

## SNR 0102-72.3

### 1 Summary

- Common Name: IE 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:  $46'' \times 42''$
- Description:

### 1.1 Summary of Chandra Observations

Sequence	Obs ID	Instrument	Exposure <sub>uf</sub> (ks)	Exposure <sub>f</sub> (ks)	Date Observed	Aimpoint (J2000) ( $\alpha, \delta$ )
580373	1423	ACIS-S3	21.6	14.6	1999-11-01	( 01 04 02.4, -72 01 55.3 )

Exposure<sub>uf</sub> → Exposure time of un-filtered event file  
 Exposure<sub>f</sub> → 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 <sup>-1</sup> )	$F_X^{\text{obs}}$ (ergs cm <sup>-2</sup> s <sup>-1</sup> )	$F_X$ (ergs cm <sup>-2</sup> s <sup>-1</sup> )	$L_X$ (ergs s <sup>-1</sup> )
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

- $N_H = 0.16 (10^{22} \text{ cm}^{-2})$
- 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.

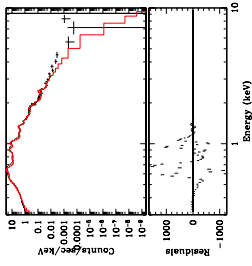
### 2.1 Total:

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

```
source=(xswabs * (xswapec + xswapec))
```

```
reduced  $\chi^2$  = 37.1376
```

```
nh = 0.11616 1022/cm2
```

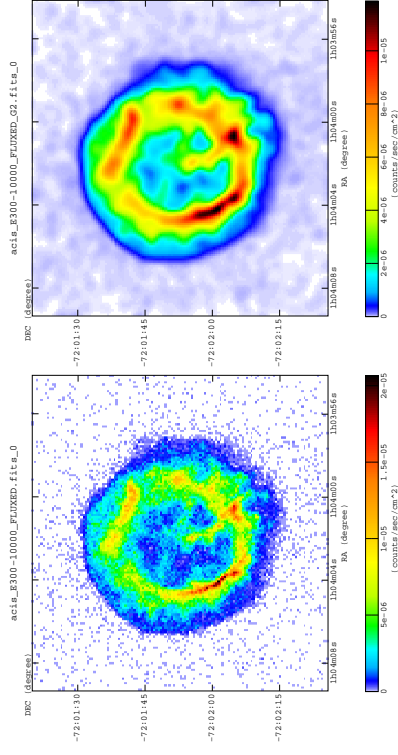
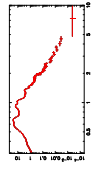


## 3 Chandra Images : Band Images

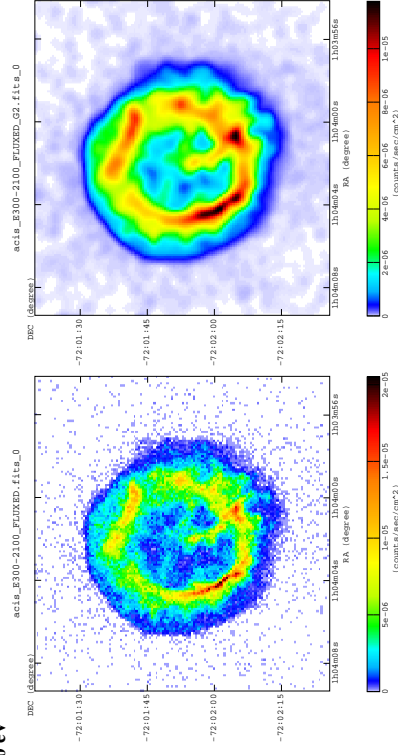
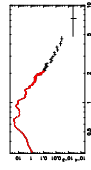
- Left : raw image, binned by 1x1 pixel
- Right : gaussian smoothed version of above ( $\sigma = 2$  pixel)

### 3.1 Wide Band Images

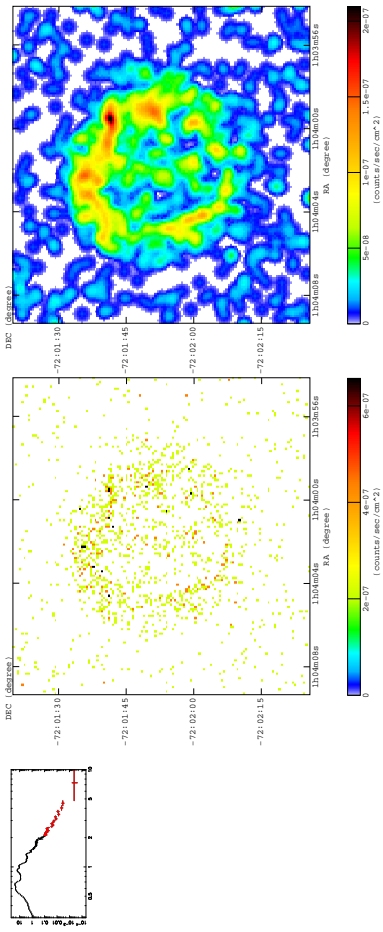
Total : 300-10000 eV



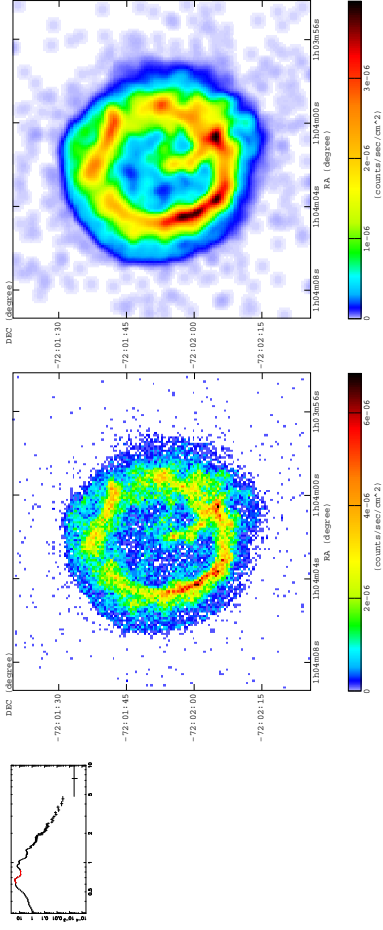
Soft Band : 300-2100 eV



**Hard Band : 2100-10000 eV**

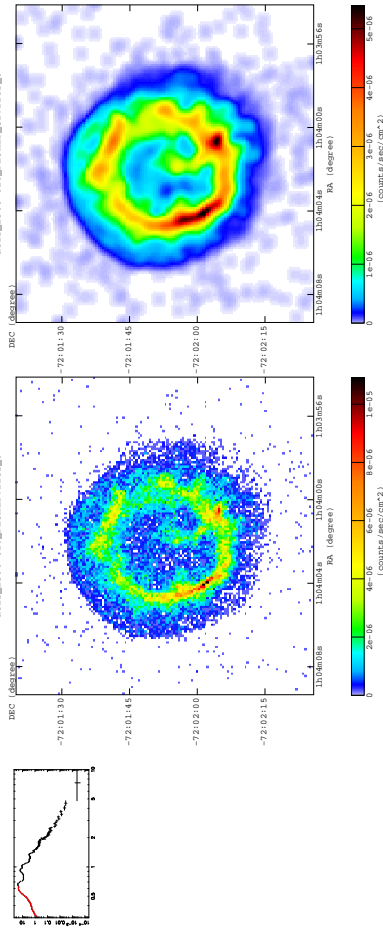


**Green : 620-830 eV**

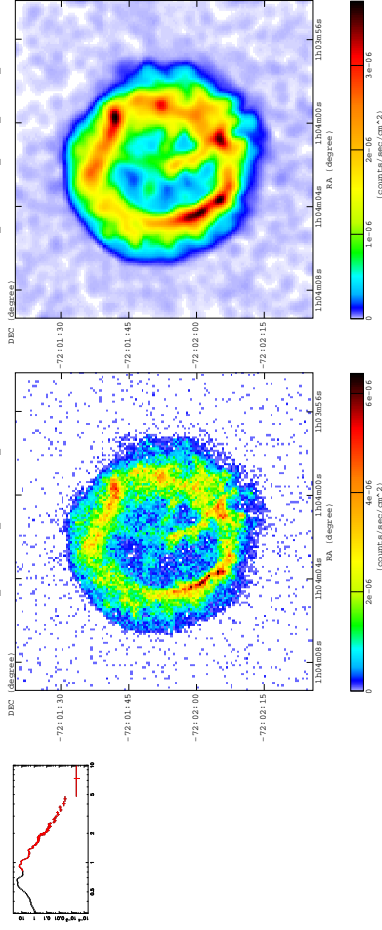


**3.2 Band images used in true color image.**

**Red : 300-620 eV**

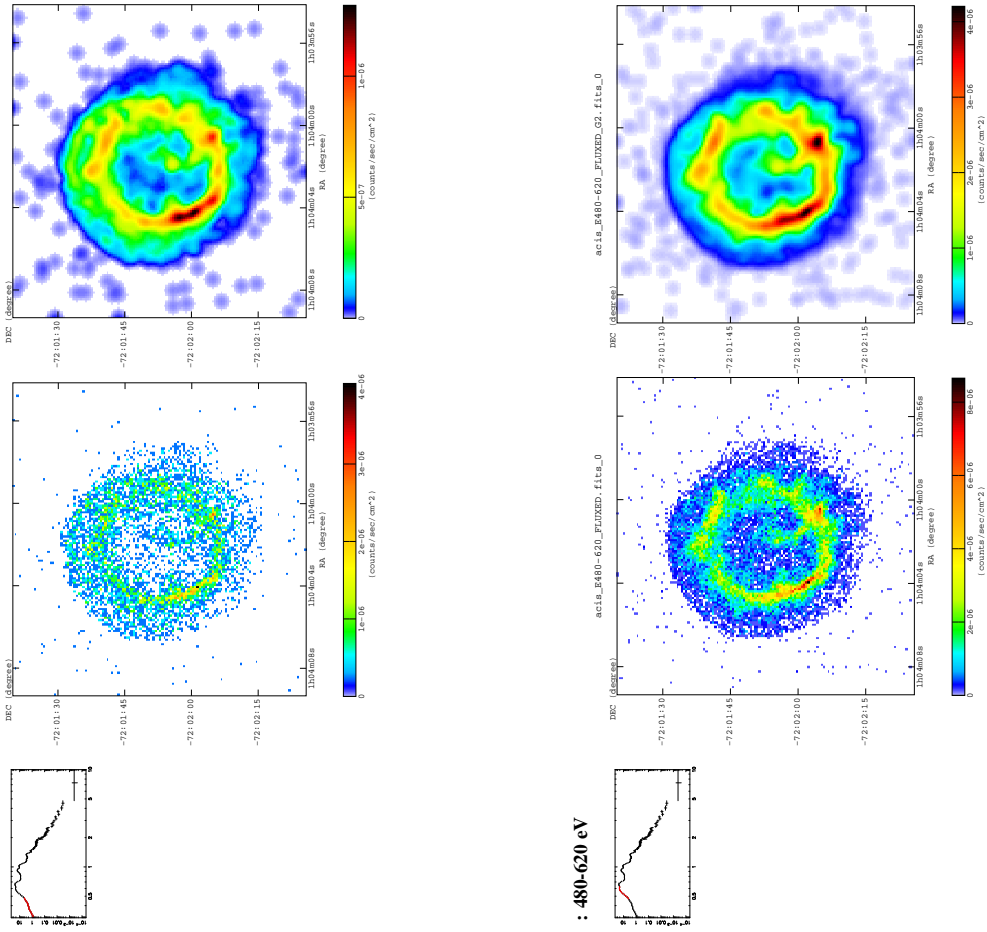


**Blue : 830-10000 eV**

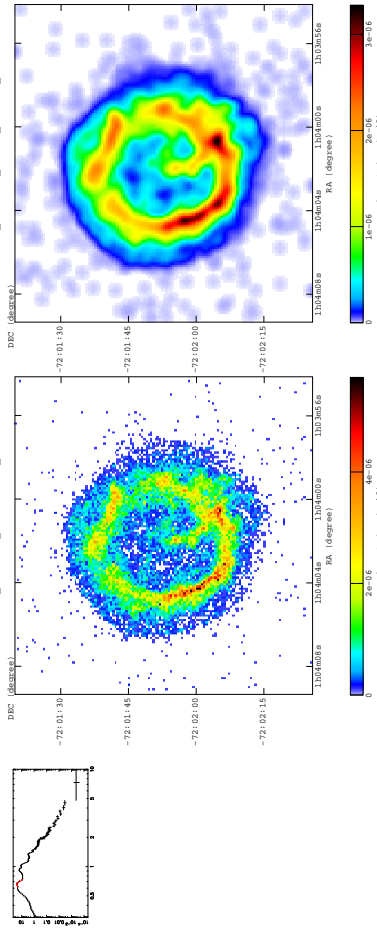


3.3 Misc.

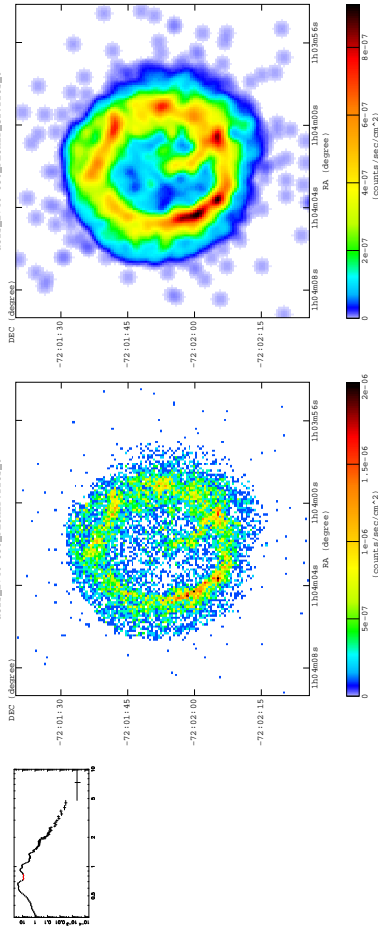
: 300-480 eV



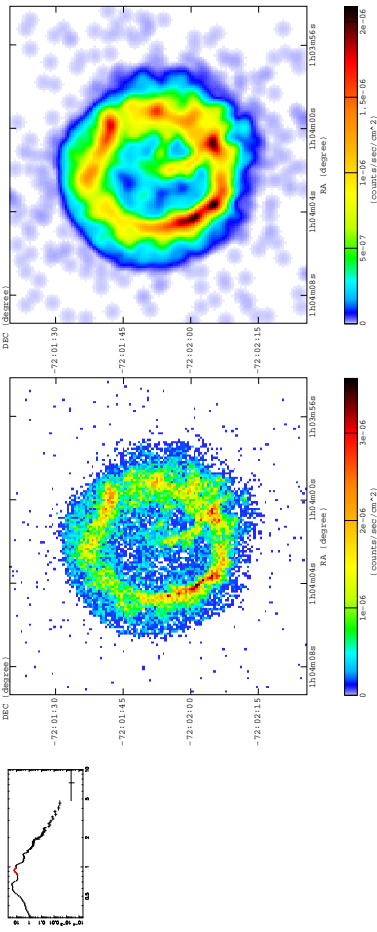
: 620-740 eV



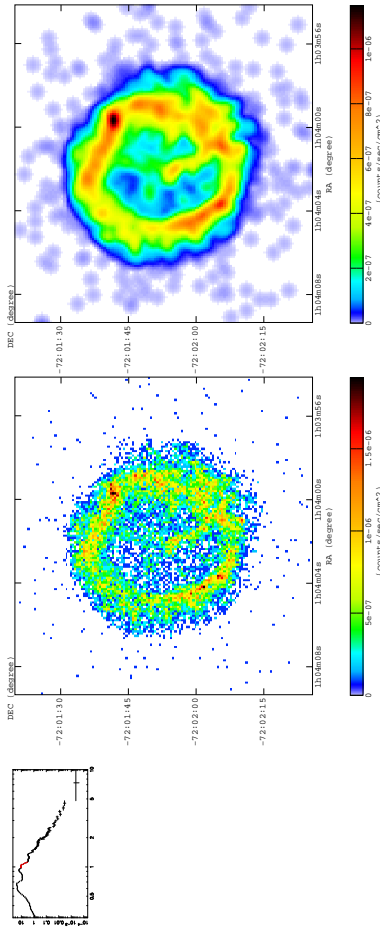
: 740-830 eV



: 830-980 eV



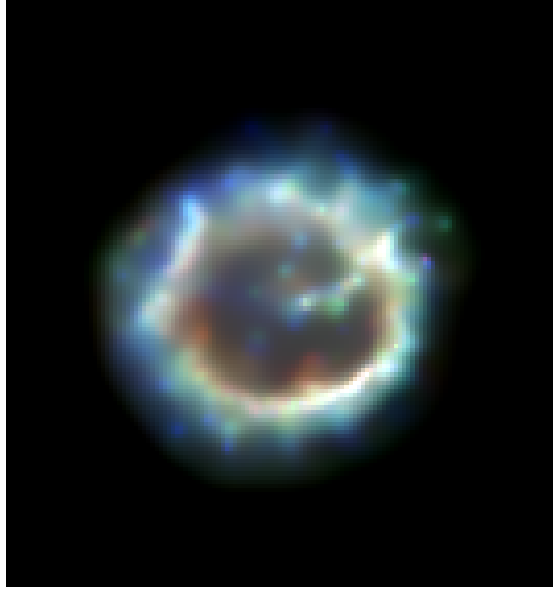
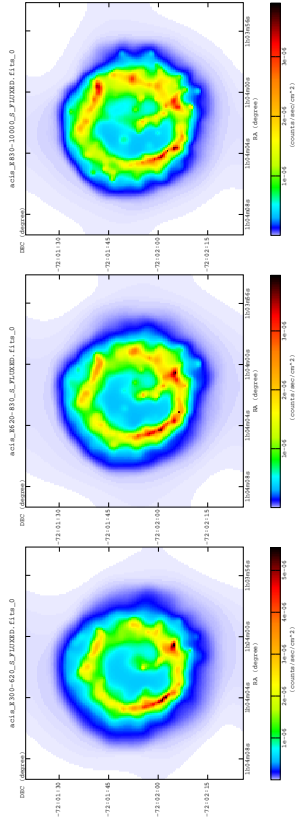
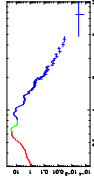
: 980-1110 eV



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

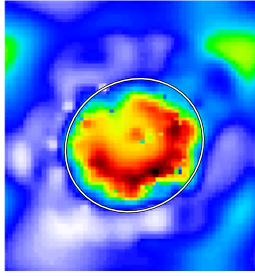
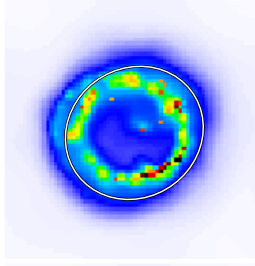
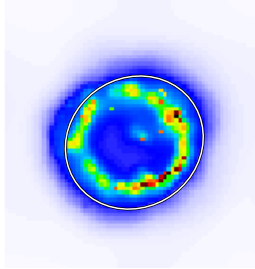
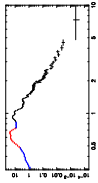


### 5 Chandra Images : Equivalent Width Map

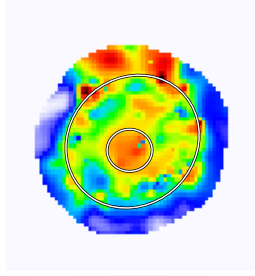
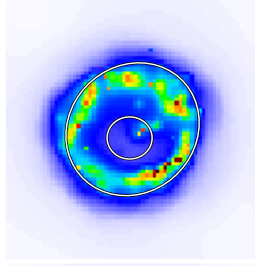
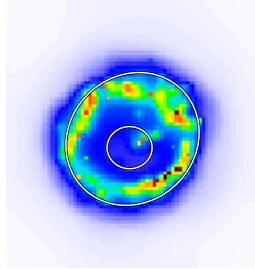
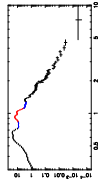
#### 5.1 Equivalent Width Images

- 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



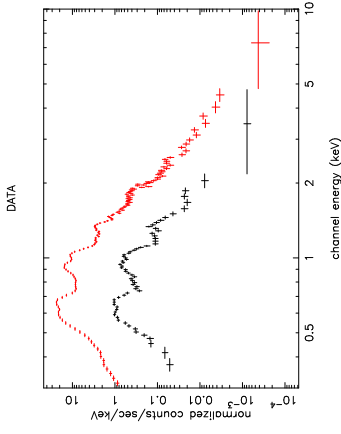
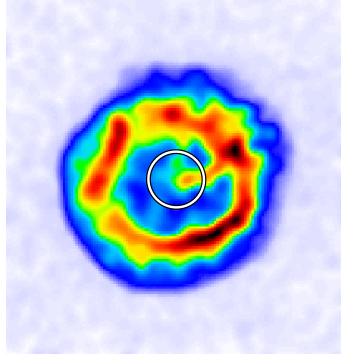
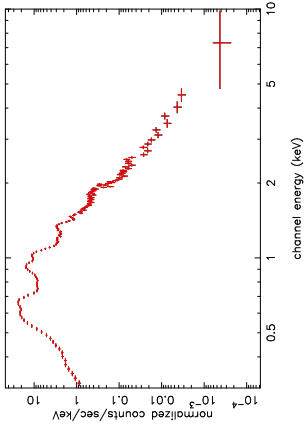
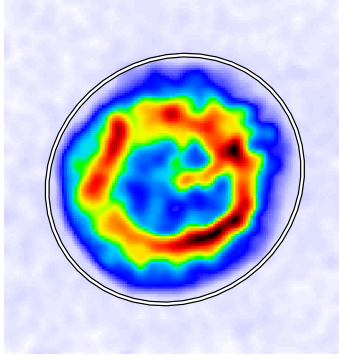
### 6 Chandra Spectrum

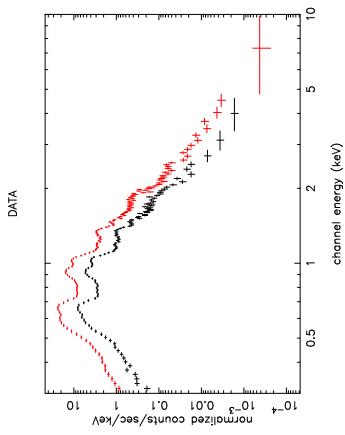
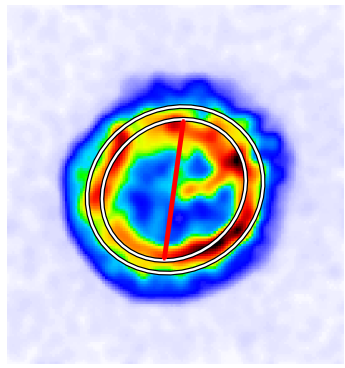
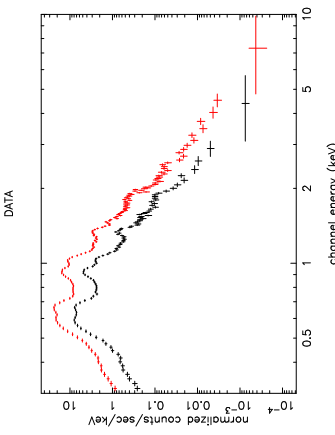
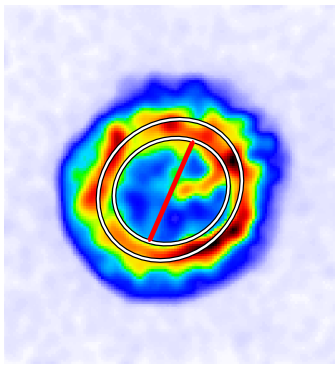
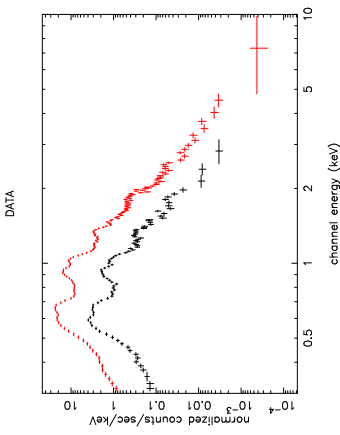
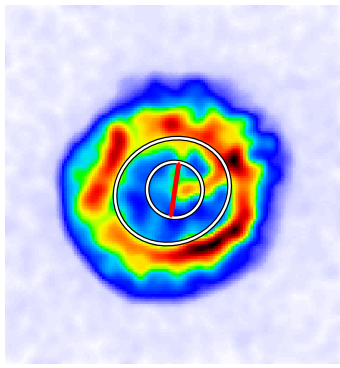
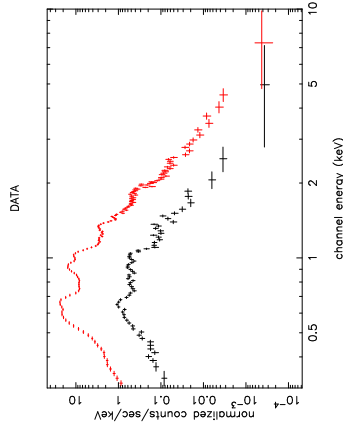
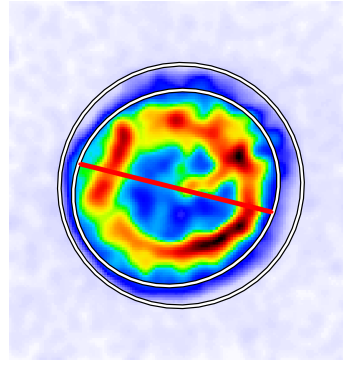
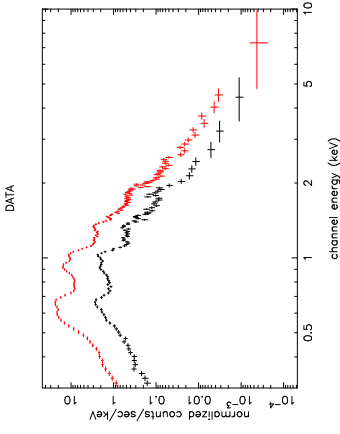
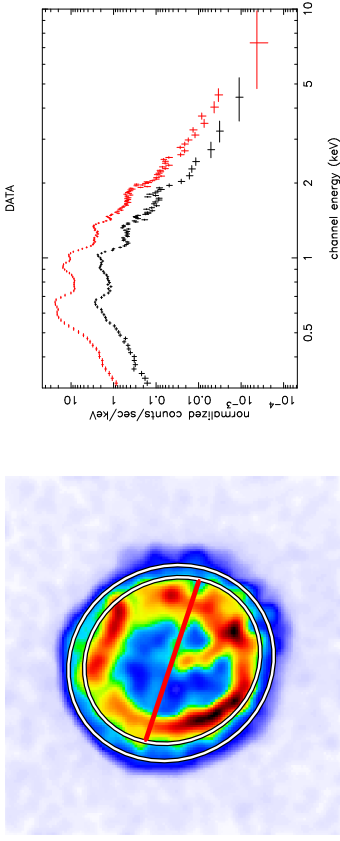
- Images show Regions used to extract spectra
- Regions with red strikes are excluded

#### 6.1 ObsID 1423

- Background was subtracted from the region around the SNR.

total



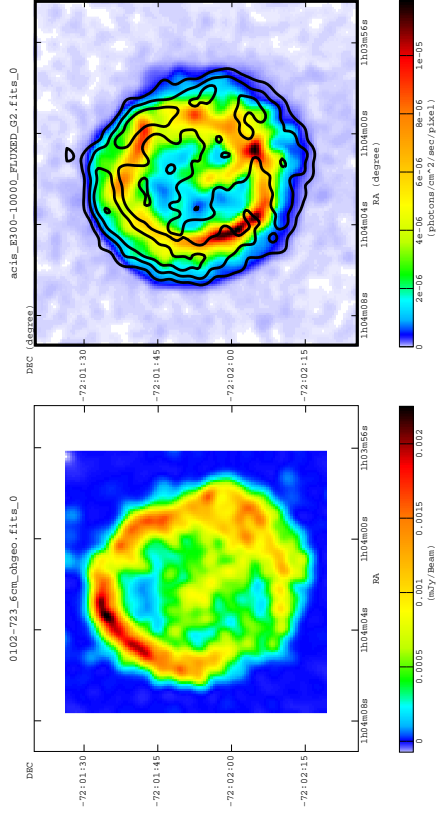


### 7 Radio Image

- 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



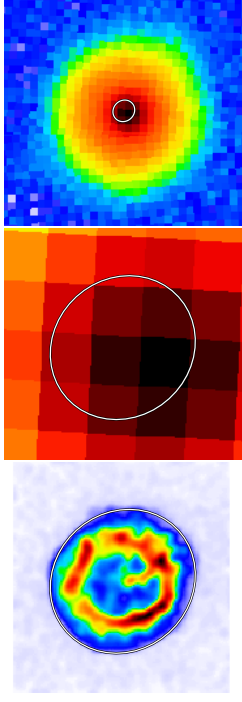
#### Summary of Observation

Telescope	.....	Australia Telescope Compact Array
Date	.....	1990 May, Aug, Sep, 1991 Jan, Apr
Frequency	....	4.790 GHz
Beam size	....	2.75" x 2.96"
1 sigma noise	..	0.075 mJy / beam

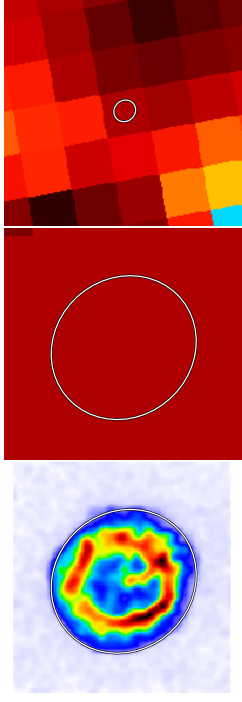
### 8 Images from Survey Missions

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

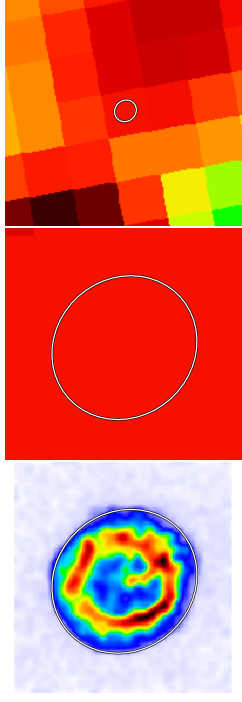
#### ROSAT PSPC (2.0 deg): X-ray (0.1-2.4 keV)



#### IRAS 12 micron: Infrared (12 micron)

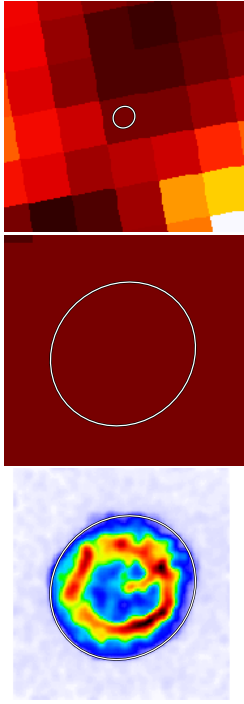


#### IRAS 25 micron: Infrared (25 micron)

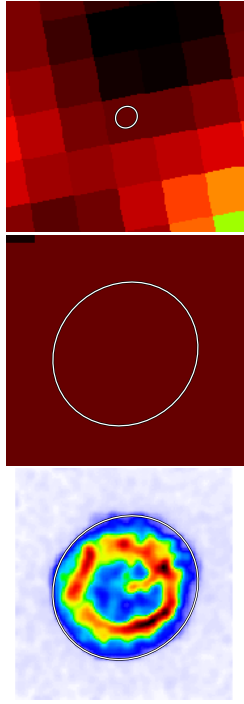




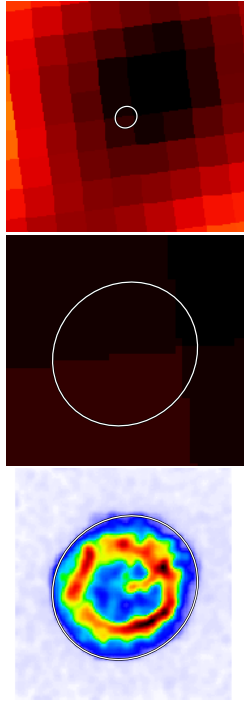
**IRAS 60 micron: Infrared (60 micron)**



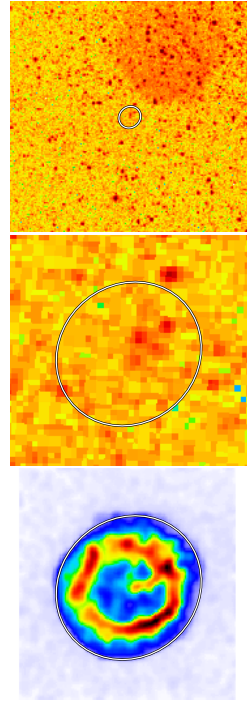
**IRAS 100 micron: Infrared (100 micron)**



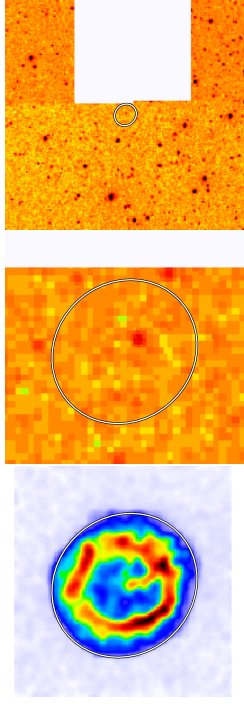
**4850 MHz: Radio (4850 MHz continuum)**



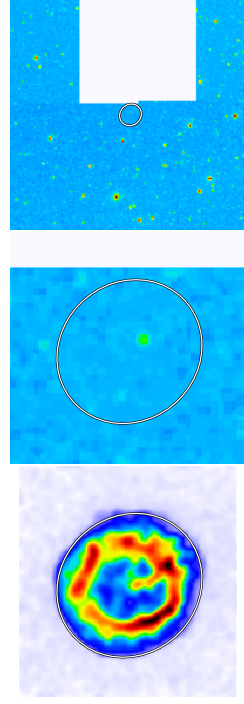
**Digitized Sky Survey: Optical (J or E band images with a few exceptions)**



**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)**

