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REDSHIFTS FOR SOUTHERN QUASARS

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SUMMARY

Spectroscopic observations of 21 quasi-stellar objects have been made with the Anglo-Australian 3·9-m telescope. Redshifts have been determined for 15 of the QSOs. Two other objects may have a single emission line while four show no features at all.

Redshifts for 15 southern QSOs have been obtained using an image-tube scanner (Robinson & Wampler 1972) at the Cassegrain focus of the Anglo-Australian 3·9-m telescope. Slit dimensions of 3×3 arcsec were used to match the

TABLE I

List of QSOs with redshifts

Parkes source number	Optical position (1950·0) RA h m s	Dec. ° ′ ″	S(2700) (Jy)	S(5000) (Jy)	Magnitude	Redshift z	Footnote
0122−00	01 22 55·15	−00 21 31·2	1·41	1·24	17·1	1·08	1
1302−102	13 02 55·83	−10 17 16·7	1·23	1·28	16·1	0·286	2
1352−104	13 52 07·8	−10 26 26	0·79	0·79	18·6	0·332	2
1451−375	14 51 18·25	−37 35 22·9	1·51	1·84	16·2	0·321	3
1954−388	19 54 39·01	−38 53 12·6	2·00	2·00	17·5	0·63	4
1958−179	19 58 04·64	−17 57 16·8	1·11	1·17	18·2	0·65	2
2021−330	20 21 26·9	−33 03 25	0·79	0·90	19·9	1·47	5
2044−168	20 44 30·78	−16 50 09·4	0·77	0·80	16·9	1·943	2
2204−54	22 04 26·15	−54 01 14·3	2·20	2·82	18·0	0·51	6
2227−399	22 27 45·2	−39 58 24	1·02	1·02	18·5	0·323	5
2243−123	22 43 39·76	−12 22 41·1	2·74	2·38	17·3	0·63	2
2255−282	22 55 22·45	−28 14 25·2	1·38	1·73	16·7	0·93	2
2310−322	23 10 27·5	−32 14 07	0·49	0·30	16·6	0·340	5
2320−035	23 20 57·51	−03 33 33·3	0·42	0·39	18·6	1·41	5
2320−035W	23 20 52·04	−03 33 39·6			20·6	2·04	5

References to finding charts

1. Bolton & Ekers (1966).
2. Peterson *et al.* (1973).
3. Peterson & Bolton (1972).
4. Shimmins *et al.* (1971).
5. Peterson & Bolton (1973).
6. Savage, Bolton & Wright (in preparation).

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TABLE II

Details of individual spectra

(1) Source number	(2) Adopted redshift (z)	(3) Line identification	(Å)	(4) Expected wavelength (Å)	(5) Measured wavelength (Å)	(6) Line width (Å)	(7) Line/ continuum ratio	(8) Wavelength range (Å)
0122−00	1·08	C III]	1909	3971	3968	125	0·4	3573–6133
		Mg II	2798	5820	5848	115	0·6	
1302−102	0·286	Mg II	2798	3598	3601	50	0·3	3301–5861
		O III	3133	4029	4011			
		He II	3203	4119	4136			
		[O II]	3727	4793	4788	NR	0·2	
		[Ne III]	3869	4976	4981			
		Hα	4340	5581	5586			
1352−104	0·332	Mg II	2798	3727	3728	40	1·2	3301–5861
		[Ne V]	3426	4563	4566			
1451−375	0·321	Mg II	2798	3696	3691	50	0·5	3578–6138
		[Ne v]	3426	4526	4528	NR	0·1	
		[O II]	3727	4923	4928	NR	0·1	
		[Ne III]	3869	5111	5111	NR	0·2	
		Hγ + [O III]	4355	5753	5753	blend		
1954−388	0·63	Mg II	2798	4571	4571	60	0·4	3578–6138
1958−179	0·65	Mg II	2798	4617	4632			3297−7329
		[Ne v]	3426	5653	5653			
		[O II]	3727	6150	6153			
2021−330	1·47	C IV	1549	3826	3828	50	3·0	3301–5861
		C III]	1909	4715	4732			

2044−168	1·943	Lyα	1216	3579	3576	30	4·2	3301–6138
		N v	1240	3649	3651	50	1·0	
		Si iv + O iv]	1400	4120	4123	blend	0·5	
		C iv	1549	4559	4538	50	1·7	
		C iii]	1909	5618	5608	35	0·4	
2204−54	0·51	Mg ii	2798	4223	4223	40	0·7	3578–6138
2227−339	0·323	Mg ii	2798	3702	3690	100	2·6	3572–6133
		[Ne v]	3426	4533	4533	25	1·2	
		[O ii]	3727	4931	4933	NR	2·0	
		[Ne iii]	3869	5119	5123	15	2·2	
		[Ne iii]	3968	5250	5265	NR	0·7	
2243−123	0·63	Mg ii	2798	4561	4570	50	1·1	3285–7329
		He ii	3202	5219	5213	50	0·2	
2255−282	0·93	C iii]	1909	3684	3678	100	1·0	3578–6138
		Mg ii	2798	5400	5423	50	0·8	
2310−322	0·340	Mg ii	2798	3749	3753	85	0·5	3572–7329
		[Ne v]	3426	4591	4580	NR	0·2	
		[O ii]	3727	4994	4995	NR	0·2	
		[Ne iii]	3869	5184	5188	NR	0·2	
		Hδ	4101	5494	5508			
		Hγ	4340	5816	5833	115	0·2	
		H_β	4861	6514	6512	150	0·6	
		[O iii]	4959	6645	6644	15	0·6	
		[O ii]	5007	6709	6709	15	1·8	
2320−035	1·41	C iv	1549	3733	3743	75	1·5	3578–6138
		C iii]	1909	4601	4593	75	0·5	
2320−035W	2·04	Lyα	1216	3697	3693	125	2·0	3578–6138
		Si iv + O iv]	1400	4256	4258	blend		
		C iv	1549	4709	4711			

NOTES ON INDIVIDUAL OBJECTS

0122−00 This object was observed by Lynds (1967) who gives a redshift of 1·070. Our measured wavelengths for the lines identified as C III] and Mg II are higher than his by 20 and 50 Å respectively. The Mg II line appears to be asymmetric, suggesting self-absorption in the blue wing. This absorption may have developed since Lynds' observation.

2021−330 The redshift for this object is doubtful. It depends on the identification of a weak and broad feature at λ 4732 Å with C III] (λ 1909).

2044−168 This object has a strong emission-line spectrum similar to that of PKS 0237−23. He II (λ 1640) is probably also present and the N V (λ 1240) is unusually prominent. There is a sharp absorption feature in the C IV emission line with a redshift of 1·928 and a corresponding feature in the Ly-α line at the same redshift. Further study of this object with higher resolution would probably be of interest.

Fifty arcsec north of 2044−168 lies a second object with ultraviolet excess. This was found to be an 18 mag white dwarf with the Balmer lines in absorption near zero redshift.

2243−123 The Mg II line appears to have a narrow emission core ≈25 Å wide superposed on a wider feature ≈150 Å wide.

2255−282 The redshifts deduced individually from the C III] and Mg II lines are 0·926 and 0·938. The discrepancy is clearly due to self-absorption in the blue wing of the Mg II line as in the case of 0122−00.

2310−322 The Hβ line has a narrow emission core ≈15 Å wide superposed on a wider feature ≈150 Å wide.

2320−035 and 2320−035W This is one of a number of ' pairs ' of quasars found by Bolton & Peterson (see Wall 1974). This pair had previously been observed by Wills & Wills (see Wills 1974) who suggest a redshift for 2320−035W (the radio-quiet member of the pair) of 2·04 on the basis of lines at λ 3700 ± 20 Å and λ 4700 ± 20 Å, in good agreement with our result. They found one line at λ 3735 ± 10 Å in the spectrum of 2320−035 but failed to detect the second which clearly establishes our redshift of 1·41. At the time of their observations (1974 August), Wills & Wills (private communication) reported that both objects were ≈19 mag; however, our observations suggested that 2320−035W is now 2 mag fainter than 2320−035 which is probably 18·6 mag.

ITS resolution of 7 Å. Twenty-one quasars were observed in a total of 17 observing hours during 1975 August 6 to 10. Integration times varied between 16 and 100 min.

The objects for which redshifts were determined are listed in Table I. The coordinates given to the nearest arcsec were estimated from the Palomar Sky Survey prints with the aid of transparent overlays. The more precise positions were measured at Parkes except for 0122−00 of which the position is taken from Argue, Kenworthy & Stewart (1973). Also given in Table I are radio flux densities recently measured at 6 and 11 cm with the Parkes 64-m telescope. The magnitudes are estimated directly from the count rate of the ITS.

Apart from the QSOs listed in Table I, six others were observed, five in the wavelength range λλ 3580 to 6080 Å and one (1424−11) in the range λλ 3300 to 5800 Å. No definite lines were found in the spectra of 2012−017, 2131−021, 2240−260 and 2312−319. The spectrum of 1424−11 shows one broad line at λ 5076 Å which is possibly Mg II at a redshift of 0·81, while 1452−217 may have an emission feature at λ 4998 Å.

Table II lists the wavelengths of the lines seen in the spectra of the QSOs, their identifications, and the expected wavelengths of these lines at the adopted redshifts. Whenever possible, redshifts were calculated from the narrow forbidden lines in preference to other broader emission features. Also given are half-power widths for lines with high signal-to-noise ratios (NR—not resolved—indicates a width approximately equal to the instrumental profile width of 7 Å), and the ratios of the line strengths to those of the interpolated continuum.

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