

# ON THE NATURE OF THE FBS BLUE STELLAR OBJECTS AND THE COMPLETENESS OF THE BRIGHT QUASAR SURVEY. II.

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## ABSTRACT

In Paper I (Mickaelian et al. 1999), we compared the surface density of QSOs in the Bright Quasar Survey (BQS) and in the First Byurakan Survey (FBS) and concluded that the completeness of the BQS is of the order of 70% rather than 30–50% as suggested by several authors. A number of new observations recently became available, allowing a re-evaluation of this completeness. We now obtain a surface density of QSOs brighter than  $B = 16.16$  in a subarea of the FBS covering  $\sim 2250 \text{ deg}^2$ , equal to  $0.012 \text{ deg}^{-2}$  (26 QSOs), implying a completeness of  $53 \pm 10\%$ .

*Subject headings:* Quasars – Surveys

## 1. INTRODUCTION

In Paper I, by comparing the FBS (Markarian et al. 1989) and BQS (Green et al. 1986) surveys in their area in common, we derived a completeness of  $\sim 70\%$  for the BQS. A number of bright AGNs have since been discovered in the area which, together with our new spectroscopic observations, allowed us to refine our previous estimate of the BQS completeness.

Table 1: New spectra. Col. 1 gives the name, col. 2 the FBS number, col. 3 the original FBS classification, col. 4 the magnitude, cols. 5 and 6 the place and date of observation, col. 7 the galactic latitude, col. 8 the classification and col. 9 the redshift

	FBS #		mag		date	$b$		$z$
FBS 0228+447	227	B2	15.5	BAO	25.11.98	-14.4	*	
FBS 0744+818	1055	B1e	16.4	OHP	14.01.99	29.1	*	
FBS 0747+729	966	N3e	15.8	BAO	25.11.98	30.4	*	
FBS 0929+733	876	B3e	16.3	BAO	25.11.98	37.2	*	
FBS 0944+713	878	B3e	18.6	OHP	14.01.99	39.3	*	
FBS 0950+664	785	N2	16.7	BAO	25.11.98	42.4	S1	0.172
FBS 1049+803	1068	N1e	17.1	BAO	25.11.98	35.7	*	
FBS 1235+699	894	N1e	17.9	OHP	15.01.99	47.4	Q	0.521
FBS 1324+448	322	B1	17.	OHP	15.01.99	71.1	Q	0.331
FBS 1715+406	936	se	16.	OHP	18.01.99	34.5	G	0.029
FBS 2308+425	418	B1	13.5	OHP	14.01.99	-16.3	*	

## 2. OBSERVATIONS

We have obtained new spectra for 11 FBS objects. The observations were carried out on November 25, 1998 and January 14–15, 1999 at the Byurakan Astrophysical Observatory (BAO) and at the Observatoire de Haute-Provence (OHP), respectively. The journal of observations is given in Table 1, together with relevant data.

Seven of the newly observed objects are stars, including FBS 2308+425 (at  $b = -16.3^\circ$ ) which is associated with a ROSAT RASS (Voges et al. 1999) X-ray source (Table 2, Paper I).

FBS 0950+664 (RXS J09540+6608) has been identified on an objective prism plate as an AGN (Bade et al. 1998); our spectrum shows it to be a Seyfert 1 at  $z = 0.172$ . Our new spectra of FBS 1235+699 and FBS 1324+448 confirm their redshift ( $z = 0.521$  and  $0.331$  respectively). FBS 1715+406 is Zw 225.094 or MCG 07.35.061, a 15.4 mag galaxy at  $z = 0.030$  (Marzke et al. 1996); according to Abramian & Mickaelian (1994), it is an emission line galaxy; our spectrum shows that it is an absorption line galaxy, with a weak [N II]  $\lambda 6583$  line in emission at  $z = 0.029$ .

The spectra of the four extragalactic objects are displayed in Fig. ??.

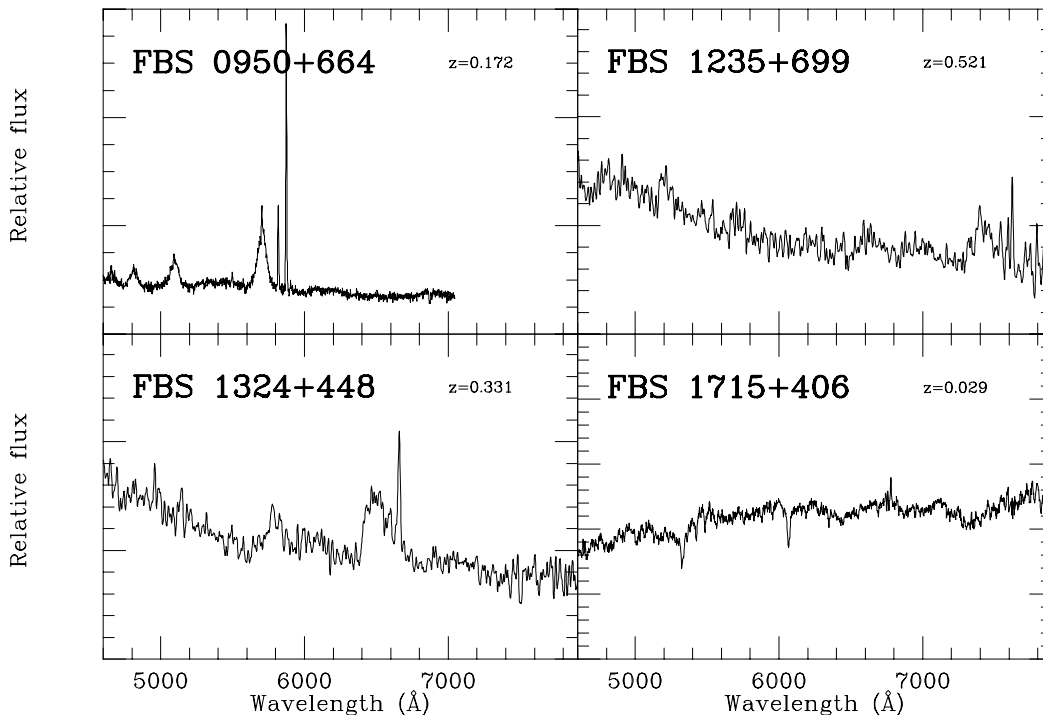


Fig. 1.— Spectra of the four extragalactic objects in Table ??.

### 3. NEW PUBLISHED DATA

Since the publication of Paper I<sup>1</sup> 51 new bright ( $B < 17.0$ ) AGNs have been discovered, at  $|b| > 30^\circ$ , in the subarea of the FBS survey studied in this paper, bringing the total number of known such objects to 108.

#### 3.1. MAGNITUDE ESTIMATE

We have extracted, when available, the  $O$  magnitudes of these 108 objects from the APS database (Pennington et al. 1993); these magnitudes are missing for five objects only (all at  $\delta > 63^\circ$ ). We have also extracted the  $O$  magnitudes from the USNO-A2.0 catalogue (Monet et al. 1996) which, as the APS, is based on measurements of the  $O$  plates of the Palomar Observatory Sky Survey I (POSS-I).

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<sup>1</sup>In Paper I, we claimed that the position accuracy of the FBS objects in the last seven papers by Abramian & Mickaelian is much better than in the first four papers of the series; in fact, the objects #924 to #939 in paper IX (Abramian & Mickaelian 1994) have an accuracy as poor as in the first four papers.

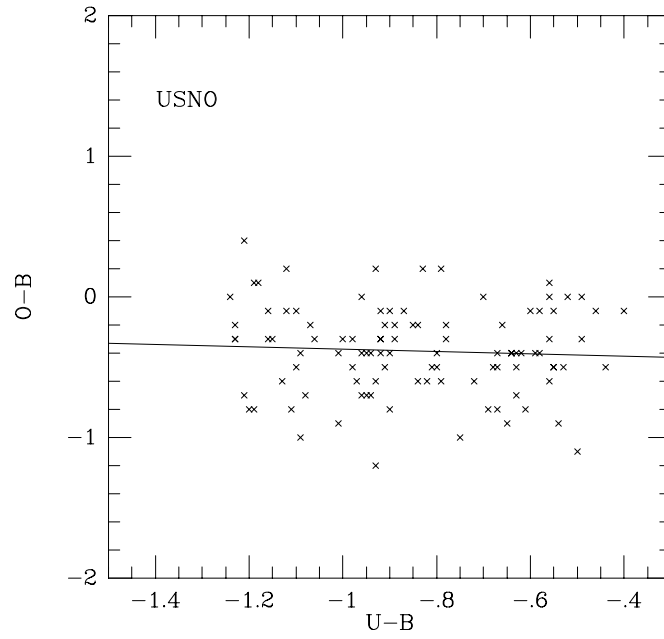


Fig. 2.— Plot of the differences between the USNO  $O$  and the photoelectric  $B$  magnitudes *vs* the photoelectric  $U - B$  colors for 102 PG objects

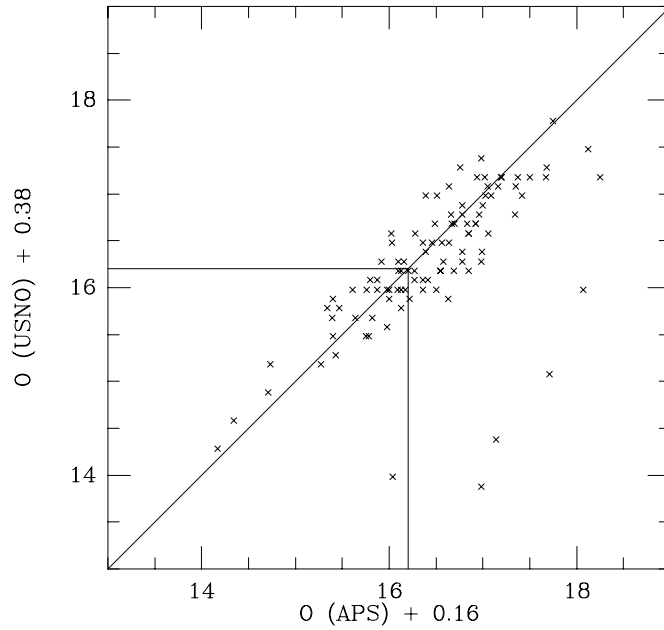


Fig. 3.— Plot of the USNO *vs* the APS  $O$  magnitudes for the bright AGNs listed in tables 2 and 3

To estimate the accuracy of these magnitudes, we have proceeded as for the APS  $O$  magnitudes (see Paper I): we have compared the differences between the USNO  $O$  and photoelectric  $B$  magnitudes of 102 PG UV-excess stars *vs* their photoelectric  $U - B$  colours (Fig. ??); we found a negligible colour equation, a *rms* dispersion of 0.31 mag, compared to 0.25 mag for the APS magnitudes, and a relatively large offset  $\langle O - B \rangle = -0.38$  mag (to be compared with  $\langle O - B \rangle = -0.16$  mag for the APS). Fig. ?? shows a comparison of the APS and USNO  $O$  magnitudes for the bright AGNs; they are in reasonable agreement, except for five objects for which the USNO magnitudes are brighter by more than one mag than the APS magnitudes; these five objects are low luminosity Seyfert 1 galaxies at relatively small redshifts ( $z < 0.13$ ) which probably explain the large magnitude differences; it seems that the USNO magnitudes for extended objects are grossly underestimated.

In Table ??, we list all bright ( $B < 17.0$ ) AGNs found in the FBS subarea at  $|b| > 30^\circ$  with their APS and USNO  $O$  magnitudes (when available) and the absolute  $B$  magnitudes computed<sup>2</sup> using the APS  $O$  magnitudes increased by 0.16 mag (or the USNO  $O$  magnitudes increased by 0.4 mag), excluding the bright QSOs of our “complete” sample (listed in Table ??).

In the case of RXSJ12110+7005 for which the APS magnitude is not available, Schwobe et al. (2000) give  $B = 17.0$ , while the USNO  $O$  magnitude is 14.3; but this object has a moderate redshift ( $z = 0.127$ ); moreover its APM  $O$  magnitude (Irwin et al. 1994) is 17.66; we therefore adopted the Schwobe et al. mag and excluded it from the “complete” sample.

### 3.2. THE NEW RADIO AND X-RAY BRIGHT QSOs

The FIRST Bright Quasar Survey (FBQS) was built by matching the VLA FIRST survey with the Cambridge Automated Plate Measuring Machine (APM) catalog of POSS-I objects (Irwin et al. 1994); it covers an area of 2 682 deg<sup>2</sup> in the north Galactic cap; it contains 1 238 objects brighter than 17.8 mag on the POSS-I  $E$  plates (White et al. 2000). About 1 180 square degrees are within the FBS area; they contain 38 FIRST radio sources identified with an AGN brighter than  $B = 17.0$  at  $|b| > 30^\circ$ ; nine are bright QSOs ( $O_{\text{APS}} < 16.0$ ), three (CSO 900, FIRST J1306+3915 and RXSJ17102+3344) being new. Although the numbers are small, this suggests that the “complete” sample we built in Paper I is only  $67 \pm 15\%$  complete.

According to White et al. (2000), QSOs with radio emission above the FIRST 1 mJy limit constitute about 25% of all QSOs brighter than  $B \sim 17.6$ , but for QSOs brighter than  $B = 16.4$ , the FBQS QSO density is indistinguishable from the density of optically selected QSOs. Nevertheless, of the 15 bright QSOs known prior to the FIRST survey in the area common to the FIRST and FBS surveys, only six (40%) have been detected as FIRST radio sources; therefore the complete

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<sup>2</sup>assuming  $H_0 = 50 \text{ km s}^{-1} \text{ Mpc}^{-1}$

Table 2: Bright AGNs ( $B < 17.0$ ) in the FBS subarea at  $|b| > 30^\circ$ , excluding the bright QSOs listed in Table 3. Cols. 1 to 6 give the B1950 position, cols. 7 and 8, the APS and USNO-A2.0  $O$  magnitudes respectively, col. 9 the name, col. 10 the redshift, col. 11 the galactic latitude, col. 12 the absolute  $B$  magnitude and col. 13 references for the newly identified AGNs: (1) Beuermann et al. (1999), (2) Cao et al. (1999), (3) Wei et al. (1999), (4) White et al. (2000), (5) Schwoppe et al. (2000), (6) Xu et al. (1999), (7) present paper

$\alpha$ (B1950)		$\delta$ (B1950)			APS $O$	US $O$	Name	$z$	$b$	$M_B$	ref.	
8	6	34.3	62	12	11	16.11	15.8	HS 0806+6212	0.173	33.0	-23.8	
8	38	31.7	77	3	59	17.55	14.7	FBS 0838+771	0.131	32.7	-21.8	
8	38	46.5	40	29	16	16.35	16.6	RXS J08420+4018	0.151	37.6	-23.3	(5)
8	44	33.9	34	56	9	16.98	14.0	FBS 0844+349	0.064	38.0	-20.7	
8	51	28.5	40	30	34	16.23	16.6	RXS J08547+4019	0.152	40.0	-23.5	(3)
8	53	58.4	75	6	34	16.40	16.1	RXS J08595+7455	0.276	34.3	-24.6	(2)
9	24	39.6	40	51	37	16.25	16.0	KUV 09247+4052	0.419	46.3	-25.6	(6)
9	31	50.8	43	44	35	16.47	15.5	FBS 0931+437	0.456	47.4	-25.6	
9	35	48.7	41	41	55	16.06	15.5	FBS 0935+416	1.966	48.3	-29.7	
9	36	38.9	39	37	38	16.69	16.2	PG 0936+396	0.458	48.6	-25.4	
9	45	33.2	40	44	42	16.82	13.5	NPM1G+40.0197	0.047	50.2	-20.3	(5)
9	47	44.8	39	40	54	16.39	15.8	FBS 0947+396	0.206	50.7	-23.9	
9	50	9.5	66	22	31	17.00	16.7	FBS 0950+664	0.172	42.4	-22.9	(7)
9	59	9.6	68	27	48	16.01	15.6	FBS 0959+685	0.773	42.0	-27.3	
10	2	12.0	34	28	59	16.86	16.8	FIRST J1005+3414	0.162	53.8	-23.0	(4)
10	2	37.3	43	47	17	16.39	15.8	FBS 1002+437	0.178	52.9	-23.6	
10	16	4.7	34	51	35	16.62	16.5	FIRST J1018+3436	0.109	56.6	-22.3	(4)
10	22	53.7	68	1	29	-	16.8	RX J10265+6746	1.178	43.9	-27.4	
10	25	11.2	63	18	8	-	15.8	RXS J10286+6302	0.080	47.2	-22.2	(5)
10	28	44.8	70	43	0	-	16.3	RXS J10325+7027	0.063	42.4	-21.2	(5)
10	31	7.6	36	10	39	16.76	16.3	CSO 275	0.169	59.6	-22.6	(4)
10	32	58.3	38	12	14	16.51	16.3	B3 1032+382	1.508	59.6	-28.5	(4)
10	48	56.5	34	15	22	15.94	15.8	FBS 1048+343	0.167	63.4	-23.9	
10	49	22.4	61	41	18	16.62	16.4	FBS 1049+617	0.421	50.4	-25.2	
10	50	37.5	66	27	59	-	15.9	RXS J10539+6612	0.117	46.9	-23.0	(1)
11	12	19.3	66	48	23	16.53	15.8	FBS 1112+668	0.544	47.9	-25.9	
11	12	19.8	43	6	11	17.03	16.8	PG 1112+431	0.302	64.9	-24.2	
11	17	16.8	39	44	32	15.18	15.4	CG 1410	0.086	67.4	-23.2	(5)
11	19	27.3	42	53	36	16.80	16.4	CSO 1169	0.813	66.2	-26.9	(4)
11	27	15.9	37	5	51	17.59	17.4	FIRST J1129+3649	0.399	70.2	-24.3	(4)

Table 2: (continues)

$\alpha$ (B1950)		$\delta$ (B1950)			APS $O$	US $O$	Name	$z$	$b$	$M_B$	ref.	
11	27	23.0	41	32	52	16.20	15.7	KUV 11274+4133	1.530	68.1	–28.4	
11	33	57.2	39	16	41	16.11	15.7	FIRST J1136+3900	0.795	70.4	–27.5	(4)
11	34	17.3	34	49	12	17.04	16.8	FIRST J1136+3432	0.192	72.4	–23.1	(4)
11	37	9.3	66	4	28	16.25	15.7	FBS 1137+661	0.652	49.7	–26.6	
11	40	56.8	68	1	34	16.82	15.9	FBS 1140+680	0.796	48.1	–26.6	
11	47	46.0	67	15	28	16.69	16.2	FBS 1147+673	1.020	49.1	–27.4	
11	48	41.7	38	39	2	16.20	15.6	FIRST J1151+3822	0.336	73.1	–25.2	(4)
11	48	53.3	38	42	33	17.34	16.8	B2 1148+38	1.304	73.1	–27.4	(4)
11	50	16.5	33	24	0	16.30	16.1	FBS 1150+334	1.389	76.0	–28.6	
11	58	17.6	35	25	13	16.76	16.3	HS 1158+3525	1.700	76.6	–28.5	(4)
12	1	51.1	43	47	38	16.23	16.0	FBS 1201+437	0.663	71.1	–26.7	(6)
12	8	37.8	70	22	12	–	14.3	RXS J12110+7005	0.127	46.6	–24.8	(5)
12	11	32.8	33	26	26	17.26	16.6	B2 1211+33	1.598	79.9	–27.9	(4)
12	18	5.9	39	9	55	16.67	16.3	FIRST J1220+3853	0.376	76.6	–25.1	(4)
12	35	12.9	69	58	13	17.96	17.1	FBS 1235+699	0.522	47.4	–24.4	
12	42	46.1	34	12	33	17.52	16.9	FBS 1242+342	0.717	83.1	–25.6	
12	48	26.6	40	7	58	16.33	16.3	PG 1248+401	1.032	77.3	–27.8	
12	55	1.7	44	45	47	16.48	16.1	FBS 1255+447	0.30	72.6	–24.7	
12	57	26.8	34	39	31	17.21	16.8	B 201	1.375	82.5	–27.6	(4)
13	12	37.0	42	34	9	15.31	15.4	NPM1G+42.0343	0.073	74.1	–22.7	(5)
13	24	54.6	44	50	36	18.09	16.8	FBS 1324+448	0.331	71.1	–23.3	
13	28	40.2	41	44	22	16.60	16.9	RXS J13308+4128	0.182	73.5	–23.5	(5)
13	29	29.8	41	17	23	16.78	16.8	FBS 1329+412	1.937	73.8	–28.9	
13	38	28.6	40	51	48	16.82	17.0	RXS J13406+4036	0.161	73.1	–23.0	(5)
13	38	52.0	41	38	22	16.50	16.4	FBS 1338+416	1.204	72.5	–28.0	
13	39	47.8	37	22	16	16.89	16.7	CSO 1010	1.106	75.4	–27.4	(4)
13	51	46.3	64	0	29	14.55	14.5	FBS 1351+640	0.088	52.0	–23.9	
13	54	2.3	41	50	53	16.69	15.8	RXS J13561+4136	0.697	70.4	–26.4	(4)
14	0	50.9	33	34	26	16.12	16.2	RXS J14030+3320	0.342	73.4	–25.4	(5)
14	15	57.2	43	25	43	17.51	16.8	RXS J14179+4311	0.079	66.2	–20.7	(5)
14	16	43.3	42	47	29	16.34	15.6	HS 1416+4247	0.421	66.5	–25.6	(4)
14	22	57.6	42	27	36	16.42	15.9	RX J14249+422	0.316	65.7	–24.9	
14	24	29.2	39	17	10	17.91	15.6	RXS J14265+3903	0.081	66.9	–20.4	(5)
14	29	20.9	40	5	55	16.62	15.9	CSO 464	1.217	65.7	–28.0	(4)
14	29	52.1	34	30	2	16.84	16.5	FIRST J1431+3416	0.704	67.3	–26.3	(4)

Table 2: (end)

$\alpha$ (B1950)			$\delta$ (B1950)			APS $O$	US $O$	Name	$z$	$b$	$M_B$	ref.
15	21	59.0	39	24	39	16.93	16.6	HS 1521+3924	0.657	56.2	-26.0	(4)
15	26	52.0	65	58	32	16.90	16.2	FBS 1526+659	0.345	44.4	-24.6	
15	43	15.9	35	2	6	17.18	16.4	RXS J15451+3452	0.518	52.3	-25.1	(4)
16	11	13.3	37	24	49	15.88	13.6	MCG 06.36.003	0.070	46.7	-22.0	(5)
16	12	59.6	37	53	34	16.87	16.6	FIRST J1614+3746	1.532	46.4	-28.2	(4)
16	30	15.1	37	44	8	16.62	16.0	FBS 1630+377	1.478	42.9	-28.4	
16	31	19.4	39	30	42	16.48	16.7	KUV 16313+3931	1.023	42.8	-27.6	(4)
16	39	36.8	35	56	0	16.54	16.3	FIRST J1641+3550	1.438	40.9	-28.4	(4)
17	1	36.2	37	41	32	15.60	15.6	RXS J17033+3737	0.065	36.8	-22.1	(5)
17	3	3.4	38	6	9	16.83	16.0	FIRST J1704+3802	0.063	36.6	-20.9	(4)
17	6	17.5	69	1	29	16.04	15.8	HS 1706+6901	0.449	34.6	-26.0	
17	11	17.2	35	27	1	16.84	16.3	FIRST J1713+3253	0.083	34.5	-21.5	(4)
17	27	18.3	38	40	46	17.19	16.7	B3 1727+386	1.386	32.0	-27.7	(4)
17	32	26.6	40	39	50	16.20	16.1	FIRST J1734+4037	0.356	31.4	-25.4	(4)

identification of the FIRST sources with bright starlike objects could not yield a complete survey of bright QSOs.

A number of recent papers are devoted to the optical identification of RASS sources (Beuermann et al. 1999; Cao et al. 1999; Grazian et al. 2000; Schwobe et al. 2000; Wei et al. 1999; Xu et al. 1999). One of the new identifications is RXS J12043+4330, a QSO at  $z = 0.663$  (Xu et al. 1999); it is also FBS 1201+437 (FBS #302) or PG 1201+436, which had been classified as a DC white dwarf by Green et al. (1986). Its APS  $O$  magnitude is 16.23; it is therefore not bright enough to be included in our “complete” sample.

Nineteen RASS sources are now identified with a bright QSO in the area discussed in this paper (including the three new FIRST QSOs); of the 17 FBS or BQS bright QSOs in our sample (Table ??), 12 (70%) are ROSAT All Sky Survey (RASS) X-ray sources, suggesting that the total number of bright QSOs is equal to  $19/0.70 = 27$  (if all optically bright, X-ray sources have been discovered).

#### 4. DISCUSSION

Our “complete” sample of bright QSOs (Table ??) contains 29 objects brighter than  $B = 16.16$  ( $O_{\text{APS}} < 16.00$ ), three of them (indicated by a “N” in the last column of Table ??) are not within the PG area. The area common to the PG and FBS surveys at  $|b| > 30^\circ$  ( $\sim 2\,250\text{ deg}^2$ ) contains



Table 3: Bright QSOs ( $B < 16$ , and  $M_B < -24$ ) in the FBS subarea at  $|b| > 30^\circ$ . The columns are the same as in Table 2 with however two additional columns; an X in col. 14 indicates that the object is a ROSAT RASS source; a Y or an N in col. 15 indicates if the object lies or not in the PG area

$\alpha$ (B1950)		$\delta$ (B1950)			APS $O$	US $O$	Name	$z$	$b$	$M_B$	ref.		
8	4	35.4	76	11	33	14.18	14.2	FBS 0804+762	0.100	31.0	-24.5	X	Y
8	12	35.6	41	54	11	15.97	15.8	KUV 08126+4154	1.280	32.9	-28.7		Y
8	33	34.0	44	36	30	15.09	15.5	US 1329	0.249	37.0	-25.6	X	Y
9	46	49.7	39	16	5	15.97	15.4	KUV 09468+3916	0.360	50.7	-25.8	X	Y
9	53	48.1	41	29	39	15.59	15.1	PG 0953+415	0.239	51.7	-25.1	X	Y
10	7	26.1	41	47	25	15.97	15.6	FBS 1007+417	0.613	54.2	-26.7	X	Y
11	0	27.4	77	15	8	15.93	15.6	FBS 1100+774	0.313	38.6	-25.4	X	Y
11	2	55.0	34	41	47	16.00	15.9	FBS 1102+447	0.510	66.2	-26.3		N
11	14	20.0	44	29	57	15.11	14.8	FBS 1114+444	0.144	64.5	-24.4		Y
11	15	46.0	40	42	19	14.57	14.8	FBS 1115+407	0.154	66.7	-25.1	X	Y
11	21	55.8	42	18	14	15.84	15.5	FBS 1121+423	0.234	66.9	-24.8	X	Y
12	29	28.3	71	0	47	15.66	15.3	FBS 1229+710	0.208	46.3	-24.7	X	Y
12	29	28.6	35	46	48	15.24	15.1	CSO 900	0.131	80.6	-24.1	(4)	X Y
13	3	54.9	39	31	28	15.71	15.7	FIRST J1306+3915	0.447	77.5	-25.8		Y
13	9	58.4	35	31	15	15.64	15.7	FBS 1309+355	0.183	80.7	-24.4	(4)	X Y
13	12	30.3	78	37	44	15.84	15.6	HS 1312+7837	2.000	38.7	-29.9		N
13	22	8.5	65	57	25	15.71	15.6	FBS 1322+659	0.168	51.1	-24.2	X	Y
13	51	15.6	36	35	33	15.48	15.3	CSO 1022	0.286	73.9	-25.6		Y
14	2	37.7	43	41	27	15.62	15.1	FBS 1402+436	0.320	68.0	-25.7		Y
14	11	50.0	44	14	12	14.01	13.9	FBS 1411+442	0.089	66.4	-24.5	x	Y
14	44	50.2	40	47	37	15.45	15.6	FBS 1444+408	0.267	62.7	-25.5	X	Y
15	12	46.8	37	1	55	15.33	15.9	FBS 1512+370	0.369	58.3	-26.3	X	Y
16	21	23.5	39	16	27	15.91	16.2	B3 1621+392	1.970	44.7	-29.8	X	Y
16	24	14.6	34	5	56	15.80	15.2	RXS J16261+3359	0.204	43.8	-24.5	X	Y
16	34	51.6	70	37	37	15.27	14.9	FBS 1634+706	1.337	36.6	-29.5		Y
16	41	17.6	39	54	11	15.88	16.1	FBS 1641+399	0.595	40.9	-26.8	X	Y
17	8	23.2	33	47	42	15.82	15.6	RXS J17102+3344	0.208	34.7	-24.6	(4)	X Y
17	10	0.2	67	53	29	15.94	15.9	HS 1710+6753	0.410	34.5	-25.9		N
17	21	32.0	34	20	41	15.23	15.3	B2 1721+34	0.205	32.2	-25.2	X	Y

26 bright QSOs (13 PG QSOs and 13 others) (but there are 17 PG QSOs with  $B_{\text{PG}} < 16.16$  in the area; this larger number is probably due to the Eddington (1940) effect, the PG magnitudes being affected by relatively large errors,  $\sigma \sim 0.37$  mag). From these data, we derive a surface density of  $0.012 \text{ deg}^{-2}$ , which is to be compared with the original value of the PG survey:  $0.0064 \text{ deg}^{-2}$ , implying a maximum completeness of  $53 \pm 10\%$  for the PG survey.

Grazian et al. (2000) have cross-correlated the RASS with photometric databases in an  $8164 \text{ deg}^2$  area of the northern sky at  $|b| > 30^\circ$ , selecting all coincidences brighter than  $R \sim 15.4$ ; from this, they derive a surface density of bright ( $B < 15.5$ ) QSOs (defined as AGNs with  $M_B < -23.0$ ) of  $10 \pm 2 \cdot 10^{-3} \text{ deg}^{-2}$  and conclude that the true surface density of such objects is about three times larger than that derived from the PG survey. However, they do not specify how the  $B$  magnitude of their objects was derived. Their sample contains 46 QSOs; 15 of them have  $z > 0.20$ ; we have extracted from the APS catalogue the  $O$  magnitudes for 12 of them (for the three others, these magnitudes are unavailable); it turns out that only one (J172320.5+341756) has  $O < 15.34$ , corresponding to  $B < 15.5$ , suggesting that the  $O$  magnitudes used by Grazian et al. are underestimated and, consequently, the surface density overestimated.

Lamontagne et al. (2000) claim that they found a surface density of bright QSOs three times larger than the PG value. They have searched for UV-excess stellar-like objects with  $B < 16.5$  and  $U - B < -0.6$  in a  $840 \text{ deg}^2$  area covering the south Galactic cap; the errors in the  $B$  magnitudes are estimated to be  $0.30 \text{ mag rms}$ . They have found 228 such objects which have all been spectroscopically identified; 32 are AGNs, out of which only eleven are brighter than  $B = 16.16$  and  $M_B = -24.0$  (including 0117–2837 which, according to Grupe et al. (1999), has a redshift of 0.349 rather than 0.055). We derive a surface density of  $0.013 \text{ deg}^{-2}$ , in agreement with our value and only twice the PG value.

## 5. CONCLUSION

In Paper I, we compared the surface density of QSOs in the Bright Quasar Survey and in the First Byurakan Survey and concluded that the completeness of the BQS is of the order of 70%; Wisotzki et al. (2000) have found that the BQS is 68% complete from a comparison with the Hamburg/ESO survey, in agreement with our previous estimate. Based on a number of recently published data, as well as on our own new observations, we redetermined the surface density of QSOs brighter than  $B = 16.16$  in the BQS area to be  $\sim 0.012 \text{ deg}^{-2}$ , implying that the completeness of the BQS is  $53 \pm 10\%$ . It should be stressed however that the numbers involved are quite small, and that larger areas should be investigated before a definitive value of the surface density of bright QSOs could be determined.

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