Australia Telescope Compact Array Flux Calibration

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We have measured the flux of 1934-638 at 4800 MHz and 8640 MHz using the source 1328+307 (3C286) as a flux reference. We find the ratio of 1934-638 to 1328+307 fluxes to be 0.763±0.001 and 0.552±0.007 at the two observing frequencies. Using the Baars *et al* (1977) flux for 3C286, these ratios correspond to 1934-638 fluxes of $S_{4800} = 5.718 \pm 0.010$ Jy and $S_{8640} = 2.82 \pm 0.04$ Jy.

Introduction

The source 1934-638 is used as the primary flux calibrator for the Compact Array. However its absolute flux has not been established at all CA wavelengths. John Reynolds (1994) has made two attempts (November 1993, February 1994) to relate the 1934-638 6cm and 3cm fluxes to those of 1328+307 (3C286). The results differed at the 5% level, reportedly because of 1328+307 being resolved on long baselines and poor pointing during one of the observations. We have made another attempt to make the flux comparison.

Observations

Observations were made with the Compact Array at 4800 MHz and 8640 MHz with 128 MHz bandwidth. The sources 1934-638 and 1328+307 were both observed on 1994 June 15 and 1994 June 22. The circumstances of each observation are summarised in Table 1.

Prior to the observation of each source, antenna pointing errors were measured. Small adjustments were made to the pointing on June 22 before data were collected in the first

Source	UT		Configuration	Elevation
1934-638	June 15	10:30 – 11:48	1.5C	28-31
1328+307	June 15	11:02 – 11:41	1.5C	28-24
1934-638	June 15	11:47 – 11:58	1.5C	38-39
1934-638	June 22	09:08 – 09:21	6C	24-25
1328+307	June 22	09:49 – 10:11	6C	29
1934-638	June 22	10:29 – 10:40	6C	33-34

Table 1: Summary of observations

Antenna	10:20UT		11:05 UT		11:20 UT	
	ΔAz	ΔEl	ΔAz	ΔEl	ΔAz	ΔEl
1	-2	3	4	3	3	10
2	1	7	3	1	0	3
3	-6	4	-1	-1	6	5
4	-1	2	3	3	1	6
5	2	6	0	4	0	9
6	1	1	-3	15	-2	10

Table 2: Measured pointing errors in seconds of arc for June 15.

Antenna	08:50UT		09:40 UT		10:20 UT	
	ΔAz	ΔEl	ΔAz	ΔEl	ΔAz	ΔEl
1	-1	0	0	1	-4	4
2	0	-1	1	3	3	3
3	0	6	0	0	-8	9
4	-1	4	-5	1	1	1
5	3	1	1	2	4	4
6	3	-1	-2	4	-8	8

Table 3: Measured pointing errors in seconds of arc for June 22.

two scans of that session. In all cases the data were taken with measured pointing errors which were small relative to the primary beam. At the two frequencies, the primary beam width (FWHM) is 603 arcsec and 335 arcsec. Pointing errors for each observation are listed in Tables 2 and 3.

Analysis

Miriad was used for data analysis. The data were analysed in the following steps:

Load data into Miriad	ATLOD
Discard unwanted data	UVFLG
Correct XY phases	ATXY
Multisource files split	UVSPLIT
Bandpass, antenna gain calibration (1934-638)	MFCAL,GPCAL
Transfer calibration to 3C286	GPCOPY

The data were calibrated assuming the flux of 1934-638 as specified in the current model spectrum (S_{4800} = 6.331 Jy, S_{8640} = 2.589 Jy). Data from the two configurations were calibrated separately. On both dates, the observations of the two sources were made at different elevations (Table 1). All measured amplitudes of 1328+307 were adjusted to compensate for the elevation dependence of atmospheric attenuation. An attenuation of 0.035 dB at the

Frequency (MHz)	4800	8640
Measured $S_{1328+307}$ (Jy)	8.294±0.015	4.69±0.06
Reference $S_{1934-638}$ (Jy)	6.331	2.589
$S_{1934-638}/S_{1328+307}$	0.763±0.001	0.552±0.007
Accepted $S_{1328+307}$ (Jy)	7.491	5.104
Derived $S_{1934-638}$ (Jy)	5.718±0.010	2.82±0.04

Table 4: Summary of results

zenith was assumed (see Waters, 1976). The correction factors were 1.004 and 1.000 for June 15 and June 22.

1328+307 has structure at the 2.5 arcsecond level and so visibility amplitudes vary with baseline length. To estimate the source flux we have extrapolated the measured amplitudes to 'zero spacing'. Figures 1 and 2 show the measured amplitudes and extrapolations at the two frequencies with data from the two configurations combined. The agreement between the two data sets is markedly worse at 8640 MHz. We attribute this to the poor phase stability observed on June 22. The fit shown in Figure 1(b) is weighted in favour of the June 15 data. The results are presented in Table 4.

References

Baars, J.W.M., Grenzel, R., Pauliny-Toth, I.I.K., & Witzel, A., *Astron. Astrophys.*, **61**, 99–106, 1977.

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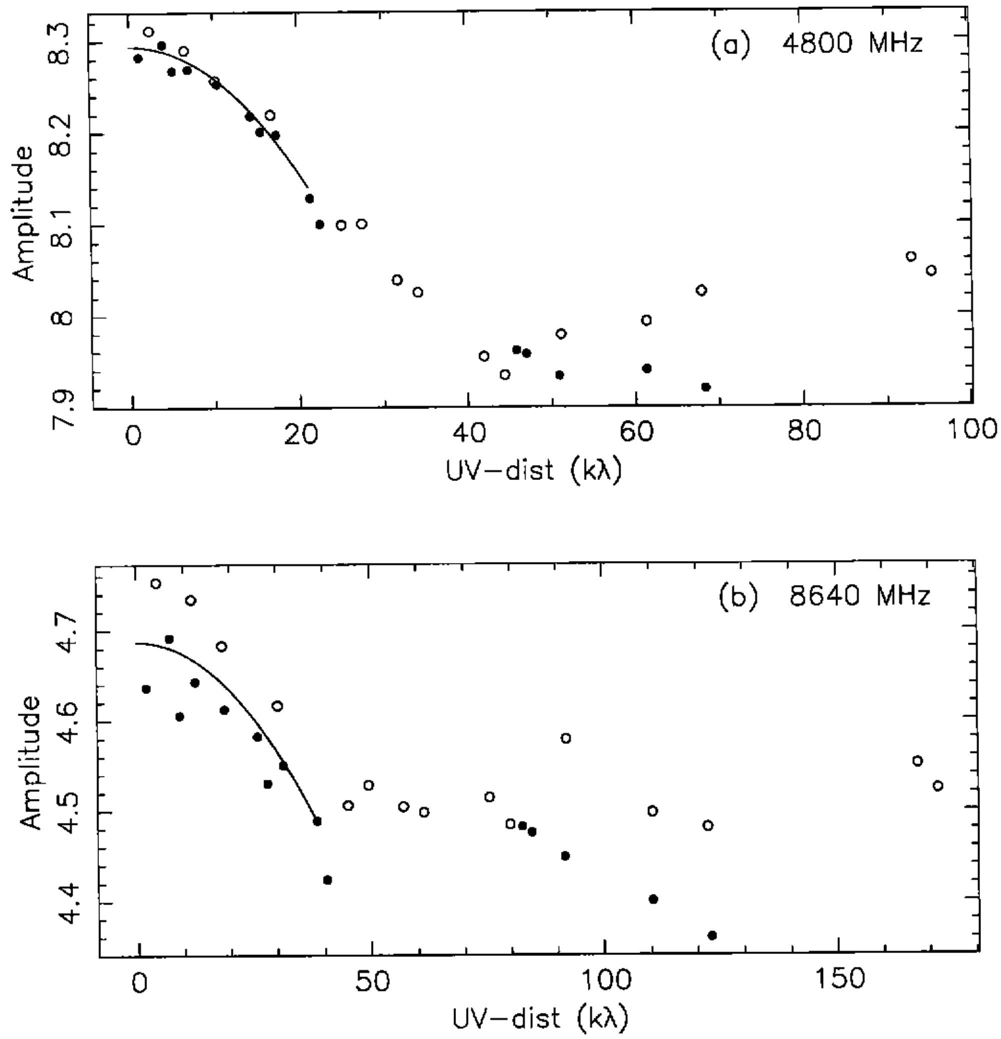

Figure 1: Visibility amplitudes at 4800 MHz (a) and 8640 MHz (b) for 3C286. The 'zero-spacing' amplitude is derived from a model fitted to the amplitudes from the baselines shorter than 1.5 km. Data from the June 22 observations are shown as open symbols. The solid line shows the model.