RADIO EMISSION FROM FOURTEEN PLANETARY NEBULAE AT 408 MHZ

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The East-West arm of the 'Northern Cross' radio telescope of the Bologna University has been used to observe 14 planetary nebulae at the frequency of 408 MHz.

The half-power beamwidth of the instrument is 4′ E–W by 100′ N–S. For the very weak sources studied here, confusion permits a positional accuracy of 2^s E–W by 15′ N–S. As the resolution limit is about 0·2 flux units, the measured flux densities of the weakest sources are accurate to 30%.

Constant declination scans were made through the optical positions given by Thompson *et al.* (1967), and at adjacent declinations spaced at intervals of 30′, in order to restore the N–S diagram of the sources. As calibration objects for flux density and position the sources 3C 48, 3C 71, 3C 119, 3C 216, 3C 237, 3C 245, 3C 446, and CTA 102 were used.

The results of the present observations, together with those of Slee and Orchiston (1965), Menon and Terzian (1965), Terzian (1966), Le Marne (1966), Thompson *et al.* (1967), are summarized in Table 1.

For the two common nebulae IC 418 and NGC 7009 there is excellent agreement between our measurements and those of Le Marne. On the contrary the results of Terzian are not confirmed for NGC 6853; our measurement seems very accurate for the object appears as a point source and there is no confusion in the neighbourhood of the nebula.

By comparing the present results with previous results at other frequencies a further confirmation of the thermal radiospectrum of planetary nebulae is derived.

As the results of this work have been encouraging enough, observations of about 30 other nebulae were obtained in July 1967. The reduction of data is now in progress and a fuller account will be given elsewhere (Ficarra, 1967, submitted to *Nuovo Cimento*; Barbieri and Ficarra, in preparation).

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Table 1

Nebula	Optical Position (1950) R.A.	Dec.	Average Flux Density (10^{-26}Wm^{-2}cps^{-1}) 3000 TCS	2730 SO	1430 TCS	750 MT	430 T	408 LM	408 BF	195 T	Notes
NGC 246	00^{h}44^{m}30^s.8	−12°09′	0·15	0·20					⩽0·2		
NGC 1514	04 06 08·3	+30 39	0·29		0·39		0·37		0·3		
IC 418	05 25 10·2	−12 44	1·41	1·29	1·14	0·43		⩽0·3	⩽0·3		1
NGC 2371-2	07 22 26·9	+29 36	<0·13				0·22		0·3		
NGC 2438	07 39 32·6	−14 37	0·12						<0·1		
NGC 3587	11 11 58·0	+55 17	0·10			0·22			⩽0·2		
NGC 6058	16 02 44·0	+40 49	<0·14						<0·1		
NGC 6210	16 42 23·7	+23 53	0·32	0·48	0·37	<0·85	<0·10		⩽0·2		
NGC 6720	18 51 43·3	+32 58	0·42		0·37	0·45	0·50		⩽0·4	0·21	2
NGC 6781	19 16 01·2	+06 27	0·37		0·77		0·38		0·5		3
NGC 6818	19 41 07·8	−14 16	0·34	0·34	0·45				⩽0·2		4
NGC 6853	19 57 27·0	+22 35	1·3	1·81	>0·51	1·09	0·97		1·6	0·40	
NGC 7009	23 01 27·7	−11 34	0·62	0·79	0·57	0·04		<0·3	⩽0·2		5
NGC 7662	23 23 29·5	+42 16	0·66		0·51	0·67			⩽0·4		6

[1] An unresolved source of 1·3 flux units is observed at 05^{h}25^{m}28^s, −11°50′ (probably the same source indicated by Le Marne, 1966). A considerable broadening Southeast of the source indicates the presence of a weaker source at the optical position of IC 418.

[2] A source of 1·2 flux units is observed at 18^{h}51^{m}39^s, +32°28′. A slight broadening North of the source indicates the probable presence of a weaker source.

[3] The flux indicated at 430 MHz is that measured by Terzian (1967). All the data now available show the spectrum is thermal. Previous evidence of a non-thermal spectrum (Terzian, 1966) comes from confusion with the source 4C 06·66.

[4] Measurement confused by the presence of a source of 1·1 flux units at 19^{h}41^{m}04^s, −13°40′.

[5] Measurement confused by the presence of a source of 1·0 flux units at 21^{h}01^{m}12^s, −12°00′.

[6] Confused, at high declination, by a strong source of 2·4 flux units at 23^{h}23^{m}21^s, +43°00′.

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