

## SNR 0509-68.7

### 1 Summary

- Common Name: N 103B
- Distance: 50 kpc (distance to LMC, [Westerlund\(1990\)](#) )
- Center of X-ray emission (J2000): ( 05 08 59.7, -68 43 35.5 )
- X-ray size: 32" x 30"
- 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) ( $\alpha$ , $\delta$ )
500012	125	ACIS-23678	40.3	32.4	1999-12-04	( 05 08 59.0, -68 43 30.0 )

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 <sub>X</sub> <sup>abs</sup> (ergs cm <sup>-2</sup> s <sup>-1</sup> )	F <sub>X</sub> (ergs cm <sup>-2</sup> s <sup>-1</sup> )	L <sub>X</sub> (ergs s <sup>-1</sup> )
total	0.3 - 10.0	2.261e+05	6.982e+00	2.19e-11	5.94e-11	1.77e+37
( 125 )	0.3 - 2.1	2.168e+05	6.694e+00	1.88e-11	5.61e-11	1.67e+37
	2.1 - 10.	9.437e+03	2.914e-01	3.16e-12	3.37e-12	1.00e+36

- N<sub>H</sub> = 0.31 (10<sup>22</sup> cm<sup>-2</sup>)
- Assumed distance: 50 kpc (distance to LMC, [Westerlund\(1990\)](#) )
- nH was derived with two thermal plasma model

### 1.3 Nearby Sources

Obs ID	Position (J2000)	Size	Net Count	Count rate	Note
125	( 05 07 36.3, -68 47 52.7 )	< 14.1"	322.0	7.99e-03	
	( 05 08 03.1, -68 40 16.5 )	< 7.2"	67.9	1.69e-03	
	( 05 08 08.4, -68 40 46.4 )	< 6.1"	135.0	3.35e-03	
	( 05 08 12.9, -68 44 35.6 )	< 5.9"	61.3	1.52e-03	
	( 05 08 32.7, -68 54 29.1 )	< 17.6"	881.0	2.19e-02	
	( 05 08 48.0, -68 45 53.7 )	< 2.5"	5.0	1.24e-04	
	( 05 09 06.8, -68 39 37.2 )	< 3.6"	49.2	1.22e-03	
	( 05 09 17.1, -68 40 52.9 )	< 1.8"	34.7	8.61e-04	
	( 05 09 39.8, -68 53 25.4 )	< 15.5"	51.2	1.27e-03	
	( 05 09 48.2, -68 39 57.5 )	< 3.1"	19.7	4.89e-04	
	( 05 10 09.3, -68 52 52.0 )	< 16.2"	117.0	2.90e-03	
	( 05 10 22.7, -68 39 12.8 )	< 8.8"	53.4	1.33e-03	
	( 05 10 22.8, -68 50 57.9 )	< 16.3"	51.9	1.29e-03	
	( 05 10 26.1, -68 52 31.7 )	< 19.2"	51.2	1.27e-03	
	( 05 10 36.4, -68 40 29.7 )	< 10.3"	50.9	1.26e-03	
	( 05 10 45.9, -68 56 28.8 )	< 33.6"	675.0	1.68e-02	
	( 05 10 48.3, -68 45 25.7 )	< 12.3"	1080.0	2.68e-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.

- The size given above is the size of the region used in detecting that source.
- For each source, background was subtracted from annular region around the source.

### 1.4 References

- Dickel and Milne, 1995 AJ, 109, 200 : ATCA
- Westerlund, 1990 A&ARv, 2, 29 : Distance to LMC

## 2 Fit Detail

- See spectrum page for used regions.

Two component were assumed.

### 2.1 Component 1:

- represented by region far east

```
source=(xswabs * xsvapec)
reduced  $\chi^2 = 1.3488$ 
nh = 0.2826 1022/cm2
```

### 2.2 Component 2:

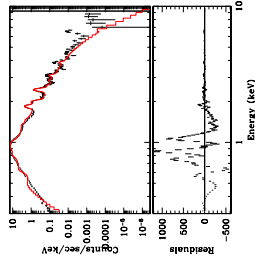
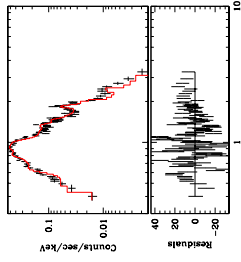
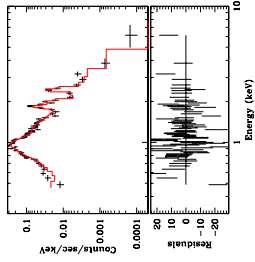
- represented by region small clump around center

```
source=(xswabs * (xsapecc + xsapecc))
reduced  $\chi^2 = 1.89472$ 
nh = 0.3378 1022/cm2
```

### 2.3 Total:

- Above two component were added together.
- fit was done with all the parameter(except nh and normalization factor) fixed at values from above fit.

```
source=(xswabs * ((xsapecc + xsapecc) + xsvapec))
reduced  $\chi^2 = 20.8426$ 
nh = 0.3071 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

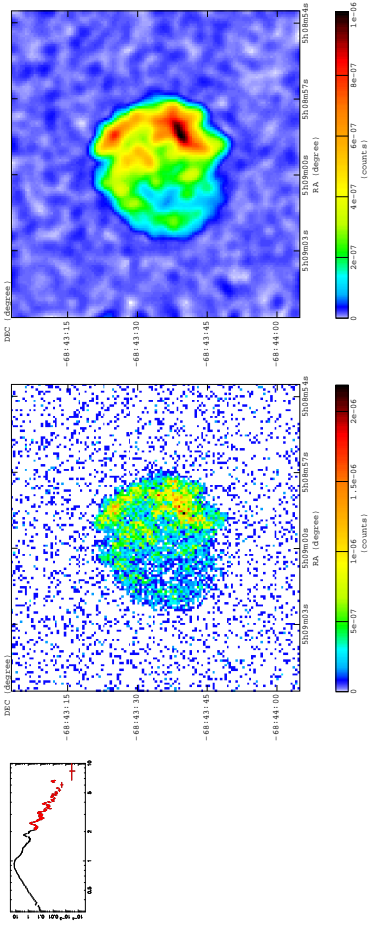
Total : 300-10000 eV



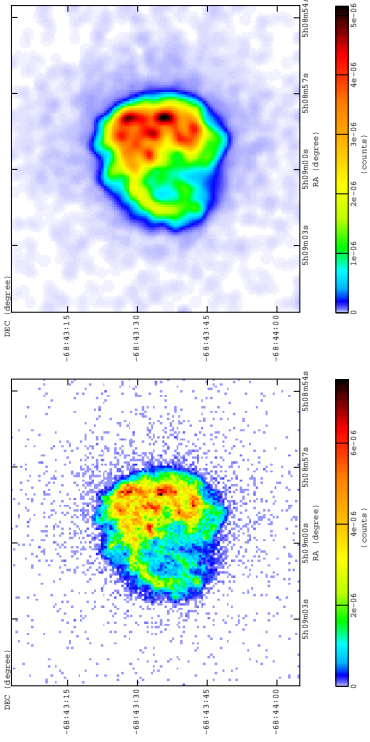
Soft Band : 300-2100 eV



**Hard Band : 2100-10000 eV**

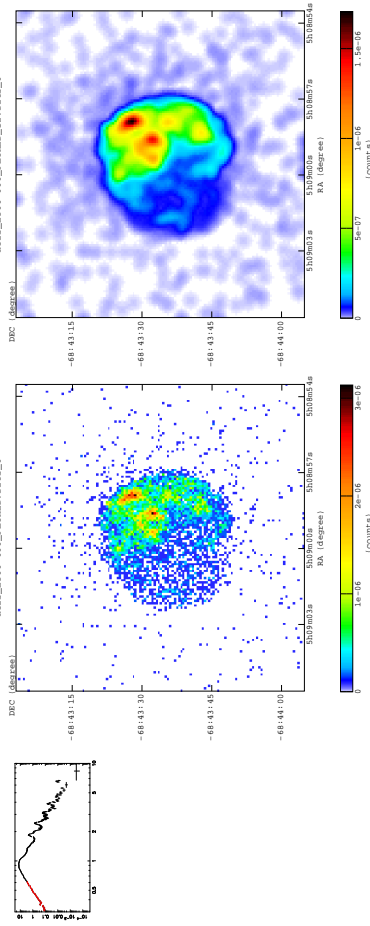


**Green : 600-900 eV**

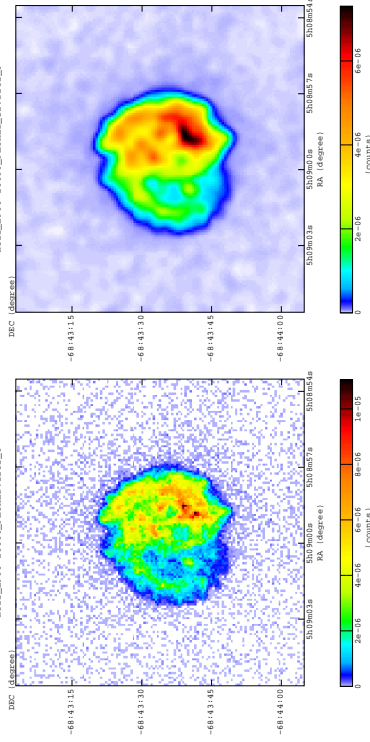


**3.2 Band images used in true color image.**

**Red : 300-600 eV**

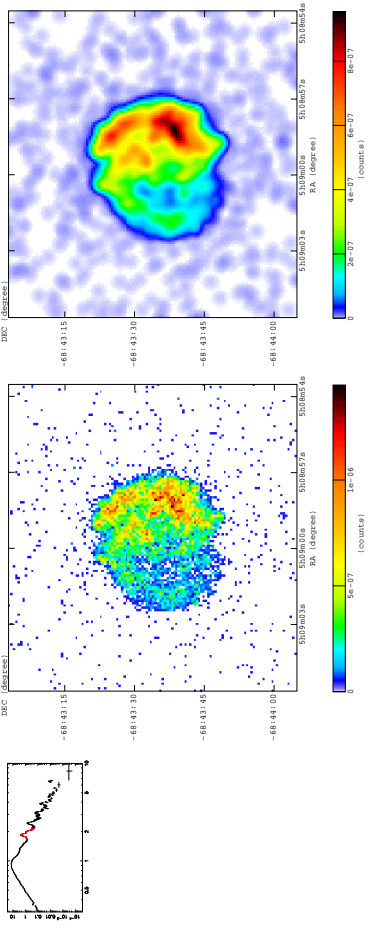


**Blue : 900-10000 eV**

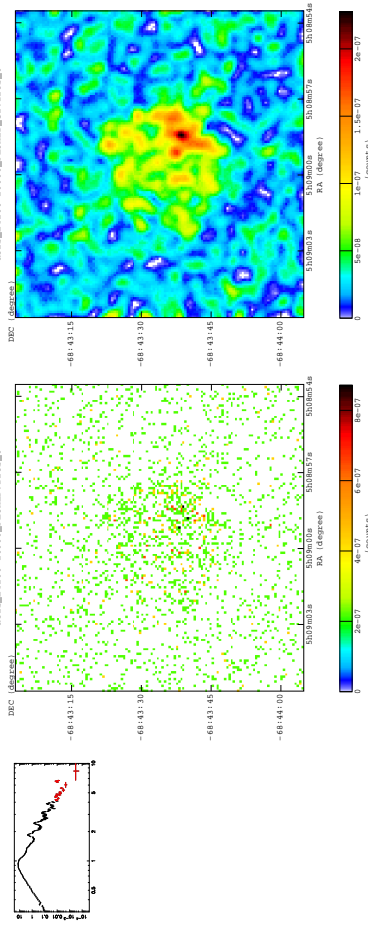


3.3 Misc.

: 1650-2150 eV



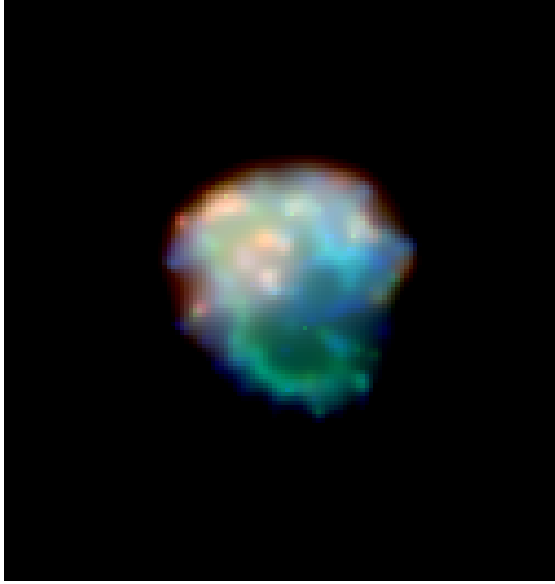
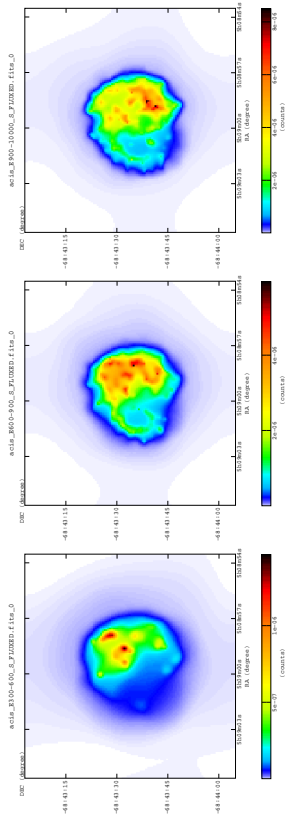
: 4200-10000 eV



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 : 300-600 eV  
 GREEN : 600-900 eV  
 BLUE : 900-10000 eV

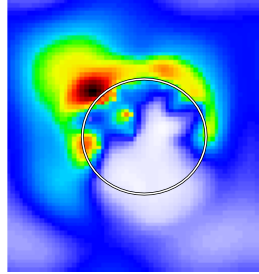
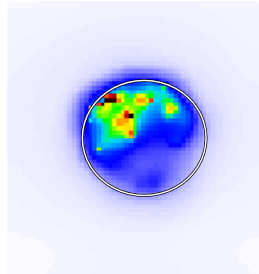
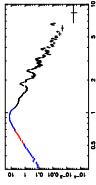


### 5 Chandra Images : Equivalent Width Map

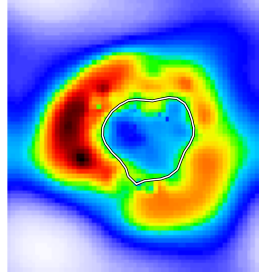
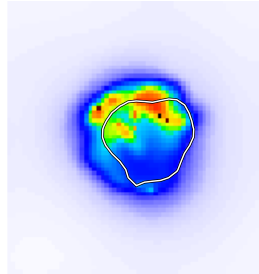
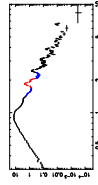
#### 5.1 Equivalent Width Images

- 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 : 300-500 eV  
 line : 500-700 eV  
 continuum : 700-1100 eV



continuum : 1430-1670 eV  
 line : 1670-2080 eV  
 continuum : 2080-2330 eV



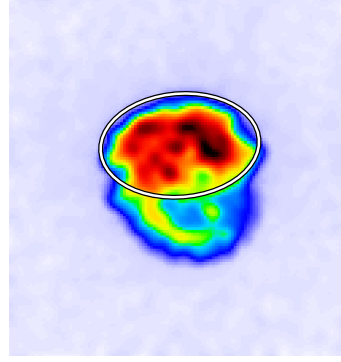
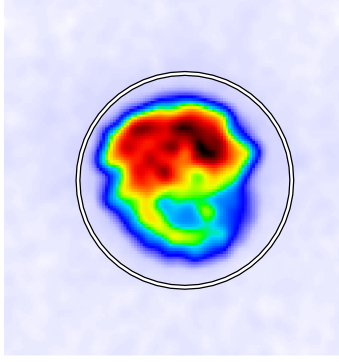
### 6 Chandra Spectrum

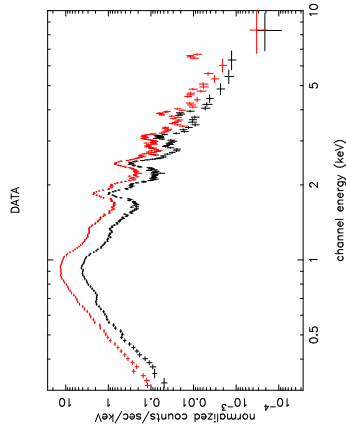
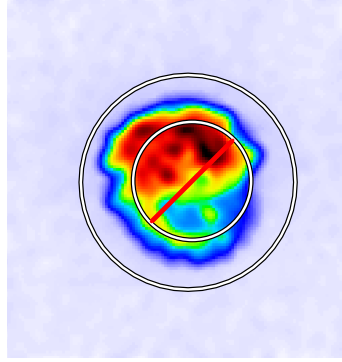
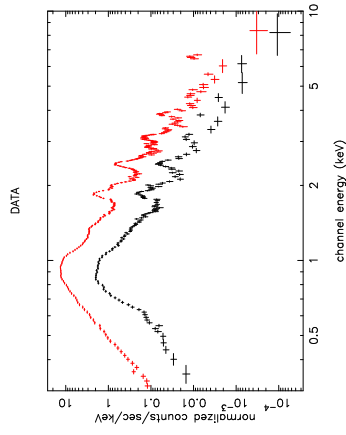
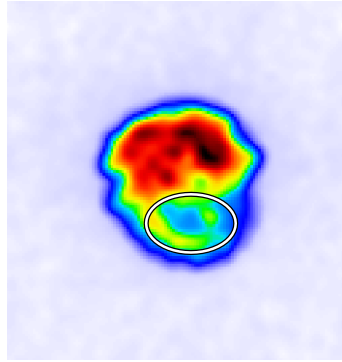
- Images show Regions used to extract spectra
- Regions with red strikes are excluded

#### 6.1 ObsID 125

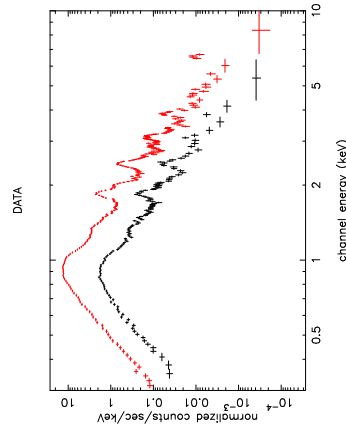
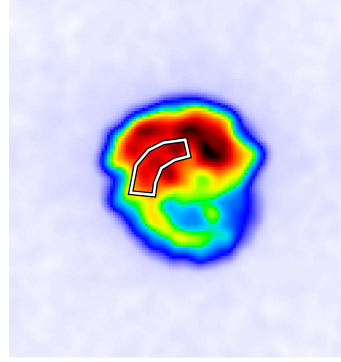
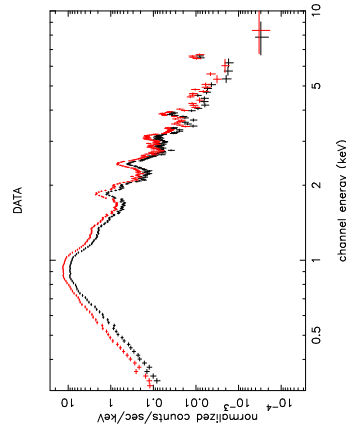
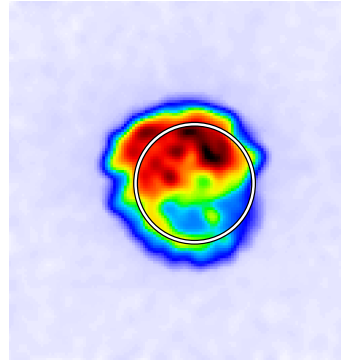
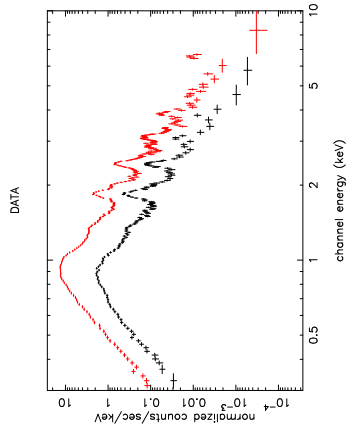
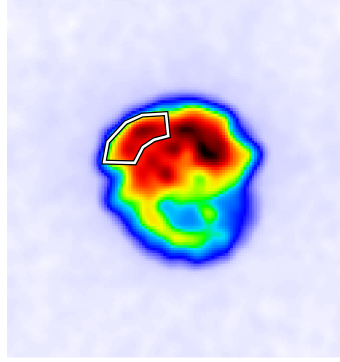
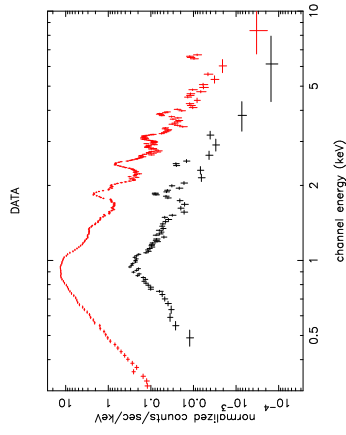
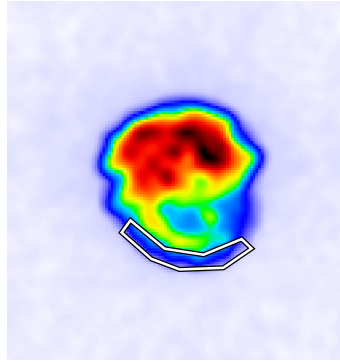
- Background was subtracted from the region around the SNR.

total

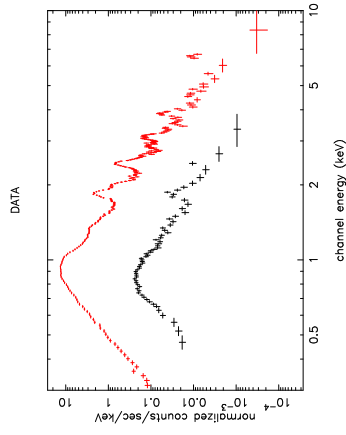
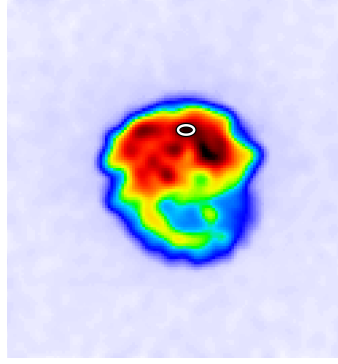
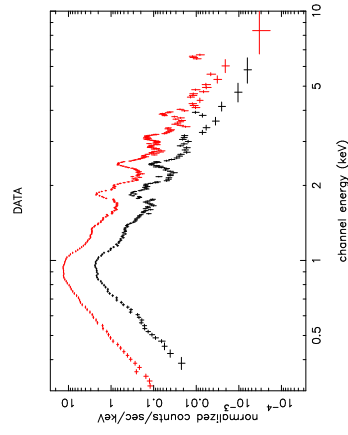
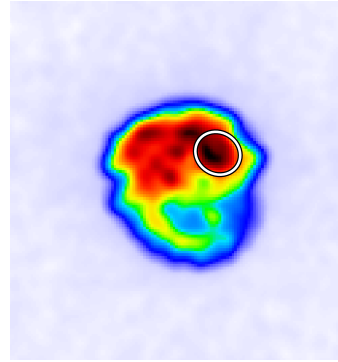
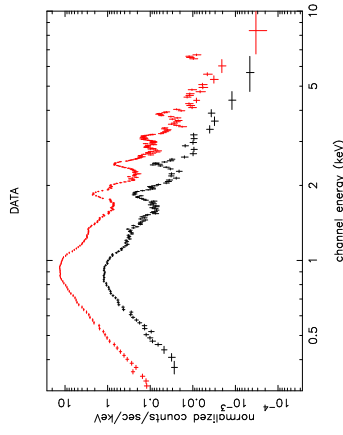
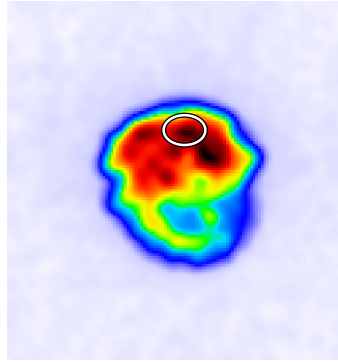
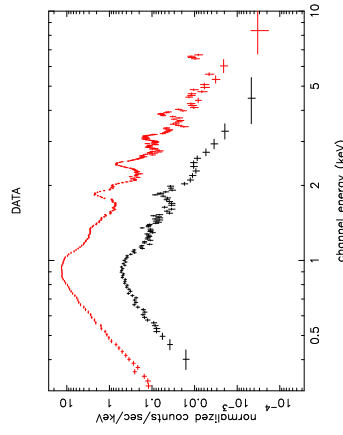
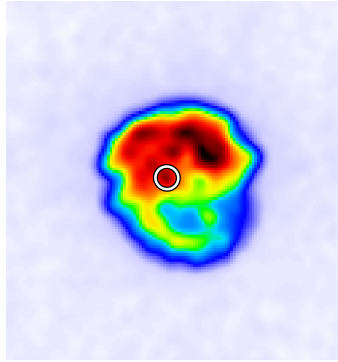




far east



small clump around center

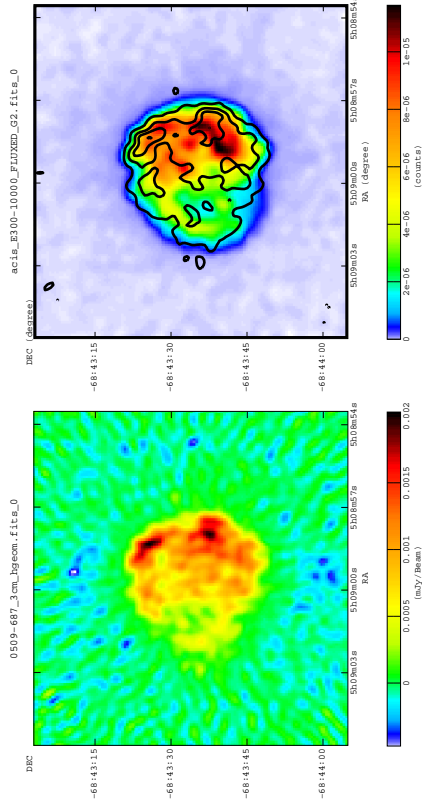


**7 Radio Image**

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

**3.5-cm**

- 3.5-cm flux density: 015 Jy
- Image from **Dickel and Milne(1995)**



**Summary of Observation**

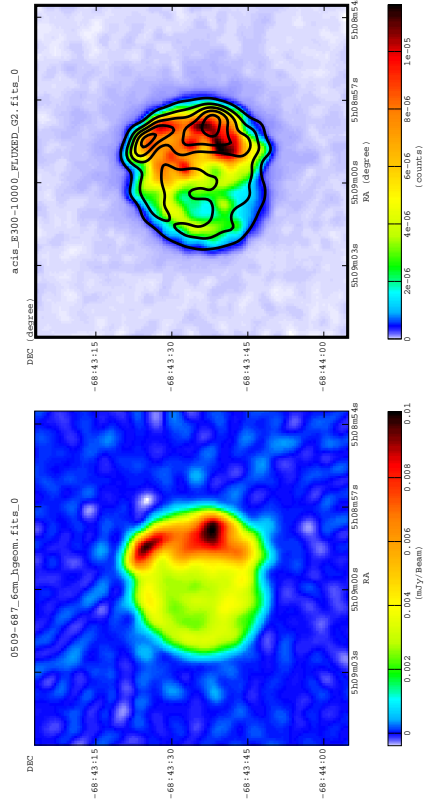
---

Telescope .....	Australia Telescope Compact Array
Date .....	1992 Jun 27, 1993 Feb 21, Mar 15, Mar20
Frequency ....	8.640
Beam size ....	1.75"
1 sigma noise ..	0.09 mJy / beam

---

**6-cm**

- 6-cm flux density: 0.26 Jy
- Image from **Dickel and Milne(1995)**



**Summary of Observation**

---

Telescope .....	Australia Telescope Compact Array
Date .....	1992 Jun 27, 1993 Feb 21, Mar 15, Mar20
Frequency ....	4.790
Beam size ....	3.0"
1 sigma noise ..	0.10 mJy / beam

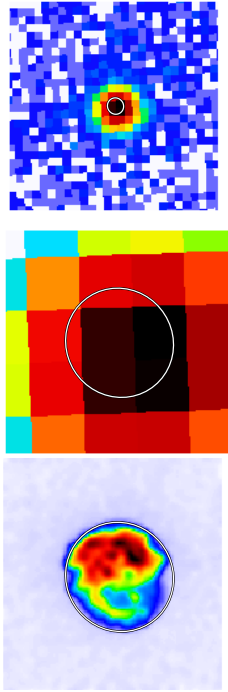
---



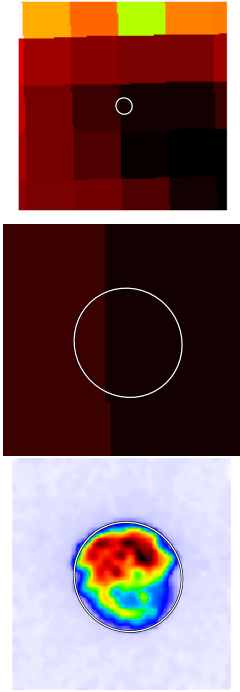
**8 Images from Survey Missions**

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

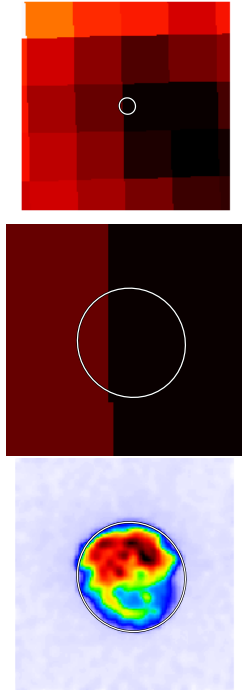
**ROSAT PSPC (1.0 deg): X-ray (0.1-2.4 keV)**



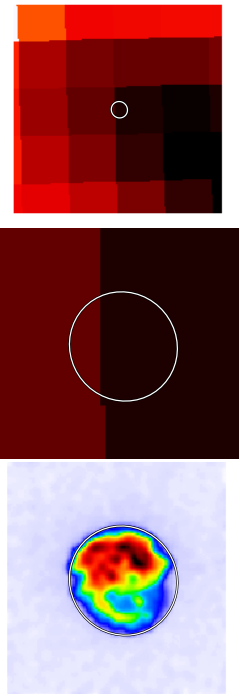
**IRAS 12 micron: Infrared (12 micron)**



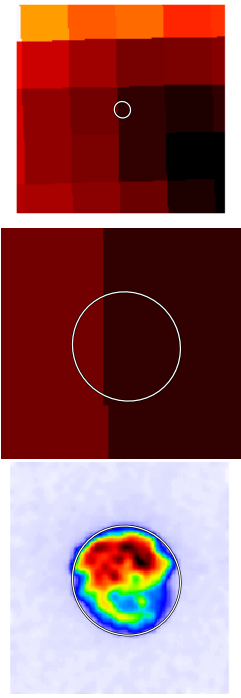
**IRAS 25 micron: Infrared (25 micron)**



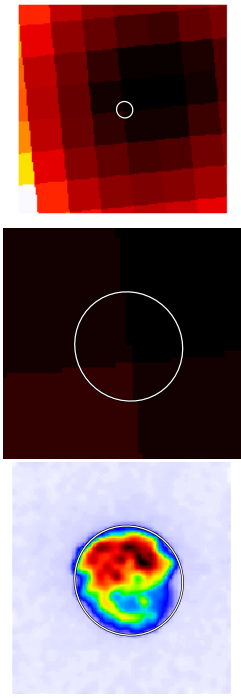
**IRAS 60 micron: Infrared (60 micron)**



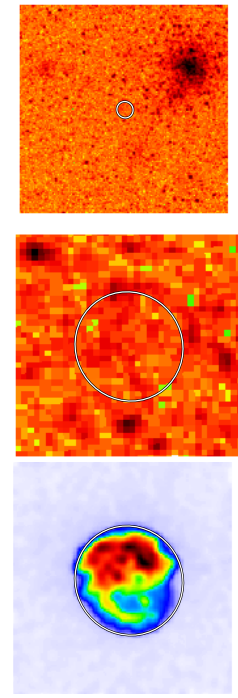
**IRAS 100 micron: Infrared (100 micron)**



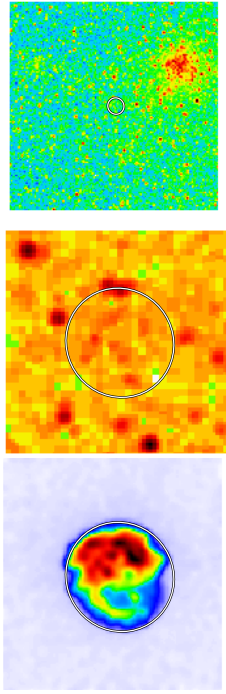
**4850 MHz: Radio (4850 MHz continuum)**



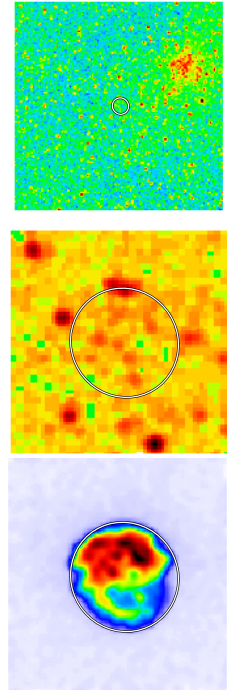
**Digitized Sky Survey: Optical (J or E band images with a few exceptions)**



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)

