THE LARGE, BRIGHT QSO SURVEY. V. QSOs IN THREE SOUTHERN FIELDS¹

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ABSTRACT

This is the fifth and final paper in a series reporting the results of a program aimed at selecting ~ 1000 QSOs brighter than $B_r \approx 18.75$ using machine-scanned direct and objective-prism plates from the UK Schmidt Telescope. The plate material is scanned at the Automated Plate Measuring facility. The candidate list is derived using a number of complementary selection algorithms ranging from "traditional" criteria, such as the presence of strong emission features, to criteria designed to select objects whose objective-prism spectra cannot be classified as normal stars, although they may possess no obvious QSO-like features. Follow-up spectroscopy at the 2.5 m duPont telescope of the Las Campanas Observatory is used to classify each candidate. In this paper we present results from three UK Schmidt Telescope fields in which 200 QSOs have been found, 182 of which form part of the LBQS sample. Coordinates, magnitudes, redshifts, and spectra of moderate resolution and signal-to-noise ratio are given for all 200 QSOs as well as for 3 additional extragalactic objects which fail to meet our absolute magnitude criterion as QSOs.

1. INTRODUCTION

This is the last paper in a series of five presenting the observational data for the Large, Bright QSO Survey (LBQS), which is aimed at providing a sample of more than 1000 QSOs of a wide variety of types in the range $16.0 \leq B_r \leq 18.85$. Candidates are selected from machine-scanned UK Schmidt Telescope direct and objective-prism plates using well-defined and consistently applied algorithms, and follow-up spectroscopy is obtained on the MMT and the 2.5 m duPont telescope. The reader is referred to the previous four papers in the series (Foltz *et al.* 1987; Foltz *et al.* 1989; Hewett *et al.* 1991; Chaffee *et al.* 1991, Papers I–IV, respectively) for a description of the scientific objectives, and candidate selection criteria used for the LBQS.

This paper reports observations of QSO candidates in the final three fields of the LBQS, all of which are located south of the celestial equator. Section 2 describes the observations and presents coordinates, magnitudes, and spectra for each

of the confirmed 200 QSOs and 3 AGNs. In Sec. 3 we compare our sample with all previously detected QSOs in the three fields and update the redshift distribution for the published LBQS.

2. OBSERVATIONS

2.1 Plate Material and Candidate Selection

Three pairs of direct and objective-prism United Kingdom Schmidt Telescope (UKST) plates, details of which are presented in Table 1, were searched for QSO candidates. The Automated Plate Measuring facility scans an area of $\sim 5.8^\circ \times 5.8^\circ$ on each plate, but the exclusion of areas around bright sources and near calibration wedges from further processing reduces the total area for the present fields to 94.9° sq. Furthermore, approximately 10% of the spectra cannot be processed because of plate flaws, satellite trails, or because they overlap with those of nearby sources. This results in an effective area of 85.5° sq., the figure that should be used for surface density and luminosity function calculations. Candidates fainter than $B_r = 16.0$ and brighter than the adopted limiting magnitude for each field (Table 1) were observed, irrespective of their direct image morphology. Candidate selection procedures have been described in Papers II and III.

¹ Observations reported here were obtained primarily at the Las Campanas Observatory, a facility of the Observatories of the Carnegie Institution of Washington.

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TABLE 1. Plate data.^a

Plate No.	R.A. (1950)	Dec.	Filter	Exp. Time ^b	Date	Grade ^c	Seeing	$B_{J_{\text{line}}}$
J9766	00 53	-28 00	GG395	70	23 Nov 1984	A	2.5	18.76
UJ3682P	00 53	-28 00	none	70	17 Oct. 1977	A1	2.0	
J6229	21 28	-45 00	GG395	65	09 Aug 1980	A	2.0	18.55
UJ4520P	21 28	-45 00	none	60	30 Sept. 1978	A13	2.5	
J1746	22 03	-18 55	GG395	70	06 Aug 1975	B14	4.0	18.46
UJ6526P	22 03	-18 55	none	45	30 Oct 1980	A	2.0	

Notes to TABLE 1

^a All plates are Kodak IIIa-J emulsion.^b Exposure times in minutes.^c Details of the UKST grading system can be found in the UKST Handbook (1983).

2.2 Magnitude Calibration

Instrumental B_J magnitudes for the three UKST direct IIIa-J plates were calibrated using a photometric sequence established from CCD B and V frames in five areas in each field obtained with the Las Campanas 1 m telescope. Further details on photometric calibration of the LBQS may be found in Paper II.

2.3 Spectroscopic Observations and Redshift Determinations

All but four of the spectra reported in this paper were obtained with the Las Campanas 2.5 m duPont telescope, using the Boller and Chivens spectrograph. The 2D-Frutti system which records the spectrum consists of a continuously readout Fairchild 380×244 CCD behind an image intensifier chain. Real-time processing centroids individual photon events to better than $1/2$ a CCD pixel, and we used a 64×3040 output pixel format. The observations were obtained in three observing runs: 22 August 1987–30 August 1987, 8 September–12 September 1988, and 28 August 1989–1 September 1989. A 600 g/mm grating was used for the first run, and a 300 g/mm grating for the remaining two. The 2D-Frutti-300 g/mm grating combination yields approximately $2.7 \text{ \AA}$ and 1.4 arcsec per output pixel in the wavelength and spatial directions, respectively. We used a 90-arcsec-long slit with the width varying between 1.6 and 2.0 arcsec. The 300 g/mm grating and a 2.0 arcsec slit gives a resolution (FWHM) of 4 pixels or $11 \text{ \AA}$, with useful coverage from $3200 \text{ \AA}$ to approximately $7500 \text{ \AA}$, (second-order light contaminates the data longward of $6400 \text{ \AA}$). The 600 g/mm grating gives twice the resolution but somewhat less useful coverage at the red end.

During each night observations were made of two to three standard stars, and arc spectra were obtained at regular intervals. Because of the rather severe distortions caused by the intensifier, subtraction of the strongest night sky lines was not perfect and many of the spectra contain residual features at the positions of the strongest lines, notably $[\text{O I}] \lambda 5577$ and $\lambda 6300$. Data reduction consisted of flatfielding, wavelength calibration (using a 4th order polynomial fit to the arc spectra), sky subtraction (using a fit to two 15 arcsec windows separated by 10 arcsec from the object on either side), and flux calibration. Due to variable seeing and occasional cloud, the absolute flux calibration is uncertain for some objects.

Two QSOs (2128 – 4555 and 2129 – 4307) were observed at the AAT in September 1989 using the RGO spectrograph and IPCS. These observations spanned the wavelength range from 3850 to $5828 \text{ \AA}$. No standard stars were observed so that the spectra are presented in units of detected photons. Finally, two QSOs were observed at CTIO using the RC Spectrograph. In October 1989, 2154 – 2105 was observed over the range 3200 – $7000 \text{ \AA}$ at a resolution of about $10 \text{ \AA}$ using the 2D-Frutti. In October 1990, 2154 – 2005 was observed at comparable resolution over the wavelength range 3500 – $6900 \text{ \AA}$ using a UV-flooded TI CCD on the Folded Schmidt Camera.

Of the 300 candidates in the three new fields presented here, 200 were found to be QSOs. All 182 QSOs with magnitudes within the LBQS limits (Table 1) are listed in Table 2 in order of right ascension. Column 1 gives the name, columns 2 and 3 the celestial coordinates (equinox 1950.0), column 4 the emission-line redshift, column 5 the B_J magnitude, column 6 the UT date of the spectroscopic observation, and column 7 comments on the spectrum. As in previous papers we estimate our coordinate and magnitude accuracy to be $\pm 1 \text{ arcsec}$ and $\pm 0.15 \text{ mag}$, respectively. Redshifts were derived using the composite spectrum of 718 LBQS QSOs (Francis *et al.* 1991) as a template against which to cross correlate the spectrum of each confirmed QSO.

Figure 1 presents flux-calibrated spectra of all objects listed in Table 2. Except for the two QSOs noted above observed at the AAT, the y axis represents the flux per unit wavelength, but the scale factors are arbitrary; for the AAT spectra the raw counts are plotted.

Figure 2 and Table 3 present the same information as contained in Fig. 1 and Table 2 for confirmed QSOs that are fainter than the LBQS limit in their corresponding field. They should not be considered part of the LBQS sample.

Figure 3 and Table 4 present spectra and relevant parameters, respectively, for those extragalactic objects with $z \geq 0.2$ and $M_{B_J} > -21.5$, the adopted absolute magnitude threshold for the LBQS sample. In computing the absolute magnitude of the objects, a Hubble constant of $100 \text{ km s}^{-1} \text{ Mpc}^{-1}$, $q_0 = 0.0$ and k corrections assuming the QSOs are represented by a simple power-law flux distribution $F(\nu) \propto \nu^\alpha$, with $\alpha = -1$ have been adopted.

Table 5 presents relevant parameters for extragalactic objects with $z < 0.2$, the adopted redshift threshold for the LBQS sample.

3. COMPARISON WITH PREVIOUSLY KNOWN QSOs

As in Papers I–IV, we compare our list of QSOs with previously published lists as a crude test of our selection efficiency. We rely primarily on the Hewitt–Burbidge (HB) catalogue (1987, 1989) for this comparison, although two recent studies by Boyle *et al.* (1990) and Cristiani *et al.* (1990) are also included in our search since they report additional QSOs in the fields presented here. We restrict our comparison to objects with $z > 0.2$ and published magnitudes between 16.0 and 19.0, irrespective of the optical passband employed. We also include objects for which no magnitude is given in HB.

Of the 131 QSOs meeting our redshift and magnitude criteria listed in the above references, our procedures have independently identified 62. The remaining 69 are listed in Table 6, where the coordinates given are those measured from our UKST direct plates. Unless otherwise noted, the entries are taken from HB. Sixty-one of the objects are fainter than our

TABLE 2. Confirmed QSOs.

Designation	R.A. (1950)	Dec. (1950)	z_{em}	B_J	UT Date	Comment	Designation	R.A. (1950)	Dec. (1950)	z_{em}	B_J	UT Date	Comment
0039-2630	00 39 36.3	-26 30 32	1.810	17.3	08/30/89	HB	0051-2605	00 51 53.5	-26 05 17	0.624	18.3	09/10/88	
0039-2727	00 39 50.0	-27 27 29	1.407	18.6	08/29/89		0052-3020	00 52 00.7	-30 20 52	0.990	17.7	08/28/89	f
0040-3024	00 40 33.2	-30 24 08	0.609	18.0	08/30/87		0052-2945	00 52 26.9	-29 45 49	0.760	18.7	09/08/88	
0040-2917	00 40 41.4	-29 17 22	2.087	17.8	08/29/89		0052-2856	00 52 40.9	-28 56 48	0.602	18.3	08/31/89	o,c
0040-2919	00 40 46.3	-29 19 40	0.624	18.4	08/24/87	o,c	0052-2550	00 52 41.2	-25 50 39	0.855	18.6	09/11/88	
0041-2638	00 41 15.2	-26 38 36	3.053	18.3	08/30/89		0052-3108	00 52 50.8	-31 08 33	0.350	18.1	08/30/87	
0041-2844	00 41 24.2	-28 44 07	0.839	18.3	08/29/87		0052-2853B	00 52 51.4	-28 53 35	0.634	18.6	08/28/89	o,c
0041-2707	00 41 24.4	-27 07 54	2.786	18.0	09/12/88	HB	0053-2639	00 53 11.3	-26 39 02	0.808	18.6	09/08/88	
0041-2904	00 41 28.6	-29 04 16	0.674	17.9	09/10/88		0053-2709	00 53 38.6	-27 09 11	1.039	18.2	08/28/87	HB
0041-2607	00 41 31.1	-26 07 42	2.505	17.1	08/30/89	HB	0053-2526	00 53 39.3	-25 26 23	1.379	18.4	08/29/87	
0041-2658	00 41 38.4	-26 58 30	2.457	18.6	08/28/89		0053-2813	00 53 47.2	-28 13 25	0.725	18.5	08/26/87	
0041-2859	00 41 40.9	-28 59 36	2.134	18.0	08/29/87		0054-3101	00 54 27.6	-31 01 01	1.788	18.7	08/29/89	
0042-2627	00 42 06.4	-26 27 46	3.289	18.5	08/29/89	HB,L	0055-2744	00 55 09.7	-27 44 40	2.195	18.6	09/11/88	HB
0042-2908	00 42 07.5	-29 08 15	1.250	18.4	08/29/87		0055-2559	00 55 14.3	-25 59 06	0.582	18.2	08/28/89	HB,n
0042-2550	00 42 17.1	-25 50 37	0.454	18.3	08/24/87	o,c	0055-2948	00 55 43.3	-29 48 59	0.663	18.5	08/28/89	HB
0042-2750	00 42 26.9	-27 50 21	0.741	18.2	08/26/87		0056-2915	00 56 20.8	-29 15 34	1.257	18.5	08/28/89	HB
0042-3053	00 42 35.7	-30 53 28	1.974	18.5	08/30/89		0056-2843	00 56 41.3	-28 43 14	0.934	17.8	08/24/87	
0042-2930	00 42 41.9	-29 30 58	2.388	17.8	08/29/87	2d,ld?	0056-2948	00 56 58.1	-29 48 19	0.351	18.4	08/25/87	
0042-2657	00 42 52.3	-26 57 16	2.898	18.7	09/11/88	n	0057-2630	00 57 30.2	-26 30 23	1.042	18.6	09/09/88	
0042-2729	00 42 55.3	-27 29 07	0.933	18.7	09/09/88		0057-2908	00 57 40.6	-29 08 15	0.489	18.4	08/25/87	HB,n,o,c
0043-2743	00 43 22.6	-27 43 34	1.049	18.5	08/26/87		0057-2729	00 57 56.6	-27 29 46	1.203	18.5	08/28/89	HB
0043-2937	00 43 02.1	-29 37 02	2.230	18.8	09/10/88		0058-2604	00 58 06.2	-26 04 45	2.472	18.5	08/24/87	
0043-3006	00 43 49.8	-30 06 34	1.124	18.7	09/01/89		0058-2919	00 58 34.5	-29 19 01	1.193	18.4	08/28/89	HB
0045-3002	00 45 04.7	-30 02 53	2.021	18.3	09/12/88	HB	0058-2907	00 58 35.6	-29 07 23	0.866	18.4	08/25/87	
0045-3045	00 45 14.4	-30 45 01	0.979	17.4	08/30/89		0059-2525	00 59 14.9	-25 25 06	0.454	17.6	08/31/89	a
0045-2806	00 45 41.6	-28 06 23	1.138	18.7	09/11/88		0059-2545	00 59 21.4	-25 45 59	1.955	18.5	09/01/89	
0045-2606	00 45 45.4	-26 06 27	1.242	18.0	08/29/89	b?	0059-2625	00 59 27.7	-26 25 08	2.100	18.6	09/11/88	HB
0046-2812	00 46 01.8	-28 12 40	1.689	18.3	09/12/88	HB,n	0059-3034	00 59 37.1	-30 34 34	1.033	17.2	08/24/87	
0046-2834	00 46 18.0	-28 34 01	0.634	17.7	09/01/89	HB,o,c	0059-2946	00 59 50.3	-29 46 19	1.076	17.8	08/28/89	
0046-2914	00 46 50.7	-29 14 40	0.781	18.0	09/09/88		0059-2735	00 59 52.4	-27 35 57	1.600	18.1	09/12/88	HB,b
0047-3059	00 47 08.9	-30 59 51	0.559	18.0	08/30/87	o,c	0100-2809	01 00 27.5	-28 09 10	1.768	18.2	08/25/87	a
0047-2759	00 47 49.7	-27 59 36	2.130	18.3	08/30/87	HB	0100-2702	01 00 31.6	-27 02 43	1.606	17.9	08/28/89	HB,r
0047-2522	00 47 52.1	-25 22 32	1.184	18.7	08/30/89		0100-3105	01 00 39.7	-31 05 44	2.641	18.3	08/30/87	n,d
0047-2647B	00 47 54.3	-26 47 55	0.495	18.6	08/28/89	HB	0101-2708	01 01 01.8	-27 08 50	0.558	18.6	09/10/88	
0047-3050	00 47 54.7	-30 50 41	2.973	18.5	08/29/89	L?	0101-2548	01 01 08.2	-25 48 33	1.973	18.6	08/30/87	
0047-2538	00 47 57.9	-25 38 56	1.969	18.4	08/29/87		0101-2611	01 01 23.9	-26 11 05	0.277	18.0	08/29/89	
0048-2901	00 48 24.2	-29 01 46	0.783	18.3	08/24/87		0101-3025	01 01 32.0	-30 25 52	3.152	18.5	08/29/89	HB,L
0048-2918	00 48 26.4	-29 18 15	0.435	18.3	08/30/89		0102-2713	01 02 16.6	-27 13 12	0.780	17.5	08/29/89	HB,f
0048-2545	00 48 35.4	-25 45 08	2.082	18.2	09/20/88		0102-2634	01 02 56.6	-26 34 18	1.223	18.3	08/29/89	HB
0048-2804	00 48 47.1	-28 04 19	0.845	17.9	08/27/87	HB	0103-2753	01 03 10.7	-27 53 02	0.848	18.1	08/26/87	b,f
0049-2820	00 49 01.2	-28 20 53	2.256	18.4	08/25/87	HB,2d	0103-2901	01 03 33.0	-29 01 32	2.870	18.5	08/28/87	d?
0049-2840	00 49 42.3	-28 40 27	0.640	18.7	09/08/88	o,c	0103-2622	01 03 34.3	-26 22 24	0.776	16.9	08/30/89	
0049-2535	00 49 44.3	-25 35 17	1.528	18.5	09/10/88	b?	0103-2913	01 03 54.3	-29 13 05	2.803	18.5	09/12/88	HB,L
0049-3050	00 49 44.4	-30 50 13	0.637	18.5	09/10/88	o,c	0103-2749	01 03 57.3	-27 49 52	1.018	18.3	08/28/87	
0050-2905	00 50 05.9	-29 05 36	1.610	18.5	09/12/88	HB,n	0104-2809	01 04 15.2	-28 09 57	1.584	18.4	08/28/87	HB
0050-2523	00 50 18.0	-25 23 11	2.159	17.8	08/24/87	HB	0105-2649	01 05 17.8	-26 49 30	2.463	17.7	08/30/89	n
0050-2527	00 50 41.4	-25 27 39	1.019	17.6	08/28/89	n	2110-4509	21 10 58.5	-45 09 05	0.555	18.5	09/11/88	o,c
0050-2806	00 50 49.2	-28 06 29	1.823	18.7	09/12/88	HB	2111-4506	21 11 09.7	-45 06 50	1.376	17.3	09/11/88	
0050-2742	00 50 50.9	-27 42 06	0.479	17.9	08/27/87	HB o,c	2111-4335	21 11 50.9	-43 35 39	1.708	16.7	08/22/87	b
0051-2839	00 51 21.7	-28 39 58	1.577	18.3	08/27/87	HB	2113-4305	21 13 23.7	-43 05 32	1.249	18.0	09/09/88	

TABLE 2. (continued)

Designation	R.A. (1950)	Dec. (1950)	z_{em}	B_J	UT Date	Comment	Designation	R.A. (1950)	Dec. (1950)	z_{em}	B_J	UT Date	Comment
2113-4538	21 13 25.5	-45 38 45	0.946	17.3	09/10/88		2154-2005	21 54 19.6	-20 05 33	2.040	18.1	10/23/90	HB
2113-4345	21 13 38.4	-43 45 08	2.053	18.5	09/11/88	a?	2154-1908	21 54 38.0	-19 08 44	1.656	18.0	09/01/89	HB
2114-4346	21 14 03.5	-43 46 60	2.041	18.3	08/30/87		2154-2105	21 54 38.1	-21 05 26	0.570	17.6	10/08/89	o,c
2114-4335	21 14 10.8	-43 35 34	1.318	17.9	09/11/88		2156-1819	21 56 04.7	-18 19 14	0.360	18.4	09/09/88	o
2115-4501	21 15 42.8	-45 01 59	0.597	18.3	08/27/87		2158-1855	21 58 14.3	-18 55 49	0.687	17.6	09/11/88	HB
2116-4439	21 16 55.2	-44 39 38	1.480	17.7	09/09/88	b	2158-1657	21 58 50.0	-16 57 28	0.475	18.4	09/11/88	HB
2118-4702	21 18 29.2	-47 02 33	1.332	18.4	08/28/87	HBv	2159-1906	21 59 05.8	-19 06 22	0.364	18.2	08/22/87	n
2119-4758	21 19 25.6	-47 58 55	1.464	18.4	09/12/88		2159-1926	21 59 24.0	-19 26 21	1.174	18.2	09/12/88	HB
2119-4415	21 19 25.7	-44 15 49	0.728	18.3	09/01/89	n	2159-2058	21 59 48.7	-20 58 55	2.120	18.4	09/10/88	a?
2119-4249	21 19 26.3	-42 49 41	1.054	18.3	09/08/88	HBv	2200-2019	22 00 32.1	-20 19 52	0.671	18.4	09/11/88	
2120-4727	21 20 50.8	-47 27 16	1.591	18.0	08/29/87		2200-1759	22 00 39.2	-17 59 17	0.988	18.4	08/22/87	HB
2120-4327	21 20 50.9	-43 27 57	1.240	18.2	08/27/87		2200-1958	22 00 54.5	-19 58 21	1.260	17.9	08/22/87	n
2121-4406	21 21 42.0	-44 06 58	1.735	18.0	08/26/87	n	2201-1834	22 01 16.9	-18 34 17	1.814	17.8	08/25/87	HB,b?
2122-4231	21 22 00.2	-42 31 44	2.266	18.1	09/09/88		2203-2145	22 03 04.8	-21 45 13	2.273	18.4	09/01/89	
2123-4338	21 23 21.3	-43 38 30	0.480	18.3	09/01/89	o,c	2203-2134	22 03 55.0	-21 34 22	0.576	18.2	09/01/89	o,c
2127-4242	21 27 19.3	-42 42 46	0.799	17.7	08/27/87		2203-1833	22 03 55.2	-18 33 26	2.728	18.4	09/11/88	L?
2128-4327	21 28 13.1	-43 27 07	0.920	17.4	08/26/87		2204-1911	22 04 32.2	-19 11 41	1.063	17.6	08/26/87	HB
2128-4555	21 28 13.8	-45 55 07	0.624	18.4	09/13/89	U,o	2204-2043	22 04 49.7	-20 43 53	1.689	17.9	09/09/88	
2128-4610	21 28 21.9	-46 10 52	0.833	17.6	08/28/87	HBv	2205-2014	22 05 18.5	-20 14 41	2.635	18.4	09/08/88	d?
2129-4307	21 29 05.3	-43 07 28	0.311	18.4	09/13/89	U	2205-2053	22 05 21.4	-20 53 38	1.546	18.1	09/09/88	HB
2129-4624	21 29 39.4	-46 24 19	0.435	17.9	08/25/87	a?	2205-2129	22 05 25.2	-21 29 48	1.420	18.5	09/12/88	
2131-4257	21 31 33.3	-42 57 52	2.096	18.3	08/27/87	HBv	2205-2001	22 05 51.6	-20 01 31	1.716	17.9	09/01/89	HB
2132-4451	21 32 37.5	-44 51 02	0.920	18.5	09/08/88	HBv	2205-1940	22 05 59.3	-19 40 15	1.280	17.9	08/27/87	HB
2132-4321	21 32 54.9	-43 21 45	2.420	18.2	08/26/87		2206-1958A	22 06 06.9	-19 58 45	2.558	17.5	09/11/88	HB,2d
2132-4240	21 32 58.0	-42 40 07	1.629	18.5	08/29/87		2206-1803	22 06 40.9	-18 03 02	1.050	18.4	09/12/88	
2134-4239	21 34 38.1	-42 39 43	1.804	17.9	08/30/87		2207-1703	22 07 08.9	-17 03 41	0.371	18.4	09/10/88	o
2135-4243	21 35 14.3	-42 43 49	0.250	17.2	09/10/88		2207-2044	22 07 44.2	-20 44 27	1.168	18.1	08/26/87	
2135-4530	21 35 14.3	-45 30 50	0.308	17.7	09/09/88		2207-1627	22 07 51.8	-16 27 06	1.318	17.0	10/13/88	u
2135-4620	21 35 19.3	-46 20 47	0.505	18.5	08/26/87		2208-1927	22 08 03.5	-19 27 38	1.532	18.2	09/12/88	HB,b??
2135-4253	21 35 20.0	-42 53 30	1.469	18.4	08/29/87	HBv	2208-1809	22 08 19.1	-18 09 47	1.290	17.7	08/25/87	
2136-4301	21 36 30.3	-43 01 23	1.343	18.2	08/29/87		2208-1720	22 08 32.1	-17 20 15	1.210	17.6	09/10/88	b
2136-4344	21 36 46.5	-43 44 38	0.490	18.2	09/10/88		2208-1905	22 08 52.5	-19 05 37	1.225	18.0	08/22/87	a?
2137-4435	21 37 51.5	-44 35 49	0.632	18.4	09/01/89	o,c	2209-1842	22 09 26.3	-18 42 30	2.092	17.7	09/01/89	HB,n
2138-4430	21 38 18.4	-44 30 14	1.104	18.5	09/09/88		2209-2124	22 09 59.5	-21 24 33	1.714	18.3	09/01/89	
2138-4650	21 38 41.4	-46 50 32	0.762	18.5	08/28/87		2210-1751	22 10 26.2	-17 51 55	1.557	17.9	09/09/88	b??
2139-4303	21 39 54.7	-43 03 11	0.320	17.5	09/11/88		2211-1745	22 11 46.2	-17 45 06	0.905	18.2	09/11/88	
2140-4552	21 40 16.3	-45 52 37	1.688	18.3	08/27/87	b?	2211-1915	22 11 53.7	-19 15 54	1.952	18.0	09/01/89	HB,b?
2142-4449	21 42 16.7	-44 49 32	1.025	18.2	09/10/88		2212-1634	22 12 13.2	-16 34 26	0.296	17.8	09/01/89	
2142-4318	21 42 42.7	-43 18 56	1.118	18.5	09/12/88		2212-1747	22 12 32.0	-17 47 20	1.159	18.3	09/01/89	
2153-2056	21 53 06.6	-20 56 03	1.849	17.8	09/01/89	HB	2212-1759	22 12 48.3	-17 59 07	2.217	17.9	09/12/88	HB,b
							2214-2048	22 14 06.6	-20 48 05	1.684	18.3	09/01/89	HB
							2214-1903	22 14 07.8	-19 03 14	0.396	18.2	09/01/89	

Notes to TABLE 2

a — 'Associated' absorption present, namely strong non-BAL absorption within 5000 km s^{-1} of the corresponding emission line.

b — BAL QSO; b? — probable BAL QSO; b?? — possible BAL QSO.

c — If single line were CIII] $\lambda 1909$, C IV $\lambda 1550$ would be observable.

d — Damped Lyman α candidate.

f — Strong UV Fe II emission.

L — Lyman limit absorption.

n — Narrow emission lines.

o — One-line redshift.

u — Droop in UV may be due to atmospheric dispersion losses at large airmass.

U — Uncalibrated flux scale.

HB — Tabulated in Hewitt and Burbidge (1987); HBv — radio-selected; HBv — Variability-selected.

FIG. 1. Intermediate-resolution spectra, in order of right ascension, of LBQS QSOs. Except for 2128 – 4555 and 2129 – 4307, for which the ordinate is proportional to the raw counts, the flux per unit wavelength is plotted, but the flux scales are arbitrary.

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 1. (continued)

FIG. 2. Spectra of QSOs which are fainter than the LBQS apparent magnitude limits.

FIG. 2. (continued)

TABLE 3. QSOs Fainter than magnitude limit.

Designation	R.A. (1950)	Dec. (1950)	z_{em}	B_J	UT Date	Comment
2113-4534	21 13 44.0	-45 34 17	2.541	18.9	08/28/87	
2114-4328	21 14 45.8	-43 28 14	1.280	18.7	08/30/87	
2115-4434	21 15 18.1	-44 34 54	2.160	18.9	08/27/87	
2117-4703	21 17 21.8	-47 03 47	2.255	19.0	08/30/87	
2118-4656	21 18 11.9	-46 56 02	1.720	18.9	08/27/87	
2123-4654	21 23 03.7	-46 54 52	1.400	18.7	09/01/89	
2124-4733	21 24 17.9	-47 33 03	1.411	18.9	08/27/87	
2124-4738	21 24 28.9	-47 38 39	0.340	18.7	08/29/87	
2126-4558	21 26 33.7	-45 58 45	1.577	18.9	08/28/87	
2126-4618	21 26 52.9	-46 18 59	1.888	18.8	08/22/87	
2127-4641	21 27 07.2	-46 41 24	0.273	18.8	08/26/87	
2127-4528	21 27 37.2	-45 28 57	2.713	18.8	08/22/87	
2133-4225	21 33 28.6	-42 25 18	0.837	18.6	08/30/87	
2133-4553	21 33 41.2	-45 53 00	0.985	18.9	09/01/89	
2135-4632	21 35 06.5	-46 32 27	2.214	18.8	08/28/87	
2138-4427	21 38 48.4	-44 27 08	3.170	18.9	08/26/87	d,L
2139-4434	21 39 14.7	-44 34 01	3.230	18.7	08/27/87	L?
2139-4332	21 39 22.3	-43 32 05	2.185	18.6	08/29/87	b

TABLE 4. AGNs with $z_{\text{em}} > 0.2$ and M_J absolute magnitude cutoff.

Designation	R.A. (1950)	Dec. (1950)	z_{em}	B_J	UT Date
0044-2951	00 44 22.6	-29 51 21	0.207	18.3	08/28/87
0046-2611	00 46 09.9	-26 11 39	0.234	18.5	09/09/88
0059-2639	00 59 48.7	-26 39 55	0.220	18.2	09/09/88

TABLE 5. AGNs and emission-line galaxies.

Designation	R.A. (1950)	Dec. (1950)	z_{em}	B_J	UT Date
0052-2956	00 52 22.2	-29 56 21	0.199	18.8	09/09/88
2131-4350	21 31 49.3	-43 50 27	0.030	17.2	09/09/88
2140-4542	21 40 10.0	-45 42 29	0.171	16.7	09/01/89
2150-1927	21 50 32.3	-19 27 49	0.137	17.5	10/13/88
2154-1942	21 54 40.5	-19 42 02	0.154	18.5	09/10/88
2154-1849	21 54 52.1	-18 49 17	0.139	16.6	08/26/87
2157-1753	21 57 45.7	-17 53 15	0.140	18.4	08/25/87
2202-1724	22 02 44.2	-17 24 34	0.141	17.9	08/25/87

FIG. 3. Spectra of extragalactic objects with $z > 0.2$ and $M_B > -21.5$.

TABLE 6. Previously discovered QSOs not in LBQS.

Designation	R.A. (1950)	Dec. (1950)	m _{pub}	B _J	Notes	Designation	R.A. (1950)	Dec. (1950)	m _{pub}	B _J	Notes
0043-267	00 43 38.4	-26 44 30	18.9	19.3	a	0100-261	01 00 33.1	-26 10 33	18.7	18.9	a
0044-281	00 44 20.7	-28 07 53	not given	19.1	a	0100-289	01 00 50.8	-28 57 28	18.9	19.2	a
0045-258	00 45 40.8	-25 51 31	not given	19.6	a	0101-268	01 01 15.8	-26 53 28	19.0	19.4	a
0045-288	00 45 41.1	-28 50 30	18.9	18.9	a	0103-271	01 03 07.8	-27 07 37	19.0	18.9	a
0045-260	00 45 49.9	-26 04 09	18.6	18.9	a	0104-275	01 04 2.1	-27 34 14	18.6	18.8	a
0047-293	00 47 06.2	-29 22 53	not given	19.4	a	0104-271	01 04 22.0	-27 07 51	not given	20.5	a,b
0048-298	00 48 16.2	-29 52 36	19.0	19.2	a	0104-265	01 04 22.8	-26 35 03	not given	19.8	a
0048-261	00 48 42.5	-26 08 36	18.2	19.6	a	2118-430	21 18 55.7	-43 03 38	18.43	18.7	a
0048-297	00 48 55.0	-29 44 46	18.9	19.6	a	Q2121-4510	21 21 37.0	-45 10 55	18.00	18.9	a,f
0049-296	00 49 13.0	-29 39 33	17.6	—	c,e	2131-461	21 31 02.6	-46 09 31	18.47	18.8	a
0049-272	00 49 29.4	-27 14 02	18.4	19.0	a	2132-452	21 32 02.9	-45 16 10	18.32	19.0	a
0049-290	00 49 29.8	-29 00 41	18.8	18.9	a	Q2132-4245A	21 32 04.6	-42 45 42	18.82	19.2	a,f
0049-276	00 49 44.7	-27 36 13	18.7	18.9	a	2133-439	21 33 45.7	-43 58 45	18.11	18.9	a,c
0050-281	00 50 10.2	-28 07 10	18.9	19.0	a	Q2134-4601	21 34 50.8	-46 01 49	17.83	—	c,e,f
0050-300	00 50 28.6	-30 01 00	not given	19.7	a	Q2135-4400	21 35 41.3	-44 00 49	18.30	18.9	a,f
0050-294	00 50 37.0	-29 29 13	18.92	18.8	a	2152-211	21 52 37.5	-21 07 27	18.9	18.6	a
0051-275	00 51 14.0	-27 33 42	18.8	18.9	a	2153-204	21 53 47.2	-20 26 50	17.01	17.4	c
0051-265	00 51 25.4	-26 29 43	not given	19.9	a,b	2154-204	21 54	-20 24	not given	—	g
0051-274	00 51 38.2	-27 26 27	18.90	18.9	a	2154-205	21 54 49.1	-20 32 07	18.4	20.0	a
0051-266	00 51 40.1	-26 37 18	not given	18.9	a,b	2155-174	21 55 39.9	-17 28 59	18.85	18.6	a
0051-280	00 51 43.2	-28 01 22	not given	20.3	a	2156-204	21 56 48.8	-20 26 24	18.5	18.6	a
0051-281	00 51 46.8	-28 11 52	18.97	18.9	a	2157-200	21 57 21.7	-20 00 14	18.5	18.8	a
0051-302	00 51 48.7	-30 12 11	19.0	—	c,e	2157-180	21 57 45.3	-18 05 23	18.6	18.7	a
0051-274	00 51 50.8	-27 24 44	not given	19.5	a	2158-214	21 58 08.2	-21 28 22	18.15	17.9	c
0053-286	00 53 30.9	-28 36 26	18.6	18.9	a	2158-179	21 58 20.6	-17 54 34	18.9	18.7	a
0053-284	00 53 59.9	-28 24 46	18.25	19.6	a	2159-175	21 59 50.1	-17 30 59	19.0	19.3	a
0054-275	00 54 06.4	-27 33 36	18.92	19.0	a	2201-202	22 01 33.3	-20 13 52	18.25	18.8	a
0055-269	00 55 32.6	-26 59 27	17.1	18.9	a	2202-185	22 02 35.6	-18 32 01	18.81	18.8	a
0055-284	00 55 38.4	-28 28 23	18.87	18.8	a	2202-189	22 02 54.1	-18 59 36	18.82	19.0	a
0057-259	00 57 23.4	-25 55 43	19.0	19.0	a	2203-187	22 03 01.6	-18 46 27	18.27	18.5	a
0057-288	00 57 50.7	-28 51 33	19.0	—	c,e	2203-188	22 03 25.7	-18 50 18	18.50	18.7	a
0058-285	00 58 41.3	-28 31 01	19.0	18.8	a	2206-199	22 06 15.5	-19 59 05	18.65	18.6	a
0058-267	00 58 43.4	-26 43 29	19.0	19.3	a	2207-204	22 07 49.4	-20 29 11	18.6	18.1	h
0059-269	00 59 57.1	-26 57 54	18.9	18.9	a	2210-167	22 10 48.3	-16 43 37	18.5	18.5	a
0100-291	01 00 15.9	-29 10 20	19.0	19.2	a						

Notes to TABLE 6

- a — Object fainter than LBQS field limit.
b — HB coordinates in error by more than 5 arcseconds.
c — Spectrum overlapped on objective-prism plate.
d — Object brighter than LBQS field limit.
e — Direct image confused with nearby object. Magnitude unreliable.
f — Cristiani *et al.* (1990), quoted magnitude for maximum brightness.
g — No object found near published position.
h — This object is a star.

magnitude limit for the field in which they appear, and six have spectra that overlap with those of nearby objects and were not processed. Of the remaining two, one, 2207 – 204, which was originally only tentatively identified by Savage & Bolton (1979) as a QSO from its objective prism spectrum, we have shown to be a star. The other, identified in HB as 2154 – 204, is listed therein only by its nominal coordinates, and no finding chart is presented in the discovery paper of Savage *et al.* (1985), the only reference to this object of which we are aware. We find no image within 20 arcsec of the quoted position on our direct plate.

Thus, the 18 LBQS fields included in this paper and Papers I–IV contain 160 previously known QSOs whose spectra were processable and which lay within the LBQS magnitude range. Of these only one *bona fide* QSO, 1237-009 (cf. Paper III) and the BL Lac object 1210 + 121 (cf. Paper I) have escaped our detection.

Figure 4 shows the redshift histogram for 1031 LBQS QSOs as published in Papers I–V. There is a small dip in the 0.8–1.0 redshift bin. We have analyzed the statistical significance of this feature in the following manner. An estimate was made independently by two of us of the number of QSOs in the 0.8–1.0 bin based on the QSO distribution excluding that bin. We both obtained 105, 17 more than the observed number. One can then ask: given a hypothetical smooth distribution of 1048 objects (1031 + 17), and hence an intrinsic probability of 0.1002 (105/1048) for objects to fall in the 0.8–1.0 bin, what is the probability of getting ≤ 88 objects in the 0.8–1.0 bin from a sample of 1031 observed? The binomial probability one derives is 6%.

The absence of discontinuities significant at the $\leq 5\%$ level in this histogram at any redshift, and the extended range of redshifts covered is an independent qualitative indicator of the success of the LBQS selection procedures. Minor revisions of the photometric calibration and the extent of the scanned areas have occurred since the publication of Paper I. To ensure that the information necessary for statistical studies using the LBQS is readily accessible, we will produce a summary paper (Hewett *et al.*, in preparation) giving details of all the QSOs making up the final LBQS sample.

Note added in proof. Recently, L. Campusano [AJ, 102, 502 (1991)] presented spectra for 35 QSOs in the SGP. Of

FIG. 4. Redshift histogram of the LBQS, including all objects in this paper and those in Papers I–IV.

those satisfying the LBQS magnitude and redshift criteria, only two (01027 – 3012 and 00505 – 2641) are not listed herein. Both are in unprocessable areas of the plates.

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