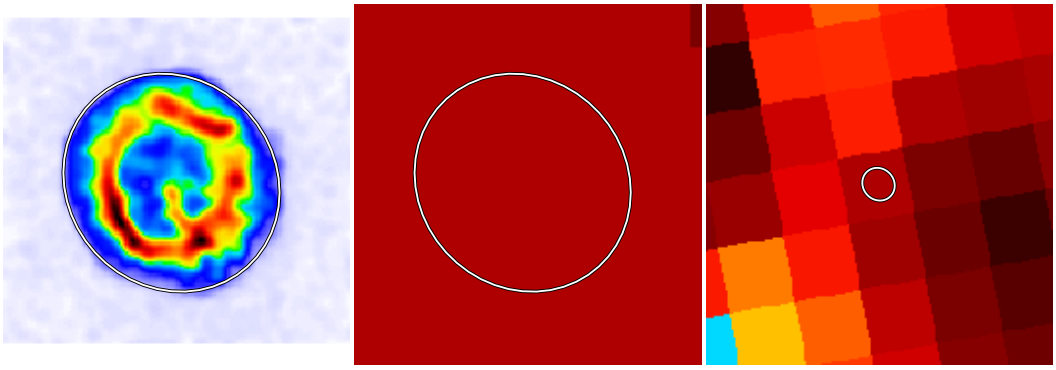
8 Images from Survey Missions

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

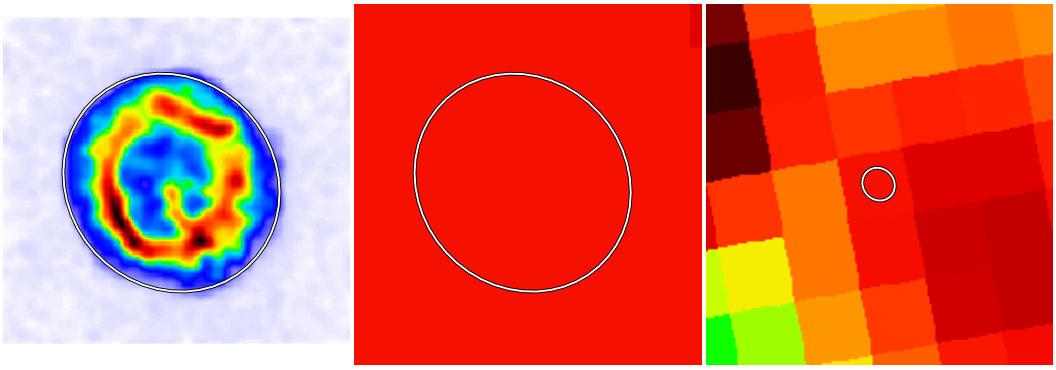
ROSAT PSPC (2.0 deg): X-ray (0.1-2.4 keV)



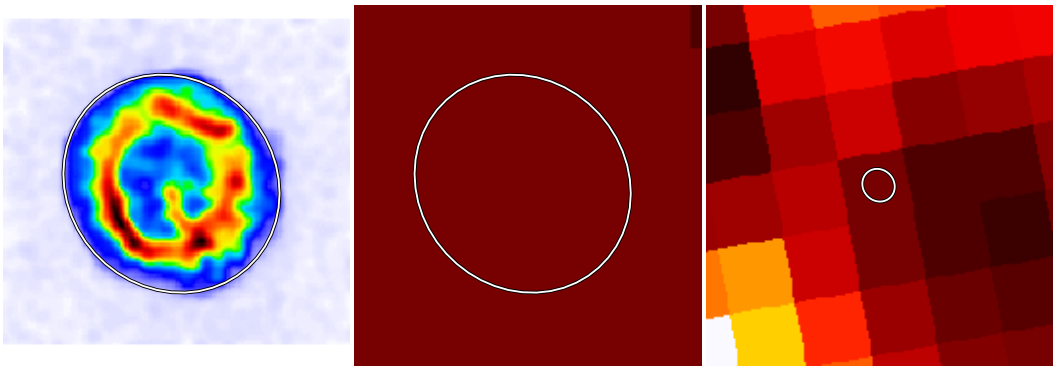
IRAS 12 micron: Infrared (12 micron)



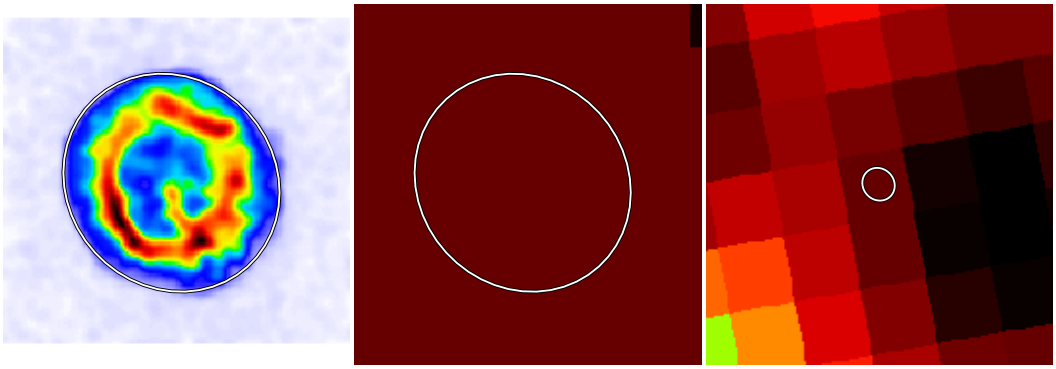
IRAS 25 micron: Infrared (25 micron)



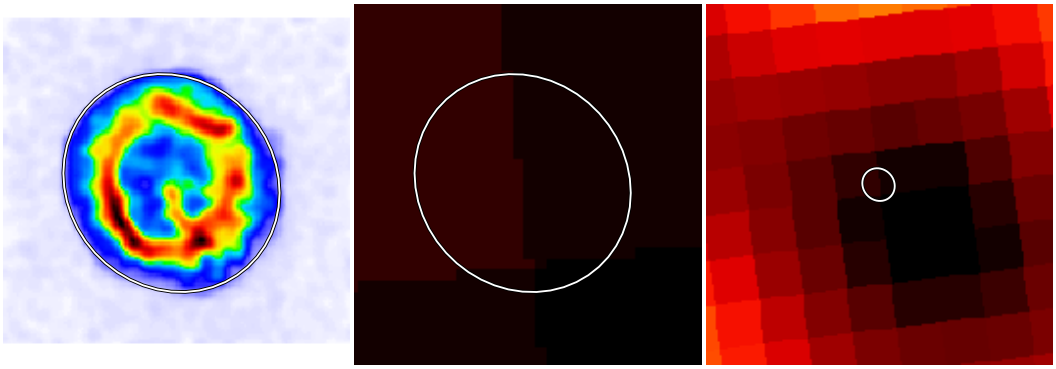
IRAS 60 micron: **Infrared (60 micron)**



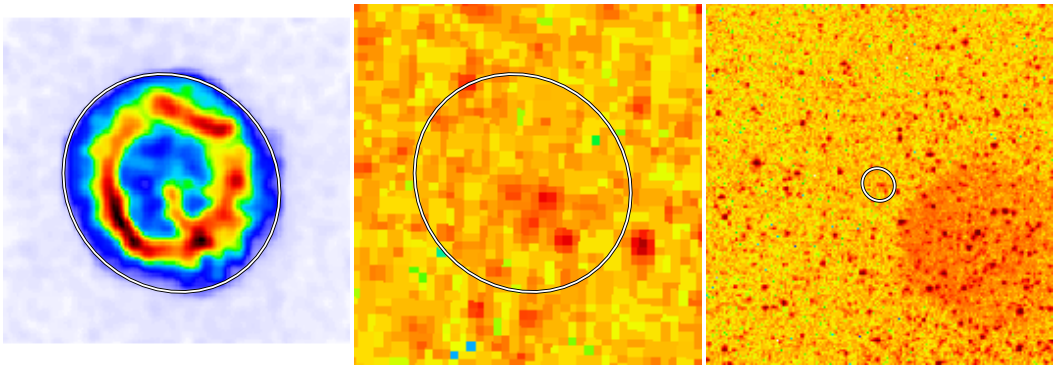
IRAS 100 micron: **Infrared (100 micron)**



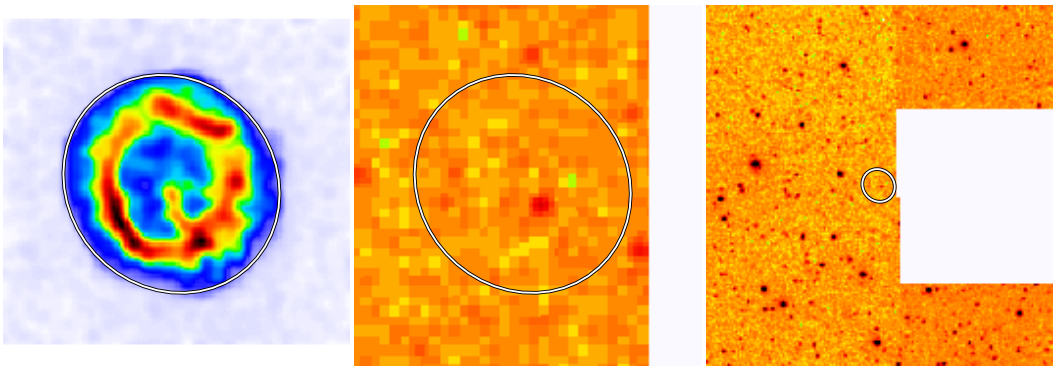
4850 MHz: **Radio (4850 MHz continuum)**



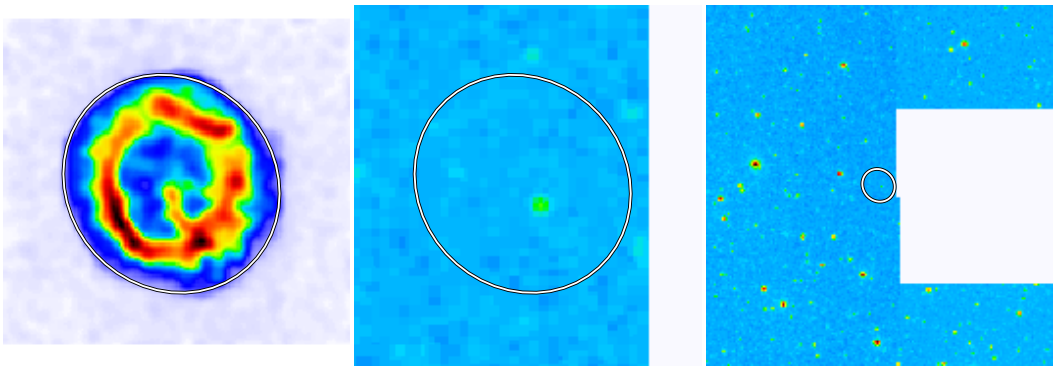
Digitized Sky Survey: **Optical (J or E band images with a few exceptions)**



The Two Micron All Sky Survey (J-band): IR (1.25 microns)



The Two Micron All Sky Survey (H-band): IR (1.65 microns)



The Two Micron All Sky Survey (K-band): IR (2.17 microns)