

# NGC253 Data Analysis (350um and 450um)

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## ABSTRACT

This is a summary on 350um and 450um NGC253 data analysis.

### 1. 350um data analysis

#### 1.1. Data Files

We have data from two nights, 07/25/2008 and 07/27/2008 (Table 1).

Here is the file list (Table 2):

#### 1.2. Software Parameters

RGM file is from July / August 2008 Run by Run (by JEV); Tau data is from Darren's email, May 24, 2010; FAZO, FZAO data is from pointing model excel (July / August 2008 Run by Run); -ip 0.0034 0.00017 0.0036 0.0 (from analysis logbook on July 3, 2007)

```
./sharpinteg_2 sharc2-043900.fits -r rgm.dat -f 1 -w -sil -em
```

```
./sharp_combine NGC253 NGC253.fits -hwp 92 -l 51 51 -sm 2 -ma 5 -ps 9.5 -pm 12.0  
-bg 10 0 -ip 0.0034 0.00017 0.0036 0.0
```

#### 1.3. Analysis and Results

The files are divided into two groups, 07/25 (group1) and 07/27 (group2).

I tried from no -m , -m 120 to -m 90 using 'sharpinteg\_2'. Figure 1 shows the process.

Group2 has higher noise than Group1. Group1 has very good signal at -m 95, where  $\chi * \sigma$  value is at the minima.

The 07/25/08 data files look good. They have low  $\tau$  and high peaks in the I maps. The centers of the Q error and U error maps are lower than the edges and the top rights are higher than bottom lefts. The Q and U maps look fine.

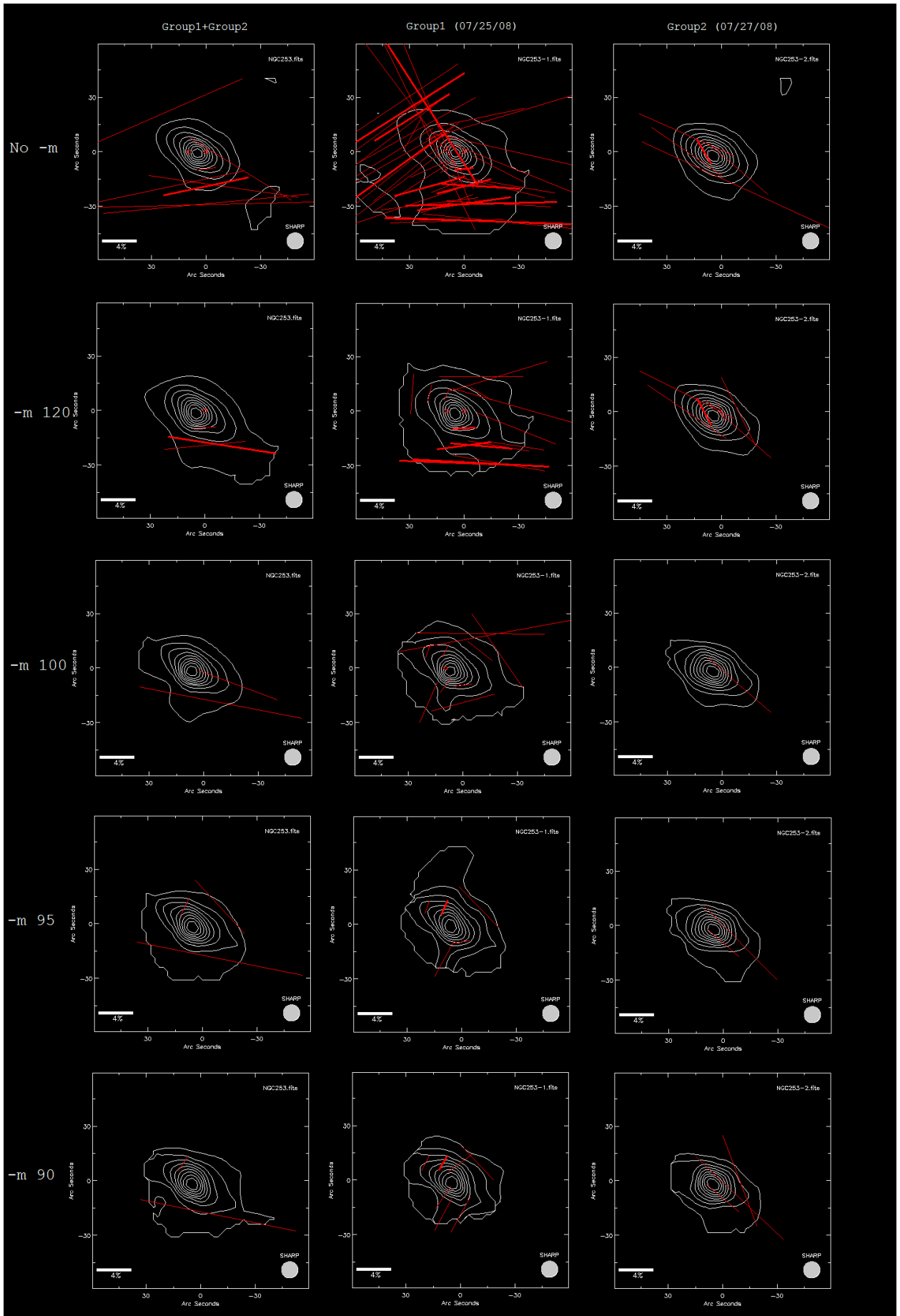


Fig. 1.—  $-m$  optimization

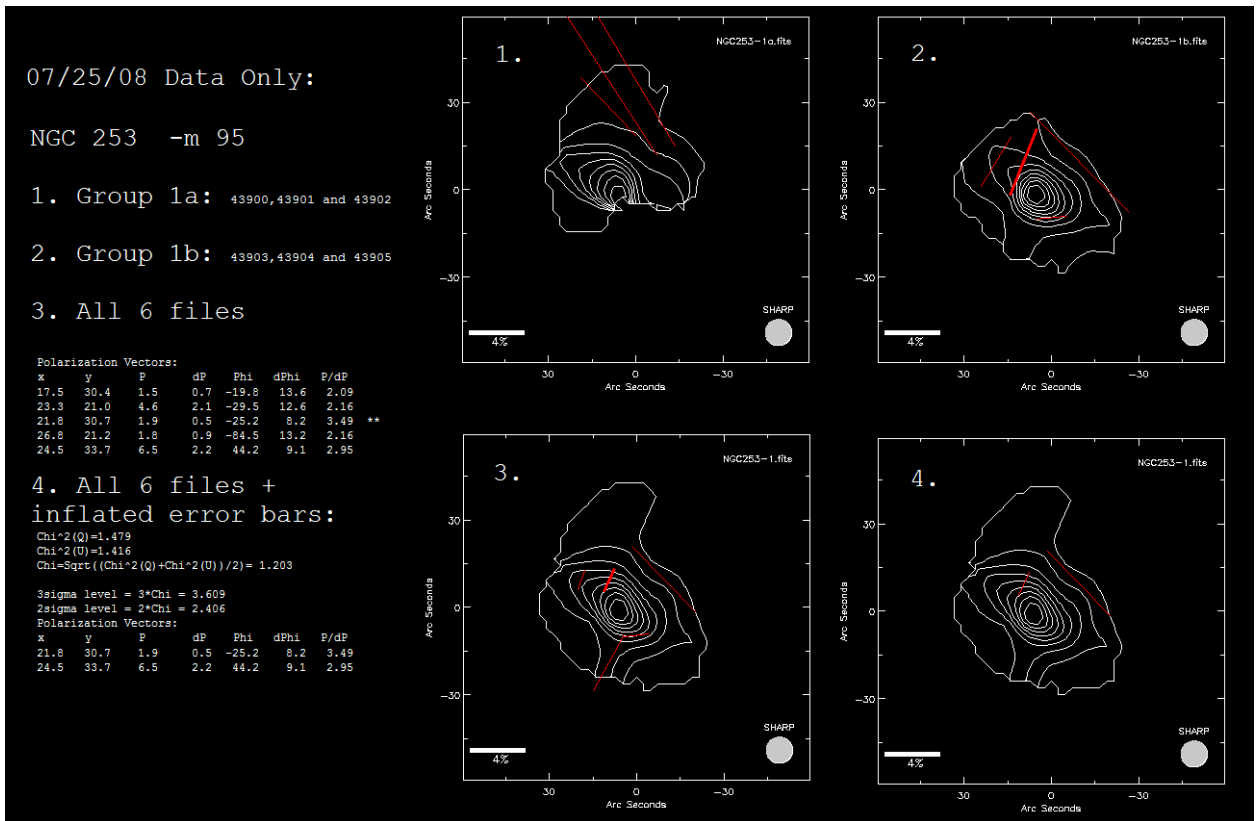


Fig. 2.— Group1 result

Date	File	FAZO	FZAO	$\tau$	I-peak x 10 <sup>6</sup>	I-Background x 10 <sup>6</sup>	I-Noise x 10 <sup>6</sup>
07/25/08	43900	-103.8	87.8	0.0450	13000	1300	700
07/25/08	43901	-103.6	87.9	0.0510	12500	250	400
07/25/08	43902	-103.4	88.0	0.0410	12200	500	350
07/25/08	43903	-103.2	88.0	0.0360	11000	300	700
07/25/08	43904	-102.9	88.1	0.0360	11500	500	800
07/25/08	43905	-102.7	88.1	0.0460	11600	200	300
07/27/08	44228	-103.2	87.9	0.0610	3400	-150	750
07/27/08	44229	-103.0	88.0	0.0610	3000	-100	350
07/27/08	44230	-102.8	88.0	0.0570	3100	300	450
07/27/08	44231	-102.5	88.0	0.0570	1900	-200	800
07/27/08	44232	-102.3	87.9	0.0570	2400	50	700

Table 1: Raw data

The 07/27/08 data files have (very strong) noise on 3 and 4 rows in all HDUs. And the peaks in I map are very low with high  $\tau$ . The backgrounds of I maps vary a lot across the edges of the fields.

I'd like to throw away Group2 data.

Here is a further analysis with Group1 data. Without error bar inflation, there is one  $3\sigma$  vector. I also tried to inflate the error bars by dividing all 6 files into two equal groups but ended up no  $3\sigma$  vectors. You can see the results in Figure 2. It is hard to have high-sigma vectors because we got only 6 files.

You can find the fits files here:

<http://www.pha.jhu.edu/~lingzz/SHARP/NGC253/350um/>

## 2. 450um data analysis

### 2.1. Data Files

The 450um observation was in Dec, 2006.

Here is the file list:

File	$\tau$	FAZO	FZAO
43900_int.fits	0.0450	-103.8	87.8
43901_int.fits	0.0510	-103.6	87.9
43902_int.fits	0.0410	-103.4	88.0
43903_int.fits	0.0360	-103.2	88.0
43904_int.fits	0.0360	-102.9	88.1
43905_int.fits	0.0460	-102.7	88.1
44228_int.fits	0.0610	-103.2	87.9
44229_int.fits	0.0610	-103.0	88.0
44230_int.fits	0.0570	-102.8	88.0
44231_int.fits	0.0570	-102.5	88.0
44232_int.fits	0.0570	-102.3	87.9

Table 2: 350um file list

File	$\tau$	FAZO	FZAO
34374_int.fits	0.0450	-109.8	71.5
34375_int.fits	0.0457	-109.8	71.6
34376_int.fits	0.0465	-109.9	71.6
34377_int.fits	0.0473	-109.9	71.7
34378_int.fits	0.0482	-109.9	71.8
34387_int.fits	0.0548	-110.1	72.9
34388_int.fits	0.0552	-110.2	73.0
34390_int.fits	0.0560	-110.3	73.4
34391_int.fits	0.0566	-110.4	73.7
34392_int.fits	0.0571	-110.4	73.9
34393_int.fits	0.0577	-110.5	74.1
34394_int.fits	0.0583	-110.6	74.4

Table 3: 450um file list

The first raw file "034373.fits" was deleted. In this file, the Q signal is higher at top right and lower at bottom left. This kind of effect cause noise in the combined maps.

## 2.2. Software Parameters

RGM file and -ip is from:

[http://lennon.astro.northwestern.edu/CSOpol/collaborators/chopnod/mar10\\_2010.txt](http://lennon.astro.northwestern.edu/CSOpol/collaborators/chopnod/mar10_2010.txt)

Tau data is from excel file (run by run, dec 2006)

```
./sharpinteg_2 sharc2-034347.fits -r rgm.dat -f 1 -w -sil -em
```

```
./sharp_combine NGC253 NGC253.fits -hwp 67 -l 51 51 -sm 2 -ma 5 -ps 9.5 -pm 12.0  
-bg 10 0 -ip 0.0 0.0 0.0010 0.0011
```

## 2.3. Analysis and Results

I divided all the raw files into two groups:

Group1 (3 files):

74, 75 and 76

Group2 (9 files):

77, 78, 87, 88, 90-94

I minimized the " $\sigma\chi$ " value by using different "-m" value in sharpinteg\_2. Table 4 lists the results that I got.

-m	$\chi^2_Q$	$\chi^2_U$	$\chi^2$	$\sigma_Q$	$\sigma_U$	$\sigma$	$\sigma\chi$
-	-	-	-	$\times 10^{-5}$	$\times 10^{-5}$	$\times 10^{-5}$	$\times 10^{-5}$
120	1.642	1.031	1.336	5.57	5.60	5.59	6.46
100	1.583	1.011	1.297	5.74	5.77	5.75	6.54
95	0.996	0.852	0.924	5.86	5.93	5.90	5.67
90	1.009	0.713	0.856	5.91	5.95	5.93	5.48
85	1.476	1.003	1.239	6.26	6.24	6.25	6.96

Table 4: 450um -m optimization

The best "-m" value is around 90 or 95. There are 2 polarization vectors with  $3\sigma$  level, in Figure 3.

This result is in good agreement with:

<http://xxx.lanl.gov/abs/0908.2985>

<http://arxiv.org/pdf/0801.3542v1>

### 3. Conclusion

We got some  $2\sigma$  and  $3\sigma$  vectors in these two waveband (350um and 450um). Results from these two waveband agree with each other and also in good agreements with other publications.

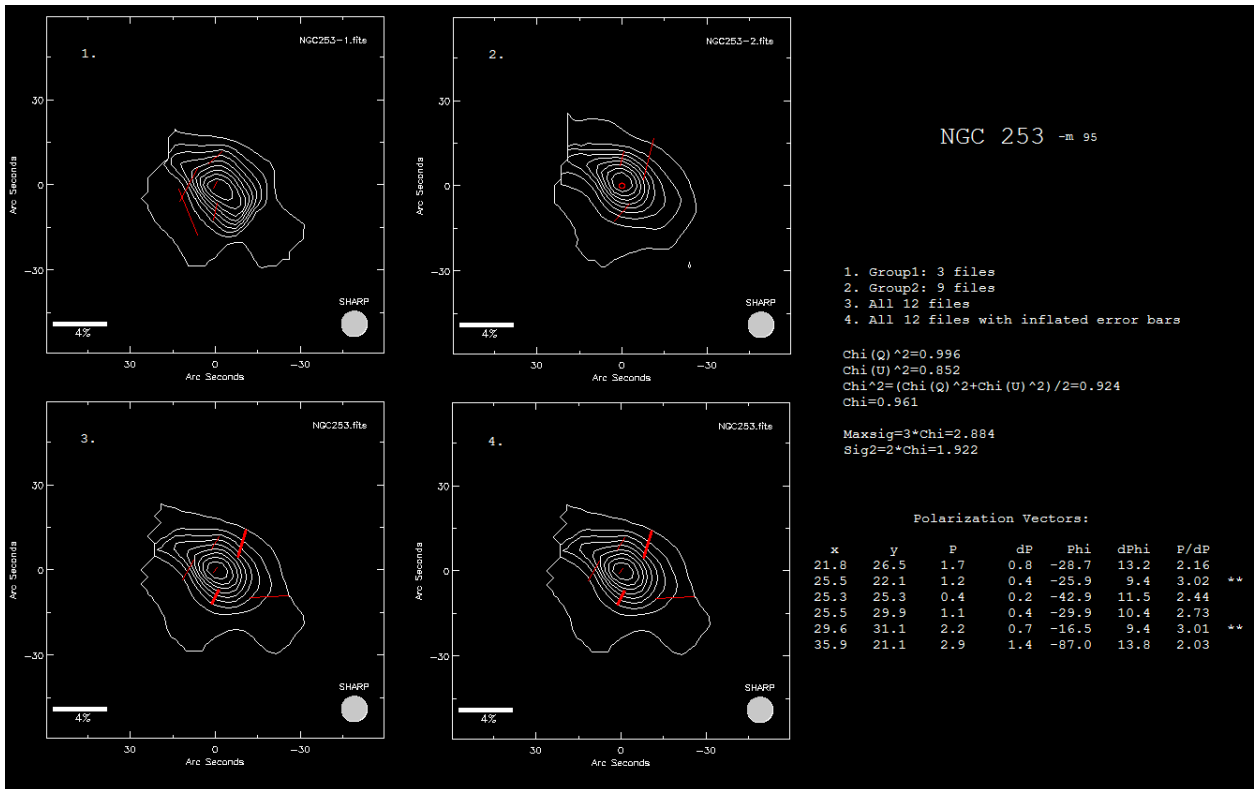


Fig. 3.— -m95 results