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Radio spectra of the WMAP catalog sources

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Abstract. Compiled radio spectra are presented for 208 extragalactic sources from the catalog created from the WMAP satellite all-sky survey data in a range of 23–94 GHz taken during the first year of its operation in orbit. 205 out of 208 WMAP sources are reliably identified with radio sources from other catalogs, including also four out of five sources unidentified by the WMAP survey authors. We have found 203 WMAP sources to have optical identification: 141 quasars, 29 galaxies, 19 active galactic nuclei, 19 BL Lac-type objects and one planetary nebula, IC 418. Simultaneous measurements of flux densities for 26 sources at five frequencies, 2.3, 3.9, 7.7, 11.2 and 21.7 GHz, were made with the radio telescope RATAN-600 in 2003 March. 25 sources were detected at all the frequencies, and only one, WMAP 0517–0546, unidentified in other catalogs was not detected in our observations and is likely to be spurious. Using the database CATS we found a large number of identifications in different radio catalogs and in several long-term monitoring programs (GBI, UMRAO, SEST, IRAM, and others). The total number of flux density measurements that we collected in the frequency range from 10 MHz to 245 GHz for the identified WMAP sources is over 206,000, varying from 10–20 points for some southern sources to a few thousand points for sources from long-term monitorings. A considerable number of WMAP sources are variable on time scales from hours to dozens of years, nevertheless, the obtained integral spectra, including measurements in different years, may be of particular interest because these bright sources have been studied for more than forty years. The general character of the spectrum (power, flat, with turnovers at low or high frequencies) of the WMAP sources remains unchanged. No significant systematic differences in flux densities measured in the WMAP observations as compared to earlier measurements at close frequencies for sources with a small variability index are seen in the spectra.

Key words: cosmology: observations – galaxies: active – quasars: general – BL Lacertae objects: general

1. Introduction

During the first year of observations with the satellite Wilkinson Microwave Anisotropy Probe (WMAP) with a high sensitivity, the entire sky was mapped at five frequencies, 23, 33, 41, 61 and 94 GHz (Bennett et al. 2003, hereafter Paper 1). In the course of data reduction for removing foreground emission, 208 radio sources were detected on the maps obtained out of the Galactic plane (Bennett et al. 2003, hereafter Paper 2). They were found as a result of reduction of the obtained sky maps with $|b| > 10°$, which included the filtration of spatial harmonics, searches for local peaks with an amplitude $> 5\sigma$, where σ is the local noise level, and Gaussian analysis of these peaks with preliminary removal of the local foreground. There are 191 flux measurements at the frequency 23 GHz, 185 at 33 GHz, 182 at 41 GHz, 137 at 61 GHz and 60 at 94 GHz. The minimum measured flux is 0.3 Jy at 33 GHz, 0.4 Jy at 41 GHz, 0.5 Jy at 23 and 61 GHz and 1.1 Jy at 94 GHz.

Then, the authors (Paper 2) performed cross identification of the obtained WMAP catalog with the sources from the catalogs GB6 (Gregory et al. 1996), PMN (Griffith et al. 1994, 1995; Wright et al. 1996) and from the complete sample of sources brighter than 1 Jy at 5 GHz (Kühr et al. 1981). The sources were thought to be identified if they were separated by less than 11′ (that is, the coordinate error was equal to 4′). For 203 sources identifications were found in the catalog, and 20 sources had more than one identification. The authors believed that since no identifications in the given window were found for five of the sources, and the number of false detections from the simulation modeling was also equal to 5 ± 4, then, probably, the remaining five sources were also spurious. Thus, no evidence is available that an unknown population of radio sources exists in the range of WMAP survey frequencies at a flux level of about

1 Jy. The mean spectral index of point sources of the catalog determined only from the measurements of the WMAP survey is equal to zero, with an error of about 0.5 (Paper 2).

An all-sky survey at high frequencies (>20 GHz) has been made for the first time and a catalog of sources has been compiled. For this reason it would be interesting to investigate those sources in detail, to understand which physical objects represent this sample of sources, what kind of radio spectra and structure they have. To solve the problem, SAO RAS has a convenient and powerful instrument for investigation — the generally accessible radio astronomical database CATS (Verkhodanov et al. 1997), which includes the relevant procedures of search and cross-identification of samples of objects. Besides, the hard disk of the CATS server (`cats.sao.ru`) contains all the main radio catalogs, catalogs of galaxies, quasars and the data of long-term monitoring programs. The CGI-procedures of the radio spectrum plotting "on-line" require only small changes to include the WMAP catalog.

2. Cross-identification of the WMAP sources in the CATS

First, following the authors of Paper 2, we performed the procedures of searching for identifications in the catalogs GB6 (Gregory et al. 1996) and PMN. The coordinates of the sources from these catalogs are much more accurate than those of the initial WMAP catalog. On the average, the differences of the WMAP coordinates and identifications are $4-6'$. At this stage it became clear that the earlier unidentified source WMAPJ2356+4952 is undoubtedly the bright source J2355+4950, although the discrepancy of their coordinates is about 12.5′. The source WMAP1633+8226 is obviously the known Seyfert galaxy NGC 6251 (J1632+8232), the difference in the coordinates here is about 6′.

The general summary of cross-identification of the WMAP sources with the largest radio surveys looks as follows (in brackets are indicated the frequencies of the surveys and the main reference): 12 sources in 8C (38 MHz; Hales et. al. 1995); 16 sources in 4MASS (74 MHz; Cohen et al. 2002); 21 sources in 3C/3CR (159 MHz; Edge et al. 1959); 41 sources in 4C (178 MHz; Pilkington et al. 1965); 45 sources in 6C (151 MHz; Hales el at. 1993); 24 sources in 7C (151 MHz; Pooley et al. 1998); 51 sources in WENSS (325/352 MHz; Rengelink et al. 1997); 105 sources in TEXAS (365 MHz; Douglas et al. 1996); 48 sources in SUMSS (843 MHz; Bock et al. 1999); 92 sources in WB92 (1400 MHz; White & Becker 1992); 168 sources in NVSS (1400 MHz; Condon et al. 1998); 46 sources in FIRST (1400 MHz, White et al. 1997); 162 sources from compiled 1-Jy survey (Kühr et al. 1979, 1981); 102 sources in VLBIS (2290 MHz; Preston et al. 1985); 127 sources in PKSCAT90 (2700/8400 MHz; Wright & Otrupcek 1990); 58 sources Z2 (3900 MHz; Amirkhanyan et al. 1992); 100 sources GB6 (4850 MHz; Gregory et al. 1996); 137 sources PMN (4850 MHz; Wright et al. 1994, 1996; Griffith et al. 1994, 1995); 73 sources MITGB (4850 MHz; Bennett et al. 1986; Griffith et al. 1990); 124 sources VLBApls (5000 MHz; Fomalont et al. 2000); 83 sources JVAS (8400 MHz; Wilkinson et al. 1998); 66 sources VLBI-2cm (15000 MHz; Kellermann et al. 1998). 108 sources are from linear polarization data catalog (Tabara & Inoue 1980). Seven of eleven WMAP sources of the northern sky (Decl(1950)> 70°) showed a variability on a scale less than 24 hours at a frequency of 2700 MHz (Heeschen et al. 1987). 34 southern WMAP sources are classified as sources with intra-day variability (IDV-sources; Kedziora-Chudczer et al. 2001).

Then the list of WMAP sources with more accurate coordinates was searched for with the CATS database with a smaller window (100″). In the course of this procedure it became clear that many identified WMAP sources are included in the long-time multifrequency monitoring programs of bright variable extragalactic radio sources: Naval Research Lab and Green Bank Interferometer[1] monitoring program (1979–2001) (Fiedler et al. 1987; Waltman et al. 1991; Lazio et al. 2001; http://ese.nrl.navy.mil/GBI/; ftp.gb.nrao.edu/pub/fghigo/gbidata/gdata/). University Michigan RAO[2] monitoring (1985–1999) (http://www.astro.lsa.umich.edu/obs/radiotel/umrao.html; Aller & Aller 1996), Metsähovi monitoring program (1985–2000) (Teräsranta et al. 1998). Data on similar programs carried out at RATAN-600 (Kovalev et al. 1999, Mingaliev et al. 1998, 2001; Kiikov et al. 2002) and data of monitoring at other radio telescopes (Quiniento et al. 1993; Reuter et al. 1997; Ghosh et al. 1994; Tornikoski et al. 1996; Dallacasa et al. 2000) are also available in the CATS database. The data of these programs increased considerably the number of flux density measurements of the identified WMAP sources required for the plotting of integral spectra.

Besides, it should be noted that the CATS database incorporates the data of the compiled catalogs of radio sources brighter than 1 Jy at 5 GHz (Kühr et al. 1979, 1981). This complete sample of 576

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[2] University of Michigan Radio Astronomy Observatory is supported by funds from the University of Michigan.

bright sources was studied purposefully in the optical range for identification and measurement of the redshift (Stickel et al. 1994). However, a considerable number (26) of unidentified sources or ones with unclear classification still remains. Nevertheless, we may say that the identified WMAP sources can not be referred to those poorly studied.

In the end we obtained a catalog of identifications which comprises more than 206000 flux density measurements in the range from 10 MHz to 245 GHz. Since the search for identifications goes on, the catalog is being replenished. The updated spectra can be plotted "on-line" `http://cats.sao.ru/cgi-bin/wmap.cgi` changing at choice the fitting parameters: a fitting law, a frequency range, an optional account of the error measurements.

We also searched for identifications of WMAP sources in the optical and X-ray ranges. 141 WMAP sources are identified with the ROSAT all-sky survey sources (Voges et al. 1999). 87 of them are bright X-ray sources. Among 1550 identified in the NVSS bright X-ray sources of the ROSAT survey, in the so-called sample RBSC-NVSS (Bauer et al. 2000) there are 39 WMAP sources, 10 of them are active galaxies, six — quasars and the rest objects are of BL Lac type, or blazars. The redshift is measured for 38 of them. Seven WMAP sources are gamma-ray sources from the Third EGRET catalog (Hartman et al. 1999).

Table 1 presents a list of WMAP sources with accurate (the error is better 5″) coordinates. The fourth column gives the type of the source from three catalogs: Veron-Cetty & Veron 2001 (herein VV10, in Table 1 — V), Stickel et al. 1994 (herein Stickel94, in Table 1 — S), Fomalont et al. 2000 (herein VLBApls, in Table 1 — F).

Table 1: *Parameters of WMAP sources*

Source name	RA 2000 hh mm ss.s	DEC 2000 dd mm ss	Type VSF	3C 3CR	z	S_{30} Jy	α_{20} $S_\nu \sim S^\alpha$	F-R type
J0006−0623	00 06 13.3	−06 23 13	BQG	3	0.347	2.07	−0.067	II IDV
J0013−3954	00 12 59.9	−39 54 25	G			1.17	0.063	IDV
J0047−2517	00 47 33.1	−25 17 17	AG		0.00086	1.12	−0.248	
J0050−5738	00 49 59.5	−57 38 27	QQ		1.797	1.42	−0.075	
J0050−0928	00 50 41.3	−09 29 06	BBB			1.21	−0.233	
J0106−4034	01 06 45.1	−40 34 20	Q Q		0.584	2.56	−0.018	
J0108+1319	01 08 50.6	+13 18 31	A			1.21	−0.721	
J0108+0135	01 08 38.7	+01 34 59	QQQ	33	2.107	1.79	−0.267	II
J0125−0005	01 25 28.9	−00 05 55	QQQ		1.070	1.10	−0.253	
J0132−1654	01 32 43.4	−16 54 48	QQQ		1.022	0.55	−0.071	
J0133−5159	01 33 05.8	−52 00 04	QQ			0.78	−0.025	IDV
J0136+4751	01 36 58.6	+47 51 29	QQQ		0.859	2.07	0.028	
J0204+1514	02 04 50.4	+15 14 10	AQG		0.405	2.20	−0.229	
J0205+3212	02 05 04.9	+32 12 31	QQQ		1.466	0.81	−0.054	
J0210−5101	02 10 46.2	−51 01 02	BQ		1.003	2.77	−0.114	
J0217+0144	02 17 48.9	+01 44 50	Q Q		1.715	1.15	−0.197	IDV
J0222−3441	02 22 56.4	−34 41 28	Q			0.74	−0.002	IDV
J0223+4259	02 23 12.1	+43 00 03	BG	66.0	0.0215	0.93	−0.509	I
J0237+2848	02 37 52.3	+28 48 10	QQQ		1.210	2.11	0.025	
J0253−5441	02 53 31.7	−54 41 52	Q			2.43	0.584	IDV
J0303−6211	03 03 50.6	−62 11 25	QQ			1.46	−0.069	IDV
J0308+0406	03 08 26.3	+04 02 40	A			1.23	−0.573	
J0309−6058	03 09 56.0	−61 58 39	Q			1.49	0.198	
J0311−7651	03 11 55.6	−76 51 49	Q			1.12	0.317	
J0319+4130	03 19 48.2	+41 30 42	AGG	84.0	0.0172	19.15	−0.376	I
J0321−3711	03 22 36.5	−37 14 21	G			13.11	−0.749	
J0329−2357	03 29 54.1	−23 57 09	Q			1.32	0.253	
J0334−4008	03 34 13.6	−40 08 25	BQQ		1.445	1.57	−0.166	
J0339−0146	03 39 30.9	−01 46 35	QQQ		0.852	2.08	−0.070	IDV
J0348−2749	03 48 38.2	−27 49 14	Q Q		0.987	1.52	0.296	IDV
J0403−3605	04 03 53.7	−36 05 02	QQQ		1.417	2.74	0.208	
J0405−1308	04 05 34.0	−13 08 16	QQQ		0.571	1.00	−0.400	

Table 1: *Parameters of WMAP sources (continued)*

Source name	RA 2000 hh mm ss.s	DEC 2000 dd mm ss	Type VSF	3C 3CR	z	S_{30} Jy	α_{20} $S_\nu \sim S^\alpha$	F-R type
J0406−3826	04 06 59.0	−38 26 28	QQQ		1.285	1.13	−0.085	IDV
J0411+7656	04 10 45.0	76 56 47	EG		0.5985	0.87	−0.715	
J0423−0120	04 23 15.8	−01 20 33	QQQ		0.915	4.10	−0.025	
J0424−3756	04 24 42.2	−37 56 20	Q Q		0.782	0.43	−0.205	
J0424+0036	04 24 46.8	00 36 07	B B		0.310	1.38	−0.035	IDV
J0433+0521	04 33 11.1	05 21 15	AGG	120	0.0331	2.64	−0.246	I
J0440−4332	04 40 17.0	−43 33 08	QQQ		2.852	1.93	−0.508	
J0450−8100	04 50 05.4	−81 01 01	AQ		0.444	1.79	0.181	IDV
J0453−2807	04 53 14.5	−28 07 44	QQQ		2.559	1.70	−0.092	
J0455−4616	04 55 50.7	−46 15 59	QQ		0.858	1.19	−0.284	
J0457−2324	04 57 03.2	−23 24 52	QQB		1.003	1.41	−0.277	
J0506−6109	05 06 44.0	−61 09 41	QQ		1.093	1.24	−0.117	
J0513−2159	05 13 49.1	−21 49 16	Q			0.66	−0.334	
J0518−0546	05 18 54.6	−05 46 10	?			1.30	0.343	
J0519−4546	05 19 44.3	−45 46 41	AG		0.0342	4.61	−0.710	II
J0522−3628	05 22 57.2	−36 27 36	GGB		0.055	4.42	−0.329	I
J0527−1241	05 27 28.2	−12 41 50	P			1.37	−0.236	
J0538−4405	05 38 50.3	−44 05 09	QB		0.896	4.85	0.044	
J0540−5418	05 40 45.9	−54 18 22	G			1.26	0.848	
J0542+4951	05 42 36.1	49 51 07	QQQ	147.0	0.545	1.38	−0.984	
J0546−6415	05 46 42.0	−64 15 23	Q			0.61	0.622	
J0550−5732	05 50 09.6	−57 32 24	Q			1.36	0.812	
J0555+3948	05 55 30.8	+39 48 49	Q Q		2.365	4.36	−0.307	
J0607+6720	06 07 52.7	+67 20 55	QQQ		1.970	0.88	0.083	
J0609−1542	06 09 40.3	−15 41 41	QQQ		0.324	7.55	0.169	IDV
J0629−1959	06 29 23.8	−19 59 20	B			1.30	0.254	
J0633−2223	06 33 26.7	−22 23 21	A			1.05	0.349	
J0635−7516	06 35 46.5	−75 16 17	QQ		0.654	4.94	−0.136	
J0636−2041	06 36 31.0	−20 31 52	G			0.23	−1.387	
J0639+7324	06 39 21.9	+73 24 58	Q			0.80	−0.018	
J0646+4451	06 46 32.0	+44 51 17	Q Q		3.408	2.03	0.279	
J0738+1742	07 38 07.4	+17 42 19	BBB		¿0.424	1.73	0.026	
J0739+0136	07 39 18.0	+01 37 04	QQQ		0.191	1.64	−0.083	IDV
J0741+3112	07 41 10.7	+31 12 00	QQQ		0.631	1.27	−0.349	
J0743-6726	07 43 31.5	−67 26 26	QQ		1.511	0.70	−0.579	
J0745+1011	07 45 33.0	+10 11 13	EEE			0.95	−0.922	
J0750+1231	07 50 52.0	+12 31 04	QQQ		0.889	2.60	0.201	
J0757+0956	07 57 06.6	+09 56 34	B			1.48	−0.039	
J0808−0751	08 08 15.5	−07 51 10	QQQ		1.837	1.73	0.120	
J0816−2421	08 16 40.4	−24 21 05	G			1.41	0.728	
J0825+0309	08 25 50.3	+03 09 24	BBB		0.506	1.41	0.002	
J0830+2410	08 30 52.1	+24 10 59	Q			1.06	0.281	
J0836−2017	08 36 39.1	−20 16 59	QQQ		2.752	1.32	−0.375	IDV
J0840+1312	08 40 47.6	+13 12 24	QQQ	207	0.684	0.78	−0.354	II
J0841+7053	08 41 24.3	+70 53 41	QQQ		2.172	1.19	−0.379	II
J0854+2006	08 54 48.8	+20 06 31	BBB		0.306	3.30	0.052	
J0909+0121	09 09 10.0	+01 21 42	QQQ		1.018	1.80	0.537	
J0918−1205	09 18 06.5	−12 05 28	AG	218.0	0.0547	2.34	−0.954	I

Table 1: *Parameters of WMAP sources (continued)*

Source name	RA 2000 hh mm ss.s	DEC 2000 dd mm ss	Type VSF	3C 3CR	z	S_{30} Jy	α_{20} $S_\nu \sim S^\alpha$	F-R type
J0927+3902	09 27 03.0	+39 02 21	QQQ		0.698	7.29	−0.235	II
J0948+4039	09 48 55.3	+40 39 44	QQQ		1.252	1.77	0.133	I
J0955+6940	09 55 51.7	+69 40 46	GG	231.0	0.0009	1.13	−0.640	I IDV
J0958+4725	09 58 19.7	+47 25 08	Q Q		1.873	0.99	0.008	
J1014+2301	10 14 47.0	+23 01 16	Q Q		0.565	1.05	−0.027	
J1033+4115	10 33 03.7	+41 16 06	QQQ		1.120	0.79	0.026	
J1038+0512	10 38 46.8	+05 12 29	G			0.90	0.307	
J1041−4740	10 41 44.7	−47 38 38	G			0.91	−0.684	
J1048+7143	10 47 27.6	+71 43 35	Q			1.11	0.124	
J1058+0133	10 58 29.5	+01 33 58	QQQ		0.892	4.06	0.211	
J1058−8003	10 58 43.3	−80 03 54	QQ			2.52	0.221	IDV
J1107−4449	11 07 08.7	−44 49 07	QQ		1.598	1.76	−0.208	
J1127−1857	11 27 04.4	−18 57 18	Q Q		1.048	2.05	0.306	
J1130−1449	11 30 07.0	−14 49 27	QQQ		1.187	1.67	−0.460	IDV
J1130+3815	11 30 52.6	+38 15 18	Q			1.08	0.127	
J1147−3812	11 47 01.4	−38 12 11	QBQ		1.048	1.87	0.211	IDV
J1153+8058	11 53 12.4	+80 58 29	QQQ		1.250	1.25	0.255	
J1153+4931	11 53 24.4	+49 31 09	QQQ		0.334	1.44	0.048	II
J1159+2914	11 59 31.8	+29 14 43	Q Q		0.729	1.44	−0.030	
J1209−2406	12 09 02.5	−24 06 20	B B			1.08	0.252	
J1215−1731	12 15 46.7	−17 31 45	GGG			1.11	−0.181	
J1219+0549	12 19 24.0	+05 49 21	GG	270.0	0.0073	2.96	−0.571	I/II
J1224−8312	12 24 54.6	−83 13 10	G			1.20	0.328	
J1229+0202	12 29 06.6	02 03 09	QQQ	273.0	0.158	29.64	−0.167	
J1230+1223	12 30 49.4	12 23 28	AGG	274.0	0.0043	16.70	−0.803	I
J1246−2547	12 46 46.8	−25 47 49	QQQ		0.633	1.45	0.028	
J1256−0547	12 56 11.2	−05 47 22	QQQ	279.0	0.536	17.87	0.108	
J1257−3154	12 57 59.0	−31 55 17	QQQ		1.924	1.50	0.104	IDV
J1310+3220	13 10 28.6	32 20 43	QBQ		0.997	3.02	−0.042	
J1316−3339	13 16 07.9	−33 38 59	QQQ		1.210	1.66	0.120	
J1329+3154	13 29 52.8	31 54 11	Q			1.12	0.259	
J1331+3030	13 31 08.3	30 30 33	QQQ	286	0.846	2.34	−0.633	
J1336−3358	13 36 37.3	−33 58 01	GG		0.0129	0.99	−0.499	I/II
J1337−1257	13 37 39.8	−12 57 24	QQQ		0.539	5.71	0.134	IDV
J1354−1041	13 54 46.5	−10 41 03	QQQ		0.332	1.22	0.362	
J1357+1919	13 57 04.4	19 19 08	QQQ		0.720	0.89	−0.230	II
J1408−0752	14 08 56.4	−07 52 26	QQQ		1.494	0.95	−0.075	IDV
J1419+3822	14 19 46.4	38 21 48	Q			1.05	0.171	
J1427−3306	14 27 38.0	−33 05 00	G			1.23	0.776	
J1427−4206	14 27 56.2	−42 06 17	QQQ		1.522	1.71	−0.191	
J1459+7140	14 59 07.6	71 40 20	QQ	309.1	0.905	1.29	−0.589	II
J1504+1029	15 04 24.9	10 29 39	QQQ		0.563	1.14	−0.323	
J1512−0906	15 12 50.4	−09 06 00	QQQ		0.361	2.42	0.063	
J1516+0015	15 16 40.2	00 15 11	AGG		0.0518	1.19	−0.166	II
J1517−2422	15 17 41.5	−24 22 23	BBB		0.0486	2.30	−0.100	
J1549+0237	15 49 28.4	02 36 49	QQQ		0.412	1.99	0.106	
J1550+0527	15 50 35.2	05 27 10	QQQ		1.422	1.66	−0.111	
J1608+1029	16 08 45.0	10 26 41	Q			1.09	−0.085	

Table 1: *Parameters of WMAP sources (continued)*

Source name	RA 2000 hh mm ss.s	DEC 2000 dd mm ss	Type VSF	3C 3CR	z	S_{30} Jy	α_{20} $S_\nu \sim S^\alpha$	F-R type
J1613+3412	16 13 41.3	34 12 48	QQQ		1.401	2.50	−0.084	
J1617−7717	16 17 46.2	−77 17 19	QQ		1.710	1.85	−0.387	IDV
J1632+8232	16 32 31.	82 32 17	GGG		0.0243	0.92	−0.149	I/II
J1635+3808	16 35 15.5	38 08 05	QQQ		1.814	2.07	−0.103	II
J1638+5720	16 38 13.4	57 20 24	QQQ		0.750	1.64	0.188	
J1642+6856	16 42 07.8	68 56 49	AQQ		0.751	9.28	−0.127	II IDV
J1642+3948	16 42 58.8	39 48 37	QQQ	345.0	0.594	1.07	−0.122	II
J1651+0459	16 51 08.7	04 59 30	GGG	348.0	0.154	1.55	−1.130	I/II
J1653+3945	16 53 52.2	39 45 36	BBB		0.0337	1.09	−0.213	II
J1658+0741	16 58 09.0	07 41 27	QQQ		0.621	1.36	−0.047	
J1703−6212	17 03 36.6	−62 12 40	G			1.68	0.706	
J1723−6500	17 23 41.0	−65 00 36	AG		0.0145	2.03	−0.463	IDV
J1727+4530	17 27 27.6	45 30 40	Q Q		0.714	1.38	0.353	
J1734+3857	17 34 20.6	38 57 51	QQQ		0.976	0.96	0.488	
J1733−7935	17 33 40.7	−79 35 55	G			1.21	0.284	
J1740+5211	17 40 36.9	52 11 44	QQQ		1.379	1.84	0.013	
J1748+7005	17 48 32.6	70 05 51	BBB		0.770	0.75	−0.130	I IDV
J1753+2847	17 53 42.4	28 48 05	Q			0.87	0.161	
J1758+6638	17 58 33.4	66 38 01	G			0.62	−0.311	
J1800+7828	18 00 45.7	78 28 04	QBQ		0.684	2.26	−0.209	I IDV
J1803−6507	18 03 22.8	−65 07 33	G			1.23	0.353	IDV
J1806+6949	18 06 50.7	69 49 28	BBB	371.0	0.051	1.62	−0.166	II IDV
J1819-6345	18 19 34.3	−63 45 59	AG		0.0627	1.13	−0.743	
J1824+5650	18 24 07.1	56 51 01	QBQ		0.664	2.06	0.326	I
J1829+4844	18 29 31.7	48 44 47	QQ	380.0	0.691	1.92	−0.517	II
J1837−7108	18 37 28.7	−71 08 43	QQ		1.356	1.90	−0.008	
J1842+7946	18 42 17.1	79 45 56	QGG	390.3	0.0569	1.13	0.158	II
J1842+6809	18 42 33.6	68 09 25	Q			0.95	−0.831	
J1849+6705	18 49 16.0	67 05 41	Q			0.98	0.208	
J1850+2825	18 50 27.7	28 25 09	Q			1.15	0.050	
J1902+3159	19 02 55.9	31 59 42	Q Q		0.635	1.07	−0.322	
J1923−2104	19 23 32.2	−21 04 33	?			1.97	−0.363	
J1927+6117	19 27 30.0	61 17 34	B			0.84	0.161	IDV
J1927+7357	19 27 48.5	73 58 01	QQQ		0.302	2.77	−0.332	I/II
J1955+5131	19 55 42.6	51 31 52	QQQ		1.230	1.20	−0.052	I/II
J1957−3845	19 58 00.0	−38 45 06	QQQ		0.626	1.12	−0.424	
J2000−1748	20 00 57.0	−17 48 58	QQQ		0.650	1.86	0.207	IDV
J2011−1546	20 11 15.7	−15 46 40	QQQ		1.180	1.55	0.077	
J2022+6137	20 22 06.7	61 36 59	AGG		0.2266	1.98	−0.256	IDV
J2024+1718	20 24 56.6	17 18 13	Q			0.73	0.045	
J2035−6846	20 35 48.8	−68 46 34	Q			1.03	0.364	
J2038−13	20 38 36.4	−13 11 44	?			0.80	0.885	
J2056−4714	20 56 16.4	−47 14 48	QQ		1.491	1.21	−0.271	
J2109+3532	21 09 31.7	35 32 40	?			1.13	−0.115	
J2109−4110	21 09 33.2	−41 10 20	QQQ		1.0547	1.91	−0.022	IDV
J2123+0535	21 23 44.5	05 35 22	Q Q		1.941	1.08	−0.332	IDV
J2131−1207	21 31 35.1	−12 07 04	QQQ		0.501	2.33	−0.148	IDV
J2134−0153	21 34 08.7	−01 53 13	QBQ		0.557	1.35	−0.168	

Table 1: *Parameters of WMAP sources (continued)*

Source name	RA 2000 hh mm ss.s	DEC 2000 dd mm ss	Type VSF	3C 3CR	z	S_{30} Jy	α_{20} $S_\nu \sim S^\alpha$	F-R type
J2136+0041	21 36 38.6	00 41 54	QQQ		1.936	3.73	−0.749	IDV
J2139+1423	21 39 01.3	14 23 35	QQQ		2.427	1.65	−0.034	
J2143+1743	21 43 35.6	17 43 49	Q			0.99	0.201	
J2148+0657	21 48 05.5	06 57 38	QQQ		0.990	1.35	0.501	
J2146−7755	21 46 30.0	−77 55 51	G			8.13	0.016	
J2157−6941	21 57 06.0	−69 41 24	AG		0.0285	3.05	−0.750	I
J2158−1501	21 58 06.2	−15 01 09	QQQ		0.672	1.44	−0.279	
J2202+4216	22 02 43.2	42 16 40	BBB		0.0688	3.26	−0.113	I
J2203+3145	22 03 14.6	31 45 56	QQQ		0.298	1.90	0.551	II
J2203+1725	22 03 26.8	17 25 48	Q			2.30	−0.097	
J2206−1835	22 06 10.3	−18 35 39	QQQ		0.619	1.57	−0.582	
J2212+2355	22 12 06.0	23 55 41	Q Q			1.24	0.160	
J2218−0335	22 18 51.8	−03 35 00	QQQ		0.901	1.23	−0.154	
J2220+43	22 20 09.5	43 35 27	?			0.73	0.840	
J2225−0457	22 25 47.2	−04 57 01	QQQ	446.0	1.404	4.06	−0.067	
J2229−0832	22 29 39.9	−08 32 55	QQQ		1.561	1.14	−0.094	
J2232+1143	22 32 36.4	11 43 50	QQQ		1.037	2.56	−0.366	II
J2235−4835	22 35 13.2	−48 35 59	Q			1.89	0.414	
J2236+2828	22 36 22.4	28 28 57	QQQ		0.795	1.12	−0.307	
J2239−5701	22 39 12.0	−57 01 01	Q			1.10	0.096	
J2246−1206	22 46 17.9	−12 06 52	QQQ		0.630	2.48	−0.067	IDV
J2253+1608	22 53 57.7	16 08 53	QQQ	454.3	0.859	9.64	−0.082	
J2256−2011	22 56 41.2	−20 11 41	B			0.90	0.346	
J2258−2758	22 58 05.8	−27 58 17	QQQ		0.926	3.67	0.022	
J2315−5018	23 15 44.3	−50 18 40	G			1.18	0.497	
J2331−1556	23 31 38.7	−15 56 57	QQQ		1.155	0.91	−0.060	
J2336−5236	23 36 12.	−52 36 21	QE			0.83	−0.374	IDV
J2348−1631	23 48 02.0	−16 31 12	QQQ		0.576	2.23	−0.131	IDV
J2354+4553	23 54 21.5	45 53 03	QQQ		1.992	0.98	−0.181	II
J2356+4952	23 55 09.5	49 50 08	AGG		0.237	0.49	−0.671	
J2357−5311	23 57 53.2	−53 11 14	QQ		1.006	1.32	−0.093	IDV
J2358−6054	23 58 48.2	−60 54 20	AG		0.0958	1.77	−0.566	II

The abbreviations denote the following: G — galaxy, A — AGN, Q — quasar, B — BL Lacs, P — a planetary nebula. The same column defines the availability of identified sources in each of these catalogs. The table shows that the type of the objects is sometimes determined ambiguously.

The table gives the names of identifications from 3C catalog, the measured redshifts (the data from VV10, Stickel94, VLBApls). Thus, it is clear that many WMAP sources had been already mapped with the VLBA system in the program of the preliminary survey of 376 bright VSOP sources (Hirabayashi et al. 2001; Fomalont et al. 2000). As it is known, the VSOP survey is being continued at the present time and its processing has not been completed yet. The next columns present the flux at 30 GHz and the spectral index at the frequency 20 GHz approximated from the spectra. The last column give the object type from the Fanaroff & Riley (1974) classification from the Stickel94 survey and IDV sources are also marked.

3. Observations and reduction

Pilot observations of 25 sources were carried out within the frames of the program of investigation of variable sources in long cycles of monitoring of flare activity in March 2003 (and J2105+3532 was observed in May). The in-service complex of continuous spectrum radiometers was used. All the detectors at frequencies 3.9, 7.7, 11.2 and 21.7 GHz were equipped with closed loop cryogenic systems lowering the temperature of the first cascades of amplification to 15-20 K. Low-noise transistor (HEMT) amplifiers were installed in the radiometer at the frequency 2.3 GHz.

Table 2 presents the realized sensitivity at different frequencies ΔS of the telescope RATAN-600 (the level 1σ with optimum smoothing of drift-scans) in one observation of a source, passing across the immovable beam pattern.

Table 2: *Flux density sensitivity of RATAN-600*

Wavelength (cm)	13.0	7.6	3.9	2.7	1.38
Frequency (GHz)	2.3	3.9	7.7	11.2	21.7
ΔS(mJy)(SS)	10	6	10	10	20
ΔS(mJy)(SSF)	15	10	20	15	30

Table 3: *Flux densities of calibration sources (Jy)*

Source	Frequency (GHz)				
name	2.3	3.9	7.7	11.2	21.7
1245-199	4.29	2.99	1.76	1.23	0.70
1328+30	11.57	8.57	5.53	4.27	2.57
1345+12	4.40	3.32	2.22	1.75	1.12
1850-001	2.27	3.04	3.88	4.20	4.50
2037+42	12.70	17.3	20.7	21.1	19.40
2105+42	3.04	4.9	6.33	6.03	5.90

The observations were made on the South Sector (SS) and on the South Sector with the Flat reflector (SSF) of RATAN-600 in 2003 March daily in the upper culmination for (SSF) and in the lower culmination for (SS). In one observation the flux from the source was recorded at all five frequencies. It should be noted that the telescope resolution was quite sufficient for reliable detection of sources and measurement of fluxes from relatively small-extended sources.

Although, not always the sensitivity of the radiometers was realized in the observations because of interference, we consider, based on daily observations of calibration sources, that the flux measurement error was better than 5 % at the frequencies 2.3, 3.9 and 11.2 GHz and 6–10 % at 21.7 GHz.

The flux calibration was performed using daily observations of the sources NGC 7027, DR 21, 1245–19, 1850–001 and 1345+12. For additional check, the best secondary calibrator 3C 286 was observed. The fluxes for them were determined earlier and brought into consistence with the basic radio astronomical scale of the fluxes of the reference sources of Baars et al. (1977) and with the renewed flux measurements from the paper by Ott et al. (1994). The adopted fluxes of the reference sources for the given set of observations are presented in Table 3.

The recording of data, preliminary reduction and writing on the computer HDD were made with the package of acquisition programs created by P. Tsybulev. The reduction of the obtained records of observations and reference sources was done with the aid of standard programs by the methods from the paper by Aliakberov et al. (1985). The current data-reduction includes the procedures of subtraction of the background, convolution with the beam pattern and Gauss analysis.

Thus we made about 350 flux measurements of the selected sources. The data of these simultaneous measurements are fitted by a flat, inverse or power spectra. Generally, these data are consistent with the former measurements, although it is evident that numerous WMAP sources have variable radio emission.

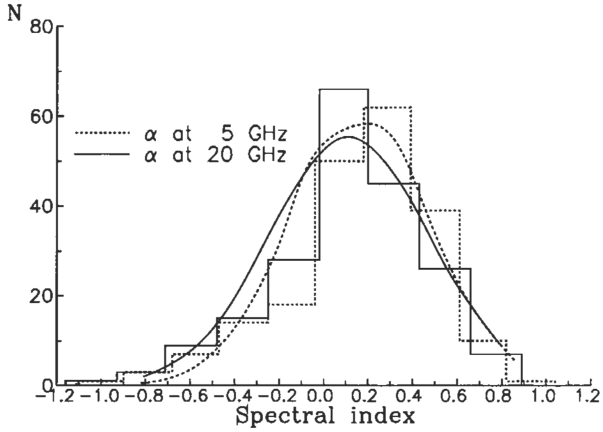

Figure 1: *Spectral index distribution of the WMAP sources in the ranges 5 GHz and 20 GHz.*

4. Analysis of spectra and discussion

The spectra of 208 WMAP sources are shown in Appendix at the end of the paper. For the sources WMAP J0518–05, WMAP J2038–13 and WMAP J2220+43 we have found only possible identifications in the catalogs NVSS and GB6. This is why their radio spectra are given only for the picture to be complete and they should be treated with care [3].

In the procedure of spectrum plotting the spectral indices at two frequencies, 5 and 20 GHz (α_5, α_{20}), if the spectrum changes the curvature, or one spectral index for the linear (power) spectrum are given. We have analyzed these data and obtained the distribution of the spectral indices throughout the whole sample. Fig. 1 shows the distribution of both indices. They are quite similar, although α_5 is significantly shifted to the right with respect to the distribution of α_{20}. When approximating these distributions by Gaussians, then α_5 has a maximum near +0.25, while α_{20} near +0.2. This can be accounted for by the presence of sources with GHz peak (GPS-sources) in the sample, for which this flux peak falls at a frequency higher than 5 GHz. On the other hand, similar sources will not show a rightward displacement in the distribution of α_{20}, if the flux peaks fall at the frequencies lower than 20 GHz. The spectra of numerous WMAP

[3] *Added in proof:* We have observed the fields of NVSS J203809−131904 and NVSS J222120+433514 at the end of May with SSF and detected the sources with fluxes 135±30 mJy and 120±25 mJy, respectively, which is consistent with their spectra.

sources are difficult to approximate by a common simple relation (linear, linear with the addition of the exponential function, or parabolic) in the total range of frequencies from 10–100 MHz to 100–240 GHz. Probably, it is due to the fact that different radiating components, extensive halo, extended double components and jets, make a contribution to the integral spectrum. For this reason, measurements with antennae with different angular resolution may give discrepant results. In our case the resolution was the lowest at low frequencies (for instance, the UTR survey, Braude et al. 2002). This is especially evident from recent maps of the radio galaxy Virgo A at a low frequency, 74 MHz (VLA), where an extended radio structure is present around the bright and more compact structure near the optical galaxy with a radio and optical jet.

Table 4: *WMAP flux density measurements with RATAN-600*

Source name	Frequency GHz	Flux Jy	Error Jy	Source name	Frequency GHz	Flux Jy	Error Jy
J0329−2357	2300	0.600	0.08	J0816−2421	11200	1.05	0.10
	3900	0.555	0.05		21700	0.91	0.10
	7700	0.960	0.07	J0830+2410	2300	0.67	0.05
J0403−3605	2300	0.922	0.1		3900	1.08	0.05
	3900	1.080	0.1		7700	1.09	0.08
	7700	2.213	0.15		11200	1.43	0.10
	11200	3.718	0.20		21700	1.57	0.10
	21700	4.435	0.20	J1014+2301	2300	0.85	0.05
J0406−3826	2300	0.843	0.10		3900	0.975	0.05
	3900	1.184	0.10		7700	0.9	0.08
	7700	1.390	0.10		11200	1.140	0.10
	11200	1.490	0.10		21700	0.980	0.10
	21700	1.309	0.10	J1048+7143	2300	1.45	0.10
J0424−3756	2300	0.966	0.1		3900	1.43	0.10
	3900	1.294	0.1		7700	1.13	0.10
	7700	1.694	0.15		11200	1.24	0.10
	11200	2.222	0.2		21700	0.91	0.10
	21700	2.072	0.2	J1127−1857	2300	0.900	0.05
J0527−1241	2300	1.805	0.05		3900	1.160	0.05
	3900	1.791	0.05		7700	1.200	0.08
	7700	1.665	0.05		11200	1.660	0.06
	11200	1.569	0.05		21700	1.440	0.15
	21700	1.354	0.10	J1153+8058	2300	1.82	0.1
J0607+6720	2300	0.88	0.05		3900	1.72	0.1
	3900	0.93	0.05		7700	1.55	0.1
	7700	0.87	0.05		11200	1.52	0.1
	11200	0.83	0.05	J1632+8232	3900	1.42	0.04
	21700	0.95	0.05		7700	1.45	0.04
J0629−1959	2300	0.819	0.1		11200	1.54	0.04
	3900	1.131	0.1		21700	1.44	0.04
	7700	1.254	0.1	J1800+7828	2300	2.32	0.1
	11200	1.619	0.1		3900	2.37	0.12
	21700	1.589	0.1		7700	2.16	0.12
J0633−2223	2300	0.732	0.073		11200	2.15	0.12
	3900	0.778	0.078		21700	1.72	0.15
	7700	0.750	0.075	J1824+5650	2300	1.32	0.1
	11200	0.672	0.067		3900	1.36	0.1
	21700	0.574	0.06		7700	1.55	0.1
J0741+3112	2300	2.600	0.26		11200	1.76	0.15

Table 4: *WMAP flux density measurements with RATAN-600 (continued)*

Source name	Frequency GHz	Flux Jy	Error Jy	Source name	Frequency GHz	Flux Jy	Error Jy
	3900	2.27	0.22		21700	2.35	0.15
	7700	1.81	0.18	J1927+7357	2300	3.60	0.25
	11200	1.52	0.15		3900	3.155	0.25
	21700	1.55	0.15		7700	3.555	0.25
J0745+1011	2300	4.210	0.1		11200	3.850	0.3
	3900	3.834	0.1		21700	4.290	0.3
	7700	2.775	0.1	J2022+6137	2300	2.220	0.15
	11200	2.367	0.1		3900	2.690	0.15
	21700	1.304	0.1		7700	3.120	0.20
J0750+1231	2300	1.175	0.11		11200	2.810	0.20
	3900	1.32	0.13		21700	2.540	0.20
	7700	1.80	0.18	J2109+3532	2300	1.56	0.10
	11200	2.44	0.23		3900	1.285	0.10
	21700	2.350	0.28		7700	1.315	0.10
J0808−0751	2300	1.955	0.18		11200	1.190	0.10
	3900	2.120	0.20		21700	1.060	0.15
	7700	1.700	0.17	J2355+4950	2300	2.05	0.10
	11200	2.105	0.20		3900	1.63	0.10
	21700	2.020	0.20		7700	1.06	0.10
J0816−2421	2300	0.27	0.05		11200	0.80	0.10
	3900	0.64	0.06		21700	0.58	0.10
	7700	0.76	0.06				

It can be seen from the distribution of the spectral indices and from the spectra themselves that the percentage of sources with the GHz peak is large (27, 13 %) and the proportion of sources with the classical power spectrum is not large (16, 8 %). The great majority of WMAP sources have flat and inverse spectra (∼ 82, 40 %). 15 (7 %) sources have combined spectra (3C 84 spectrum type) with a power low-frequency component and a flat (inverse) high-frequency component. A detailed comparison of the spectra and the structure of the sources needs a separate study.

4.1. Radio maps of WMAP sources

Numerous bright WMAP sources are included into the lists of VLBI monitoring (for instance, Kellermann et al. 1998). This is why, detailed multi-frequency radio maps with a millisecond angular resolution have been drawn for them, and after the launching of the 8 m space telescope HALSA (satellite VSOP) even with a sub-millisecond resolution. Most frequently such maps reveal a double structure of sources or a nucleus with a jet (Fomalont et al. 2000). The super-luminous WMAP source, the radio galaxy 3C120, was mapped sequentially during 16 months at a frequency of 43 GHz (Gomez et al. 2001). For the first time, a detailed investigation into the inner structure of the jet with a spatial resolution of about 0.07 pc was carried out.

Fig. 2 displays NVSS maps of 16 extended WMAP sources at the frequency 1.4 GHz. Everywhere the first level of the brightness isophotes is 0.001 Jy/beam and the following levels are with a multiplication factor of 1.41. Everywhere the reference grid corresponds to the epoch J2000. But for the lacking source J1230+1223 (Virgo A), this is a complete sample of the extended (on arc min scale) WMAP sources identified with 168 sources of the NVSS survey, that is, having the structure (or multiple components) of radio emission more than 45″ in extent. Among them there are two galaxies with a star formation burst, J0047–2517 (NGC253) and J0955+6940 (M82), the known radio galaxies, Fornax A (J0321–3706, NGC 1316) and Her A (J1651+0459), already mentioned Seyfert (Sy 2) galaxy J1632+8232 (NGC6251).

In the window 30″ 45 WMAP sources are identified with the sources of the FIRST catalog (White et al. 1997). All of them have angular sizes smaller than 12 arcseconds, but for the radio galaxy Virgo A. The SUMSS maps at the frequency 843 MHz of three southern WMAP sources, having angular sizes of about 1′, are presented in Fig. 3 on the left. The first level of the brightness isophotes is also 0.001 Jy/beam and the following levels are with a multiplication factor of 1.41. Fig. 3 (right) presents the FIRST maps of three WMAP sources, having angular dimensions more than 5″, at the frequency 1.4 GHz. The first level of the brightness isophotes is also 0.001 Jy/beam

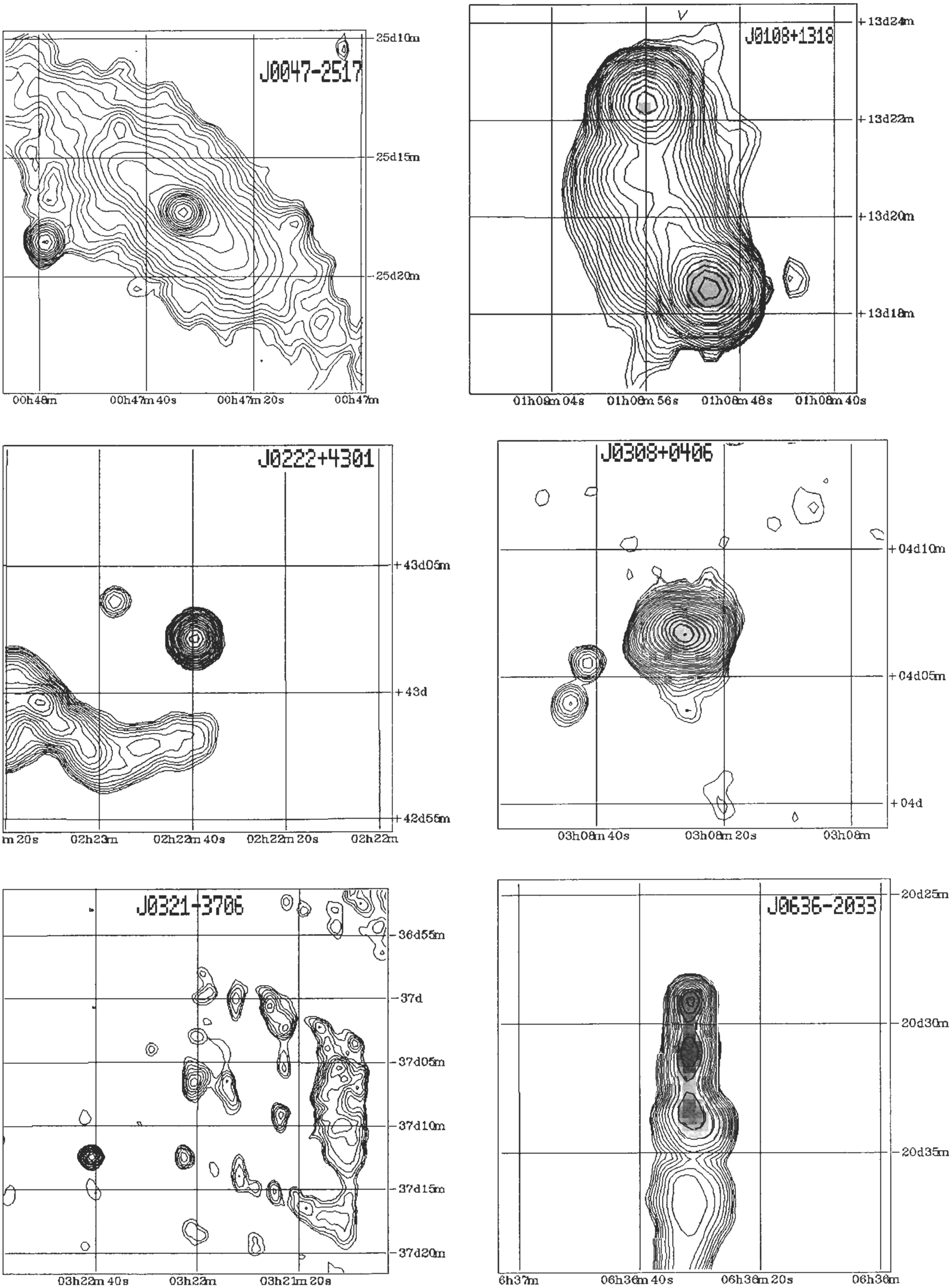

Figure 2: *a) NVSS maps of the extended WMAP sources at 1400 MHz.*

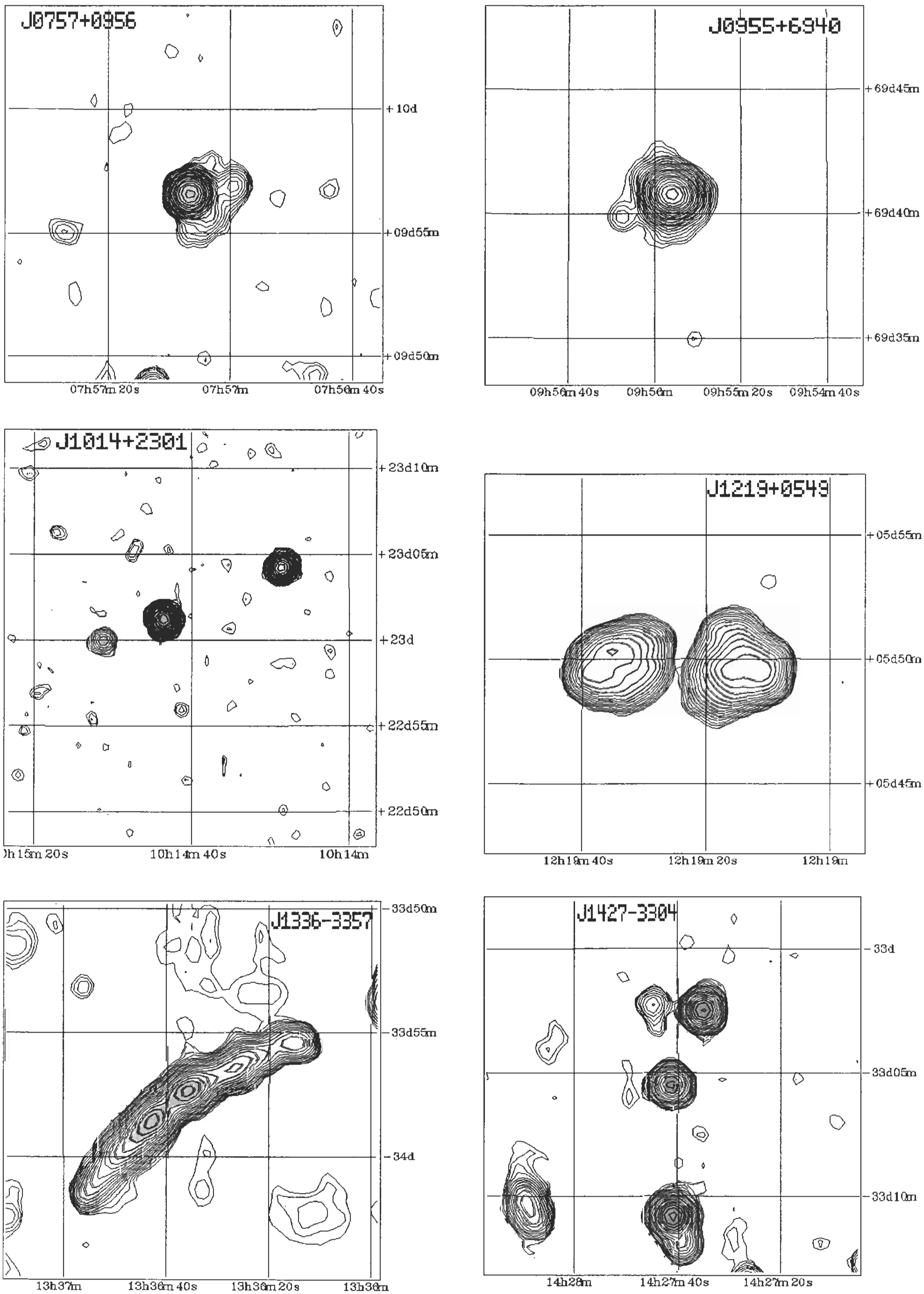

Figure 2: *b) (continued) NVSS maps of the extended WMAP sources.*

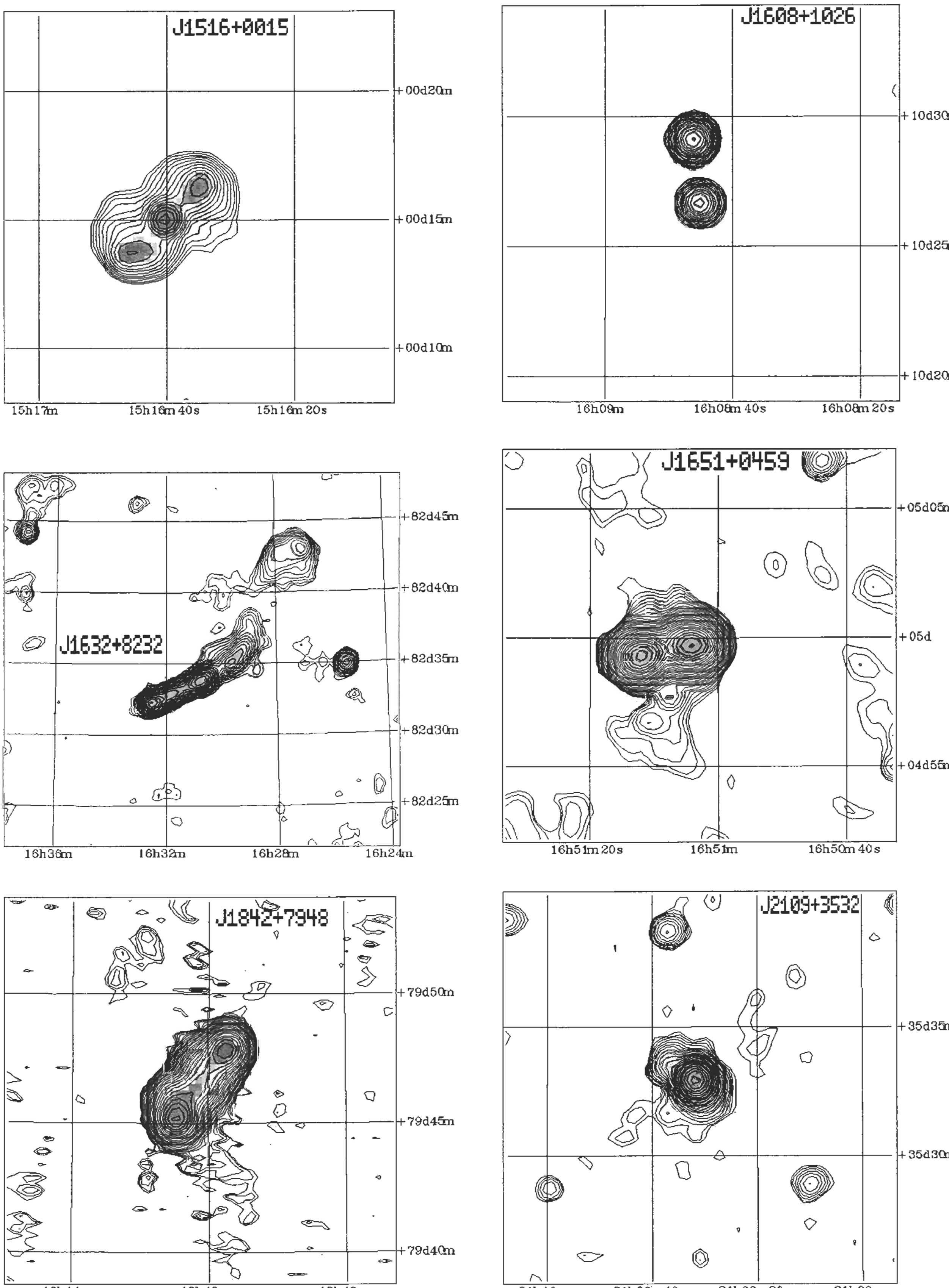

Figure 2: *c) (continued) NVSS maps of the extended WMAP sources.*

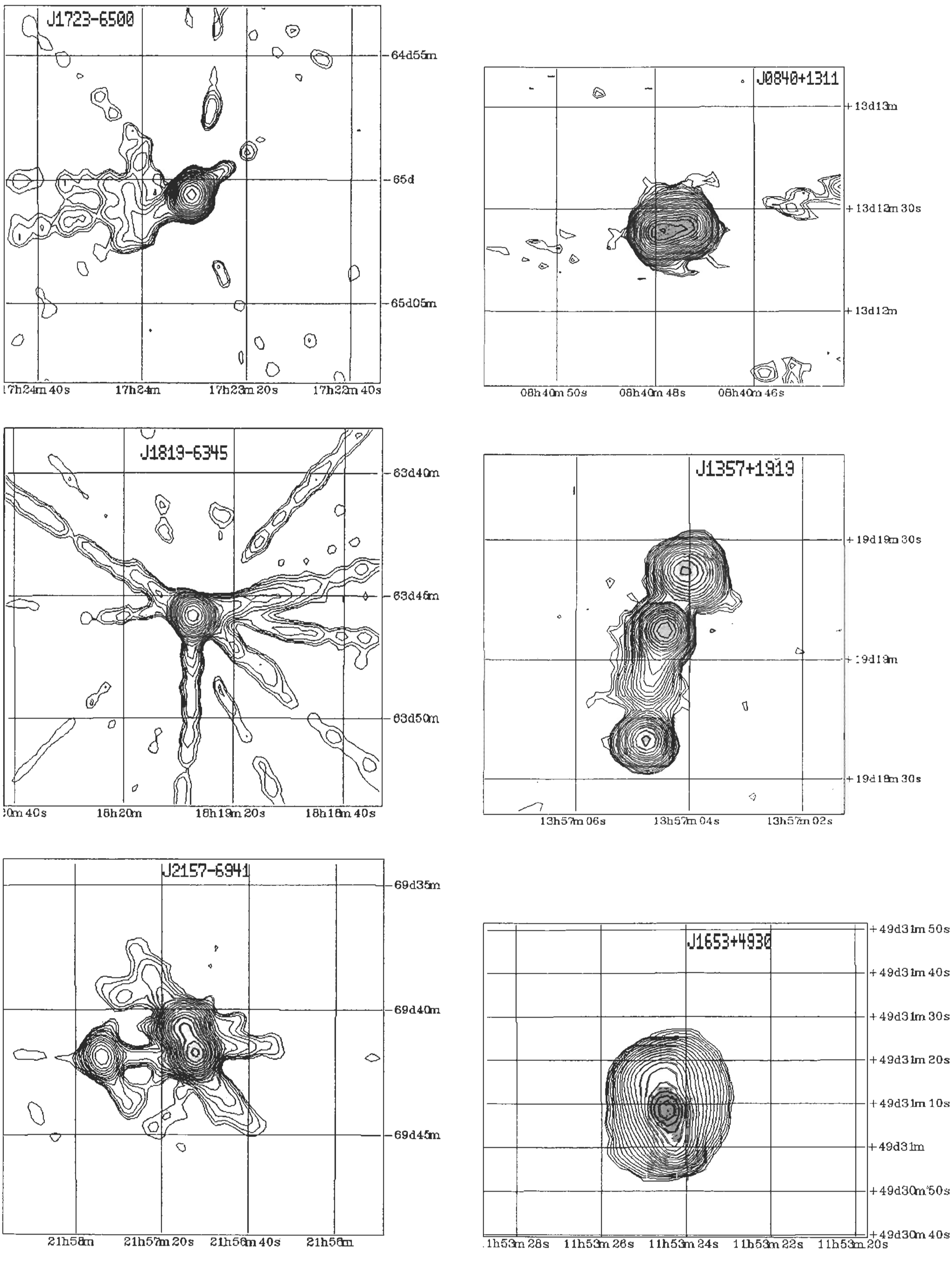

Figure 3: *Maps of the WMAP sources (left: SUMSS, 843 MHz; right: FIRST, 1400 MHz).*

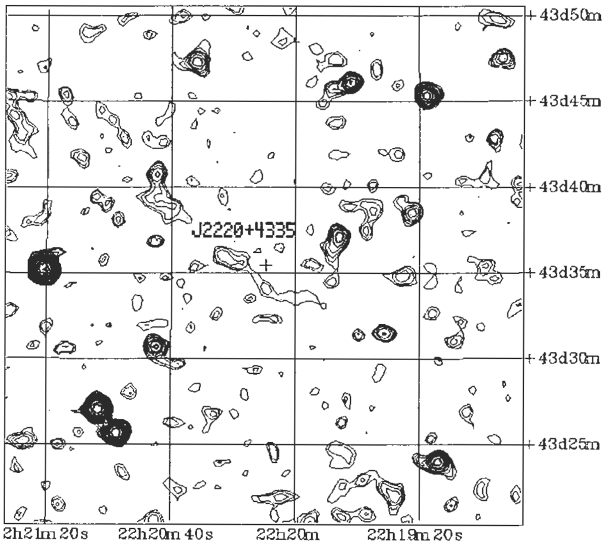

Figure 4: *Radio map of the region around the source WMAPJ2230+43 from the NVSS survey at 1.4 GHz. The isophotes begin from the map brightness level 0.0005 Jy/beam and go further to a maximum with a multiplication factor of 1.41. The cross in the middle marks the position of WMAPJ2230+43.*

and the following levels are with a multiplication factor of 1.41. Everywhere the coordinate grid corresponds to the epoch J2000.

We have failed to find clear identification for the source WMAPJ2220+43. Possibly, this is a double source south-east of WMAPJ2220+43 or a source east of WMAPJ2221+43, which is its double on the NVSS map (Fig. 4), although they are located $\sim 12'$ away from it.

5. Conclusions

We have studied spectral features of the complete sample of WMAP sources, which is presently the only all-sky survey catalog at frequencies higher than 20 GHz. We have shown that the most of WMAP sources are already known sources of the former more low-frequency surveys 3C, 4C, GB6, PMN, NVSS, FIRST and others, and 203 sources (97.5 %) are identified with optical objects: 141 quasars (68 %), 42 galaxies or active galactic nuclei (20 %), 19 Bl Lac objects (9 %) and one planetary nebula IC418.

Based on our observational data of 26 sources and compilation of ~206000 flux measurements, we have studied the radio spectra and constructed the most complete distribution of spectral indices over the whole sample of WMAP sources. The spectra are frequently plotted in a frequency interval including 4–5 orders — from 10 MHz to 245 GHz.

A considerable part of WMAP sources was included in the programs of long-time monitoring of variability of extragalactic sources at frequencies from 300 MHz to 245 GHz. First of all, it should be noted that 15–20-year programs of investigations of the identified WMAP sources were performed with the GBI (NRAO) at two frequencies, and the 25 m telescope at UMRAO (USA) at three frequencies, and with the 12 m telescope in Metsähovi (Finland), and revealed various variability of many WMAP sources. Over 40 WMAP sources are the compact IDV sources. Samples of some bright variable WMAP sources have repeatedly been observed at RATAN-600 (Amirkhanian et al. 1992; Kovalev et al. 1999; Mingaliev et al. 2001; Kiikov et al. 2002). We have also carried out observations of 26 "spectrally poorest" sources, accessible to observations at RATAN-600.

Immediately after the publication of the WMAP survey data of the first year (Paper 2) the WMAP catalog was included into the generally accessible CATS database (Verkhodanov et al. 1997) for the procedures of searching, cross-identification of different data and plotting of radio spectra. Such an extensive catalog can be a basis for performing statistical studies of complete samples of extragalactic objects.

We have presented the NVSS radio maps of the brightness distribution for 16 extended WMAP sources and the radio maps of the extended structure for other six WMAP sources from the SUMSS and FIRST surveys.

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References

Aliakberov K.D., Mingaliev M.G., Naugolnaya M.N., Trushkin S.A., Sharipova A.M., Yusupova S.N., 1985, Astrofiz. Issled. (Izv. SAO), **19**, 60

Aller H.D. & Aller M.F., 1996, Bul. AAS, **189**, 9902A

Amirkhanyan V.R., Gorshkov A.G., & Konnikova V.K., 1992, Astron. Zh., **69**, 225

Baars J.W.M., Genzel R., Pauliny-Toth I.I.K., Witzel A., 1977, Astrophys. J., **61**, 99

Bauer F.E., Condon, J.J., Thuan T.X., Broderick J.J., 2000, Astrophys. J. Suppl. Ser., **129**, 547

Bennett C.L., Halpern M., Hinshaw G., Jarosik N., Kogut A., Limon M., Meyer S.S., Page L., Spergel D.N., Tucker G.S. et al., 2003, Astrophys. J., First Year

Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Maps and Basic Results, (submitted), Paper 1, **astro-ph/0302207**

Bennett C.L., Lawrence C.R., Burke B.F., Hewitt J.N., Mahoney J., 1986, Astrophys. J. Suppl. Ser., **61**, 1

Bennett C.L., Hill R.S., Hinshaw G., Nolta M.R., Odegard N., et al., 2003, Astrophys. J., First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Foreground Emission, (submitted), Paper 2, **astro-ph/0302208**

Braude S.YA., Rashkovsky S.L., Sidorchuk K.M., Sidorchuk M.A., Sokolov K.P., Sharykin N.K., Zakharenko S.M., 2002, Astrophys. Space Sci., **280**, 235

Bock D.C.-J., Large M.I., Sadler E.M., 1999, Astron. J., **117**, 1578

Cohen A.S., Lane W.M., Cotton W.D., Perley R.A., Kassim N.E., Lazio T.J.W., Condon J.J., Erickson W.C., 2002, American Astronomical Society Meeting, **201**, No. 105.06

Condon J.J., Cotton W.D., Greisen E.W., Yin Q.F., Perley R.A., Taylor G.B., Broderick J.J., 1998, Astron. J., **115**, 1693

Douglas J.N., Bash F.N., Bozyan F.A., Torrence G.W., Wolfe C., 1996, Astron. J., **111**, 1945

Dallacasa D., Stanghellini C., Centonza M., Fanti R., 2000, Astron. Astrophys., **363**, 887

Edge D.O., Shakeshaft J.R., McAdam W.B., Baldwin J.E., Archer S., 1959, Mem. R. Astron. Soc., **68**, 37

Fanaroff B.L.& Riley J.M., 1974, Mon. Not. R. Astron. Soc., **167**, 31P

Fiedler R.L., Waltman E.B., Spencer J.H., Johnston K.J., Angerhofer P.E., Florkowski D.R., Josties F.J., Klepczynski W.J., McCarthy D.D., Matsakis D.N., 1987, Astrophys. J. Suppl. Ser., **65**, 319

Fomalont E.B, Frey S., Paragi Z., Gurvits L.I., Scott W.K., Taylor A.R., Edwards P.G., Hirabayashi H., 2000, Astrophys. J. Suppl. Ser., **131**, 95

Ghosh T., Gopal-Krishna, Rao A.P., 1994, Astron. Astrophys. Suppl. Ser., **106**, 29

Gomez J.-L., Marscher A.P., Alberdi A., Jorstad S.G., Agudo I., 2001, Astrophys. J. Let., **561**, L161

Gregory P.C., Scott W.K., Douglas K., & Condon, J.J., 1996, Astrophys. J. Suppl. Ser., **103**, 427

Griffith M., Langston G., Heflin M., Conner S., Lehar J., Burke B., 1990, Astrophys. J. Suppl. Ser., **74**, 129

Griffith M.R., Wright A.E., Burke B.F., & Ekers R.D., 1994, Astrophys. J. Suppl. Ser., **90**, 179

Griffith M.R., Wright A.E., Burke B.F., & Ekers R.D., 1995, Astrophys. J. Suppl. Ser., **97**, 347

Hales S.E.G., Baldwin J.E., Warner P.J., 1993, Mon. Not. R. Astron. Soc., **263**, 25

Hales S.E.G., Waldram E.M., Rees N., Warner P.J., 1995, Mon. Not. R. Astron. Soc., **274**, 447

Hartman R.C., Bertsch D.L., Bloom S.D., Chen A.W., et al., 1999, Astrophys. J. Suppl. Ser., **123**, 79

Heeschen D.S., Krichbaum Th., Schalinski C.J., Witzel A., 1987, Astron. J., **94**, 1493

Hirabayashi H., Fomalont E.B., Horiuchi S., et al., 2001, Pub. Astron. Soc. Japan, **52**, 997

Kedziora-Chudczer L.L., Jauncey D.L., Wieringa M.H., Tzioumis A.K., & Reynolds J.E., 2001, Mon. Not. R. Astron. Soc., **325**, 1411

Kellermann K.I., Vermeulen R.C., Zensus J.A., Cohen M.H., 1998, Astron. J., **115**, 1295

Kiikov S.O., Mingaliev M.G., Stolyarov V.A., Stupalov M.S., 2002, Bull. Spec. Astrophys. Obs., **54**, 5

Kovalev Y.Y., Nizhelsky N.A., Kovalev Yu.A., Berlin A.B., Zhekanis G.V., et al., 1999, Astrophys. J. Suppl. Ser., **139**, 545

Kühr H.U., Nauber U., Pauliny-Toth I.I.K., Witzel A., 1979, A Catalogue of Radio Sources. Max-Planck-Institut für Radioastronomie Auf dem Hugel 69, 5300 Bonn, Preprint No. 55

Kühr H., Witzel A., Pauliny-Toth I.I.K., Nauber U., 1981, Astron. Astrophys. Suppl. Ser., **45**, 367

Lazio T.J. W., Waltman E.B., Ghigo F.D., Fiedler R.L., Foster R.S., Johnston K.J., 2001, Astrophys. J. Suppl. Ser., **136**, 265

Mingaliev M.G., Botashev A.M., Stolyarov V.A., 1998, Bull. Spec. Astrophys. Obs., **46**, 28

Mingaliev M.G., Stolyarov V.A., Davies R.D., Melhuish S.J., Bursov N.A., Zhekanis G.V., 2001. Astron. Astrophys., **370**, 78

Ott M., Witzel A., Quirrenbach A. et al., 1994, Astron. Astrophys., **284**, 331

Pilkington J.D.H., & Scott P.F., 1965 Mem. Roy. Astron. Soc., **69**, 183

Pooley D.M., Waldram E.M., Riley J.M., 1998, Mon. Not. R. Astron. Soc., **298**, 637

Preston R.A., Morabito D.D., Williams J.G., Faulkner J., Jauncey D.L., Nicolson G., 1985, Astron. J., **90**, 1599

Quiniento Z.M., & Cersosimo J.C., 1993, Astron. Astrophys. Suppl. Ser., **97**, 435

Rengelink R.B., Tang Y., de Bruyn A.G., Miley G.K., Bremer M.N., Rottgering H.J.A., Bremer M.A.R., 1997, Astron. Astrophys. Suppl. Ser., **124**, 259

Reuter H.-P., Kramer C., Sievers A., Paubert G., Moreno R., Greve A., Leon S., Panis J.F., Ruiz-Moreno M., Ungerechts H., Wild W., 1997, Astron. Astrophys. Suppl. Ser., **122**, 271

Stickel M., Meisenheimer K., & Kühr H., 1994, Astron. Astrophys. Suppl. Ser., 105, 211

Tabara H., & Inoue M., 1980, Astron. Astrophys. Suppl. Ser., **39**, 379

Tornikoski M., Valtaoja E., Teräsranta H., Karlamaa K., Lainela M., Nilsson K., Kotilainen J., Laine S., Lahteenmaki A., Knee L.B.G., Botti L.C.L., 1996, Astron. Astrophys. Suppl. Ser., **116**, 157

Teräsranta H., Tornikoski M., Mujunen A., Karlamaa K., Valtonen T., et al., 1998, Astron. Astrophys. Suppl. Ser., **132**, 305

Veron-Cetty M.-P., Veron P., 2001, Astron. Astrophys., **374**, 92

Verkhodanov O.V., Trushkin S.A., Andernach H., Chernenkov V.N., 1997, In: "Astronomical Data Analysis Software and Systems VI", Eds.: Gareth Hunt and H.E. Payne, ASP Conference Series, **125**, 322

Voges W., Aschenbach B., Boller T., Braeuninger H., et al., 1999, Astron. Astrophys., **349**, 389

Waltman E.B., Fiedler, R.L., Johnston K.J., Spencer J.H., Florkowski D.R., Josties F.J., McCarthy D.D., & Matsakis D.N., 1991, Astrophys. J. Suppl. Ser., **77**, 379

White R.L., & Becker R.H., 1992, Astrophys. J. Suppl. Ser., **79**, 331

White R.L., Becker R.H., Helfand D.J., & Gregg M.D., 1997, Astrophys. J., **475**, 479

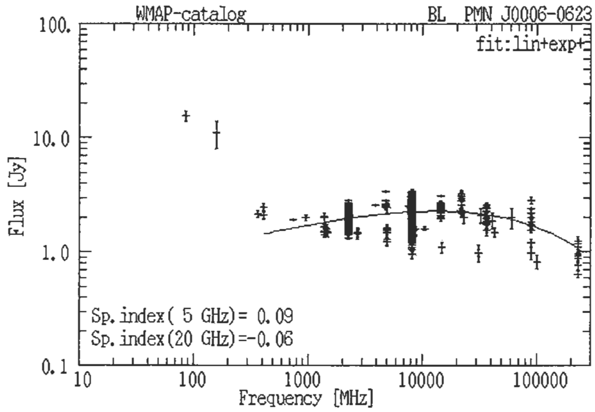
Wilkinson P.N., Browne I.W.A., Patnaik A.R., Wrobel J.M., Sorathia B., 1998, Mon. Not. R. Astron. Soc., **300**, 790

Wright A.E., Griffith M.R., Burke B.F., & Ekers R.D., 1994, Astrophys. J. Suppl. Ser., **91**, 111

Wright A.E., Griffith M.R., Hunt A.J., Troup E., Burke B.F., & Ekers R.D., 1996, Astrophys. J. Suppl. Ser., **103**, 145

Wright A., & Otrupcek R., 1990, Parkes Catalogue, Australia Telescope National Facility. Parkes, Australia

Integral spectra of 208 MMAP sources are presented below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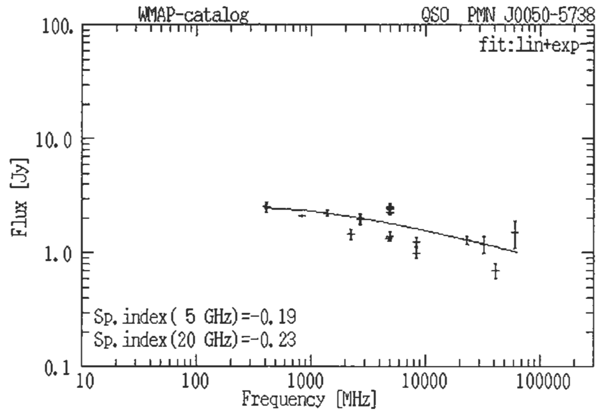
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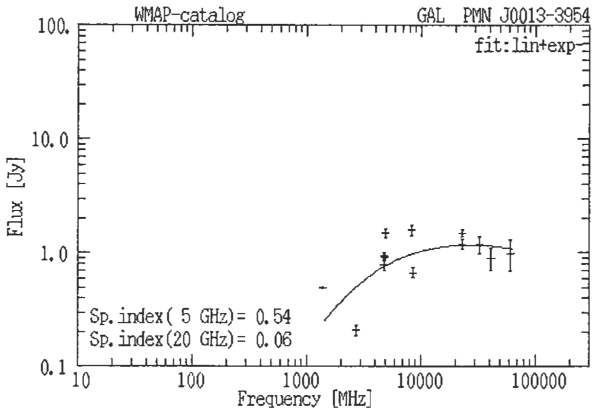
Sp. index(20 GHz)=-0.23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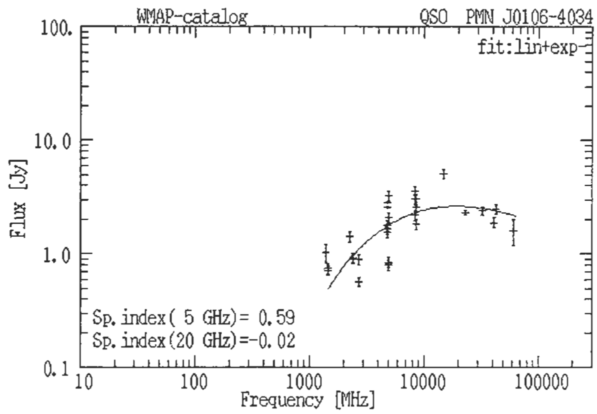
Sp. index(20 GHz)= 0.06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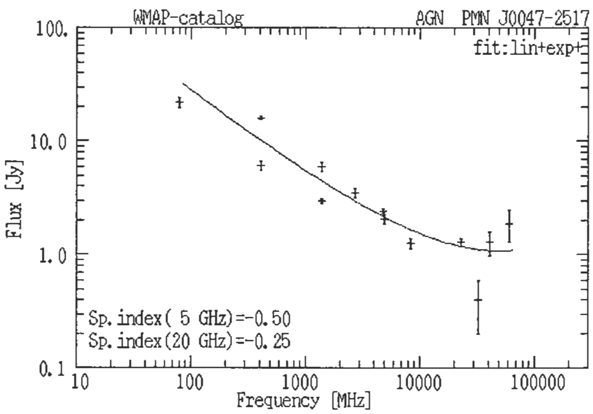
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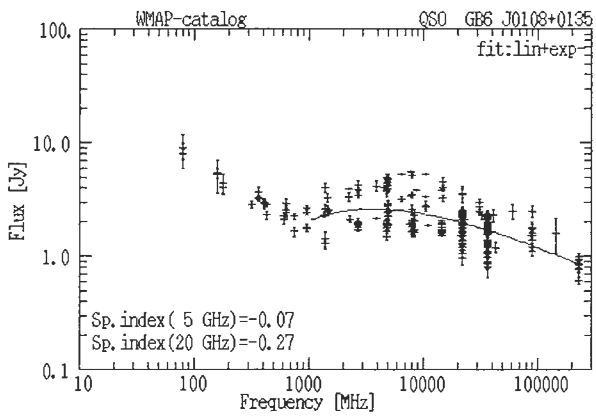
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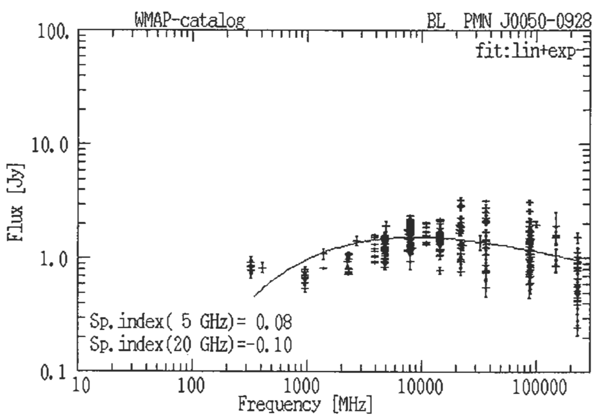
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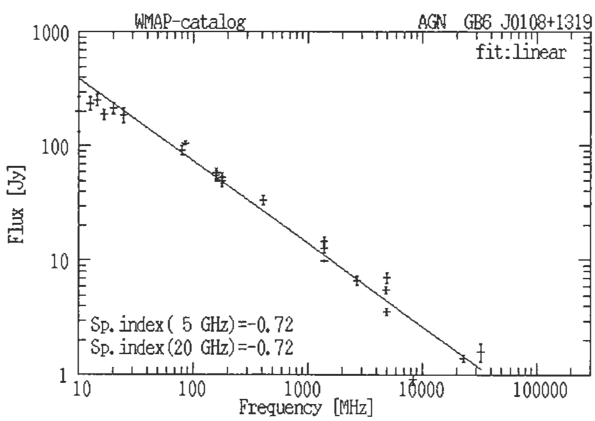
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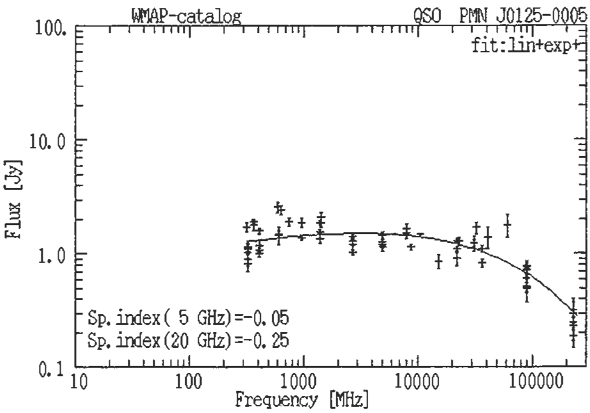
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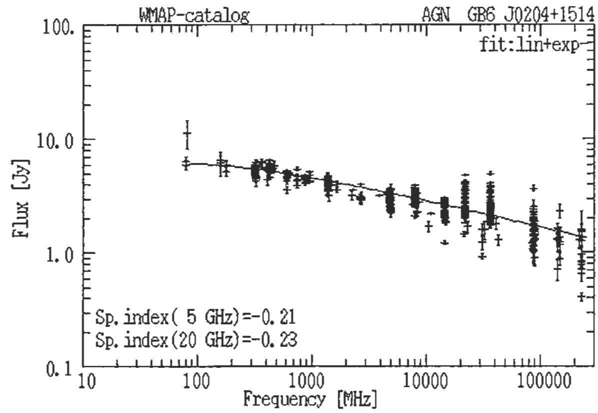
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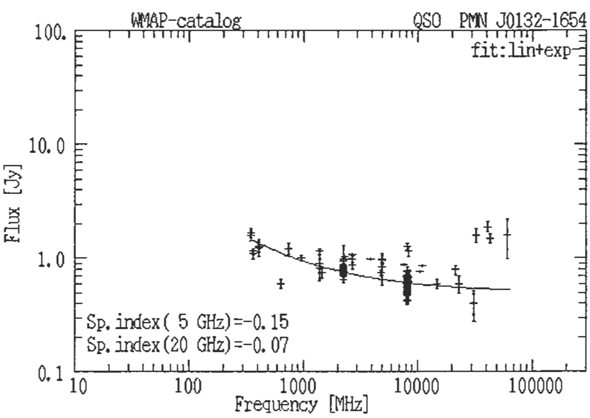
Frequency [MHz]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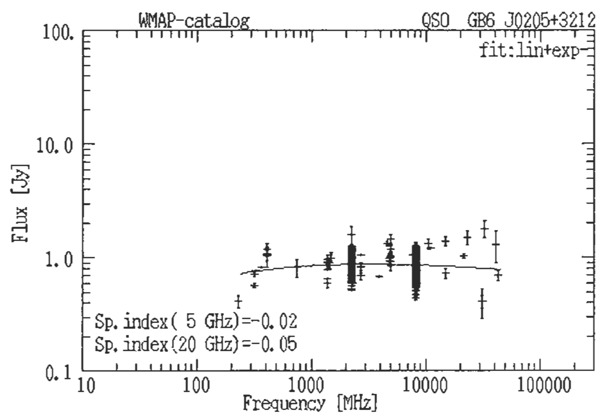
Flux [Jy]
Frequency [MHz]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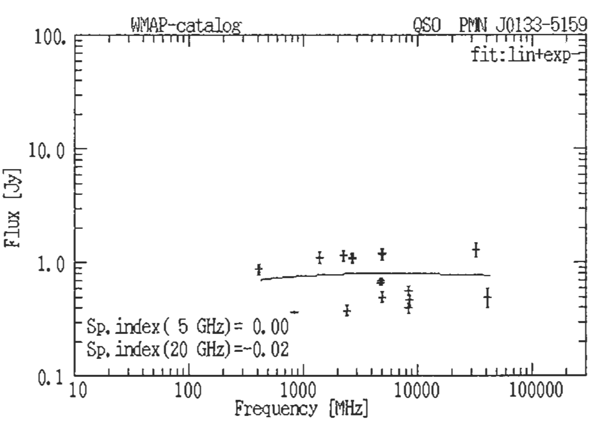
Frequency [MHz]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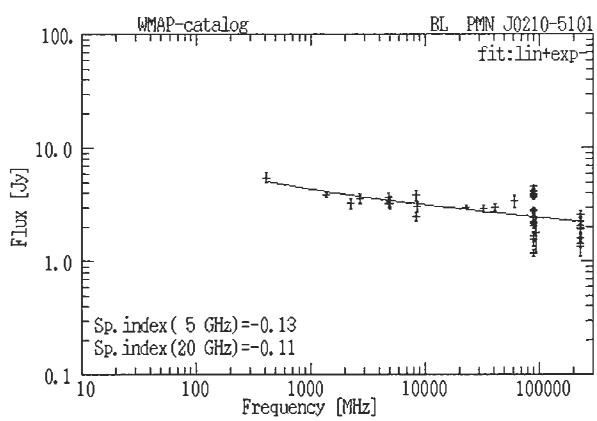
Frequency [MHz]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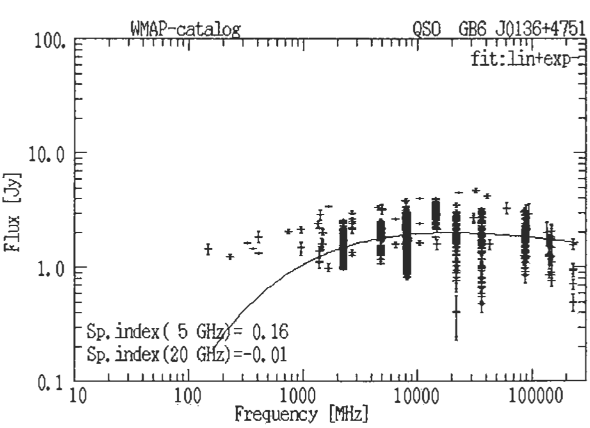
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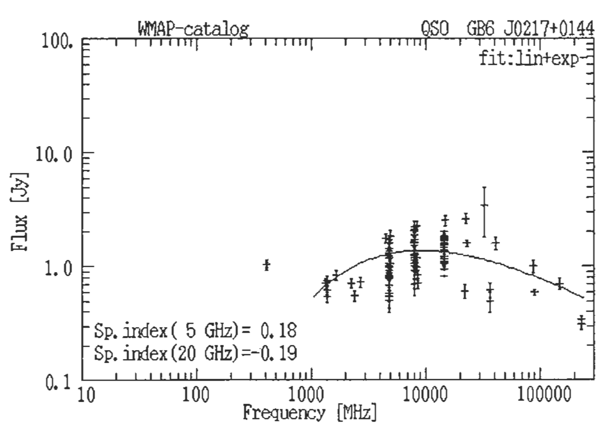
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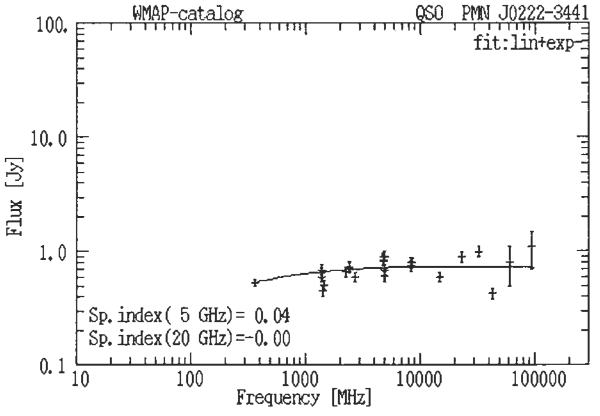
Frequency [MHz]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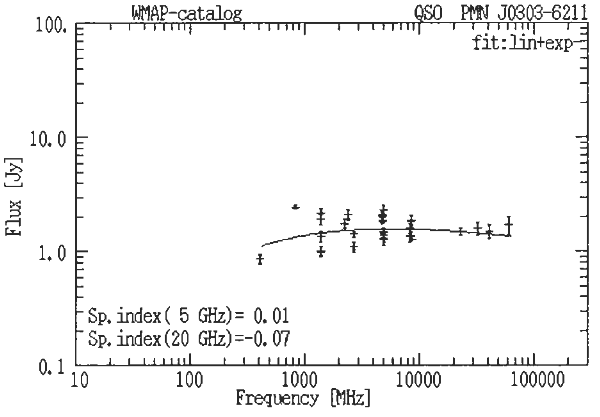
Frequency [MHz]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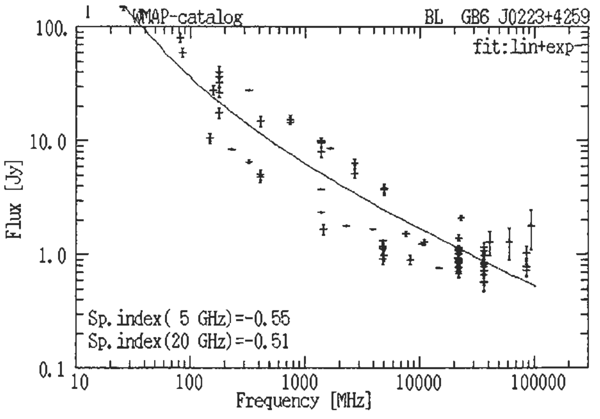
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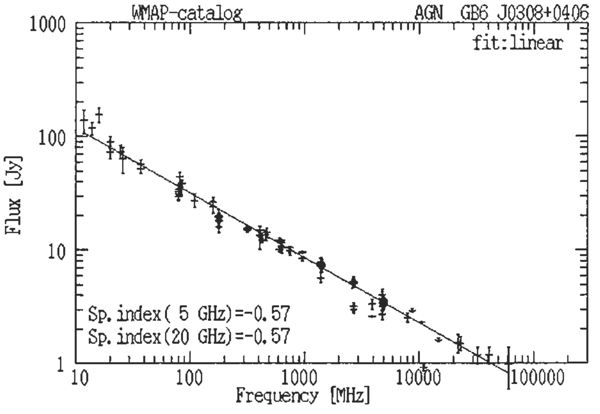
Frequency [MHz]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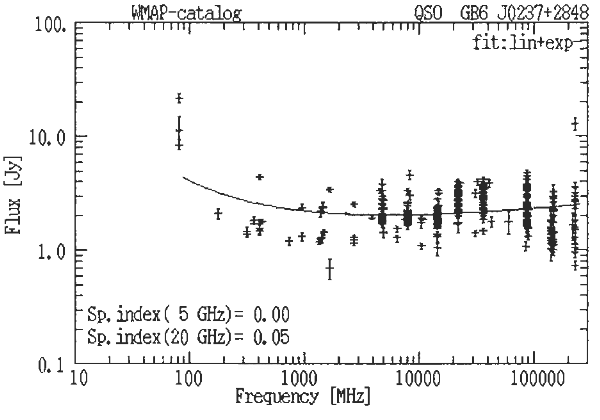
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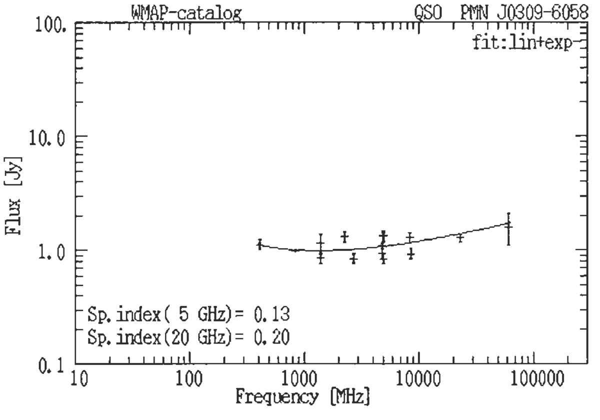
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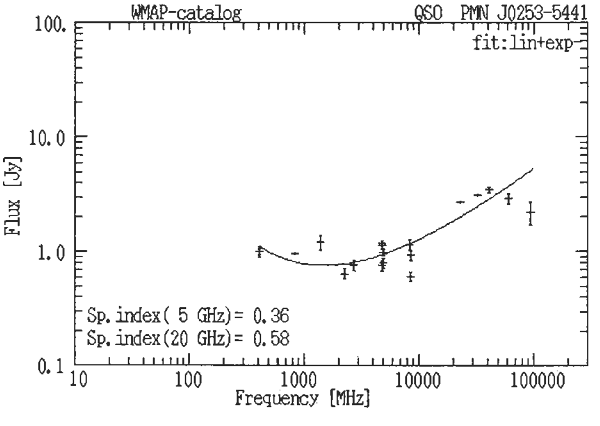
Frequency [MHz]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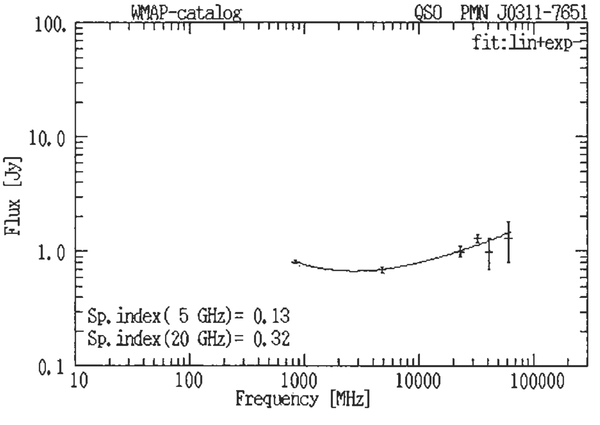
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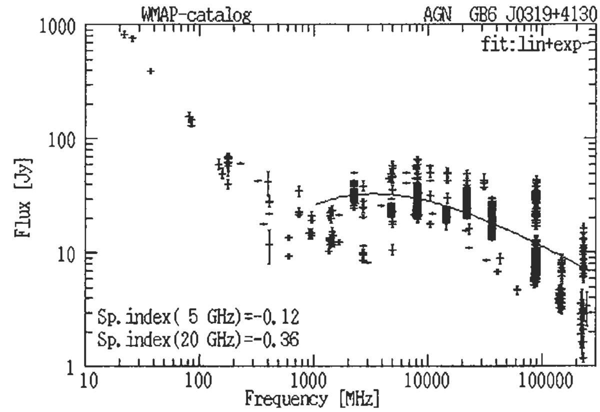
Frequency [MHz]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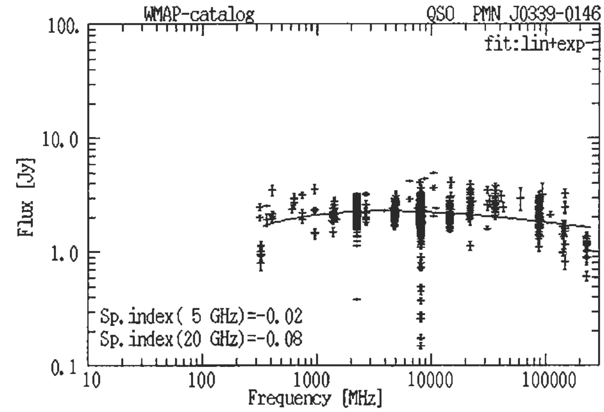
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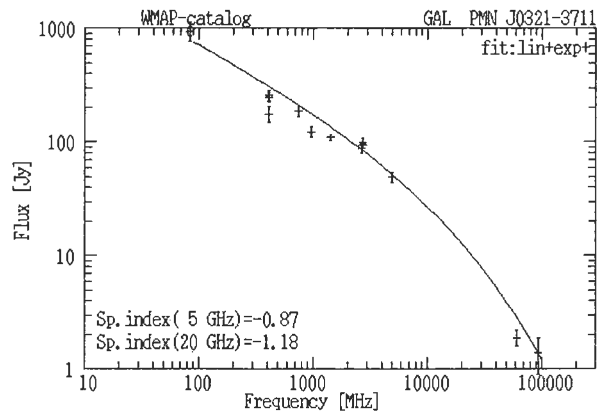
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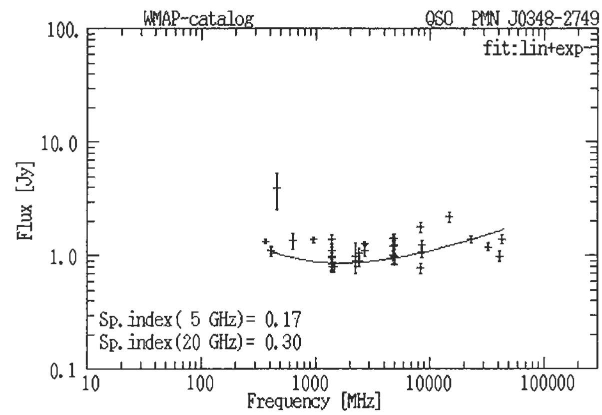
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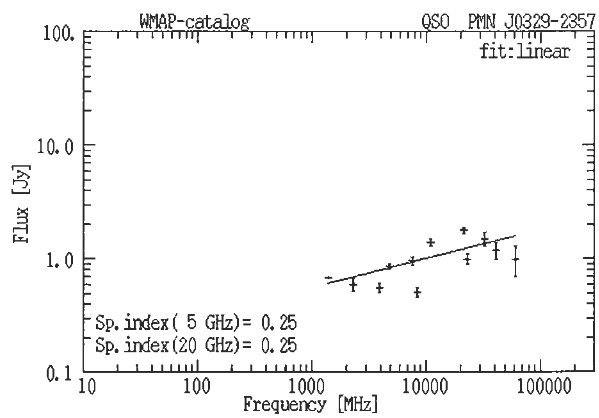
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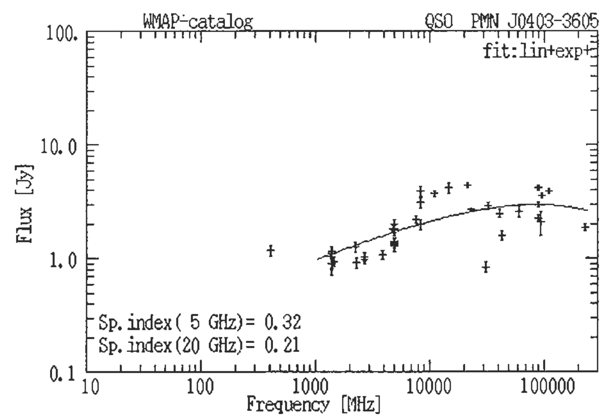
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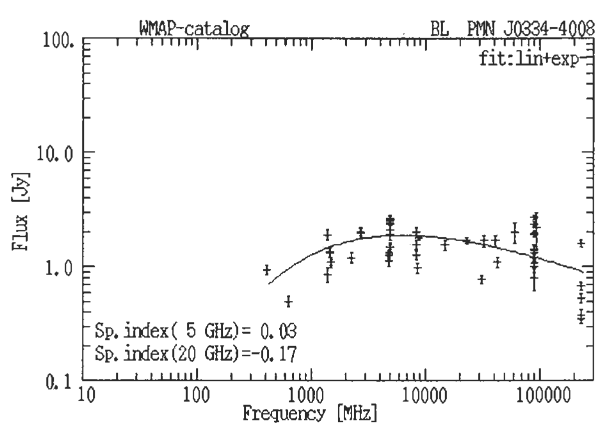
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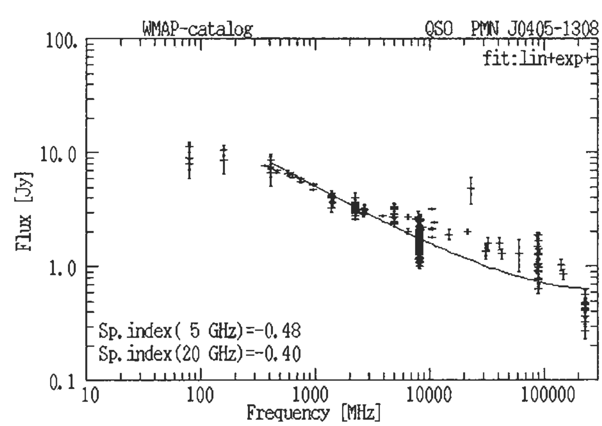
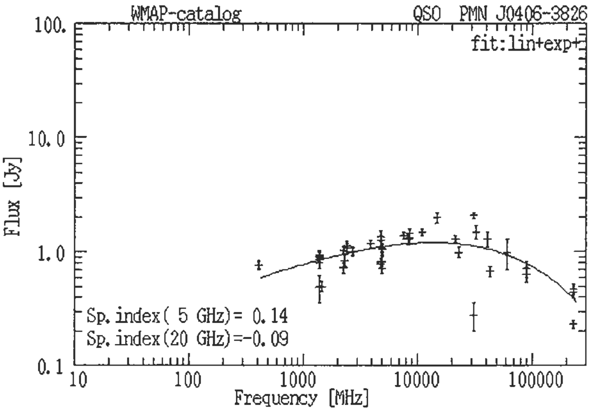
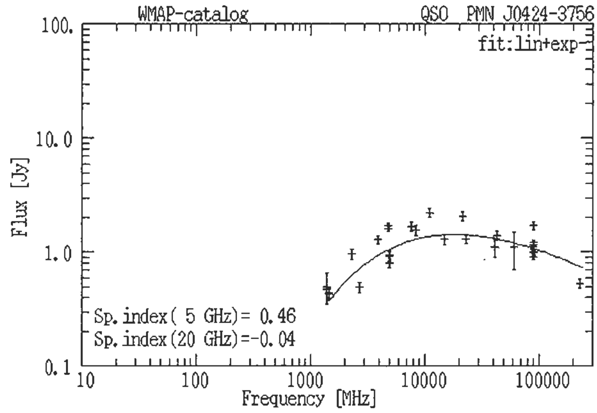
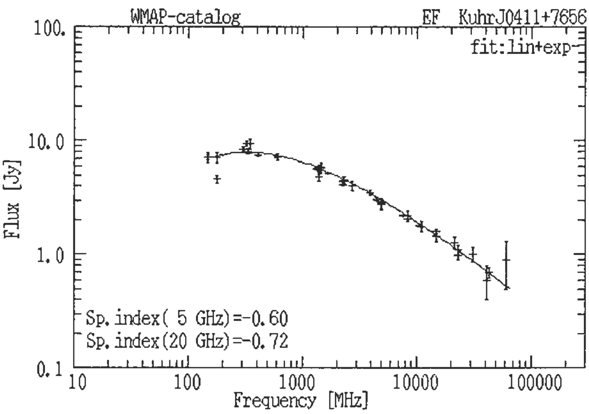
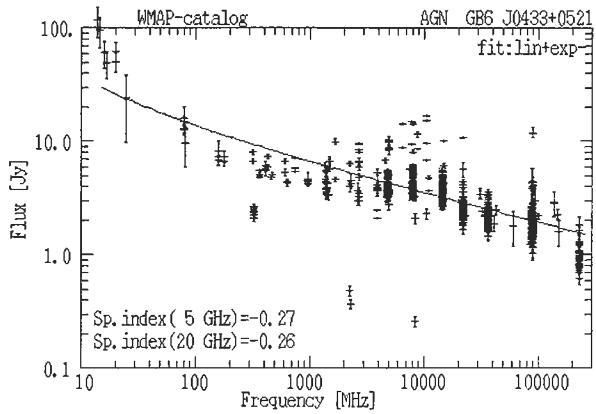
BL PMN J0334-4008
fit: lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0. 03
Sp. index(20 GHz)=-0. 17

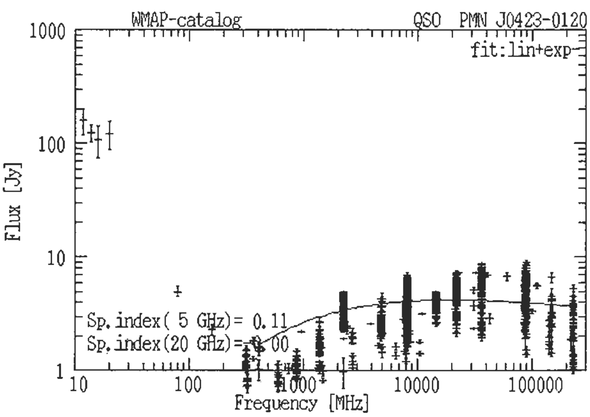

WMAP-catalog
QSO PMN J0405-1308
fit: lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0. 48
Sp. index(20 GHz)=-0. 40

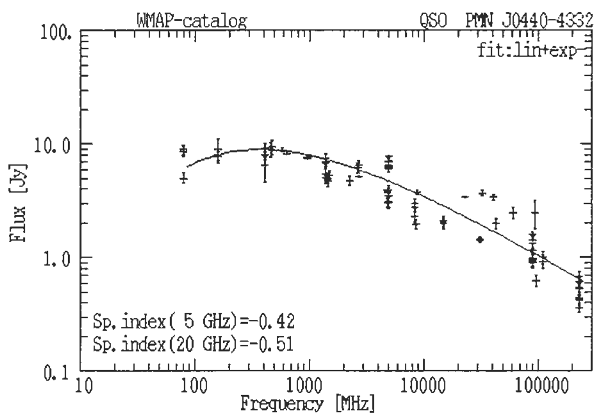

WMAP-catalog
QSO PMN J0406-3826
fit:lin+exp
Sp. index(5 GHz)= 0.14
Sp. index(20 GHz)=-0.09
Flux [Jy]
Frequency [MHz]

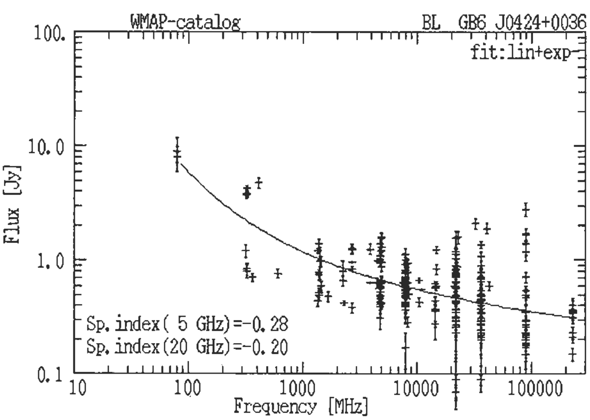

WMAP-catalog
QSO PMN J0424-3756
fit:lin+exp
Sp. index(5 GHz)= 0.46
Sp. index(20 GHz)=-0.04
Flux [Jy]
Frequency [MHz]

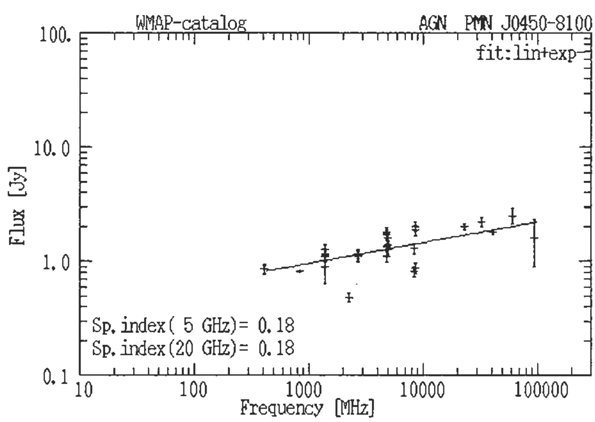

WMAP-catalog
EF KuhrJ0411+7656
fit:lin+exp
Sp. index(5 GHz)=-0.60
Sp. index(20 GHz)=-0.72
Flux [Jy]
Frequency [MHz]

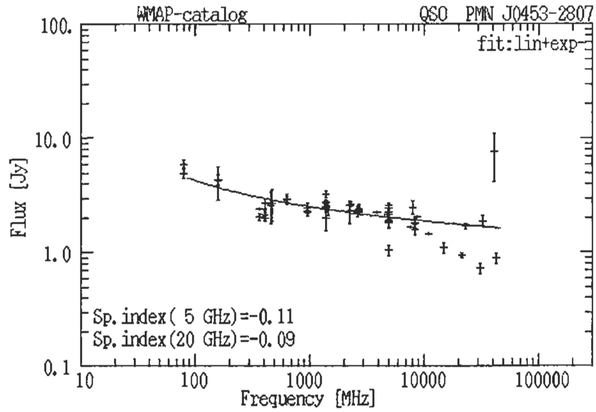

WMAP-catalog
AGN GB6 J0433+0521
fit:lin+exp
Sp. index(5 GHz)=-0.27
Sp. index(20 GHz)=-0.26
Flux [Jy]
Frequency [MHz]

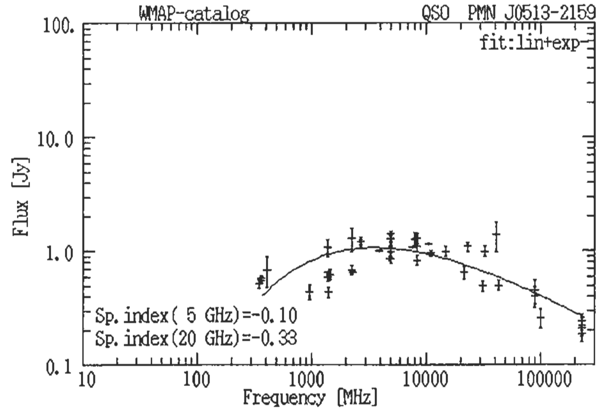

WMAP-catalog
QSO PMN J0423-0120
fit:lin+exp
Sp. index(5 GHz)= 0.11
Sp. index(20 GHz)= 0.00
Flux [Jy]
Frequency [MHz]

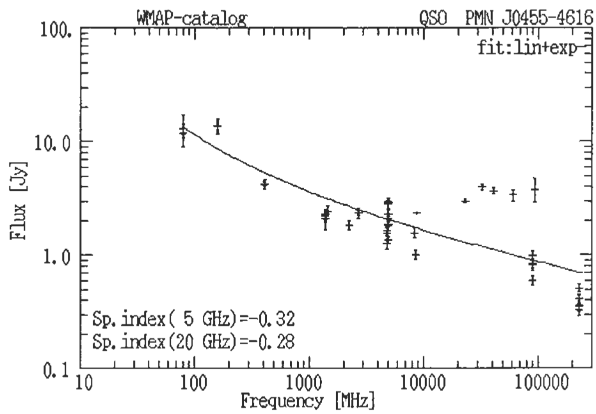

WMAP-catalog
QSO PMN J0440-4332
fit:lin+exp
Sp. index(5 GHz)=-0.42
Sp. index(20 GHz)=-0.51
Flux [Jy]
Frequency [MHz]

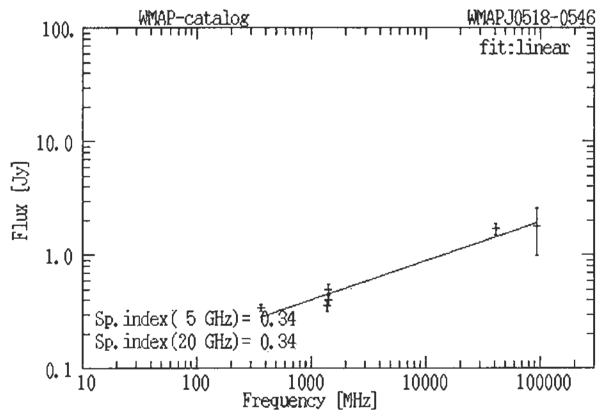

WMAP-catalog
BL GB6 J0424+0036
fit:lin+exp
Sp. index(5 GHz)=-0.28
Sp. index(20 GHz)=-0.20
Flux [Jy]
Frequency [MHz]

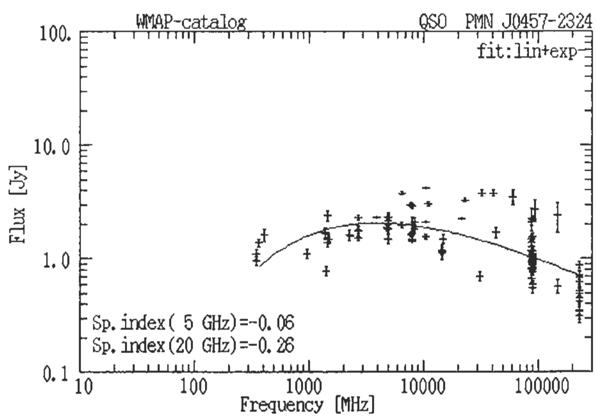

WMAP-catalog
AGN PMN J0450-8100
fit:lin+exp
Sp. index(5 GHz)= 0.18
Sp. index(20 GHz)= 0.18
Flux [Jy]
Frequency [MHz]

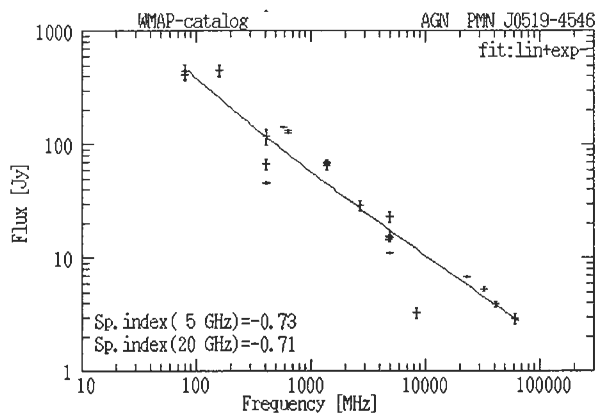

WMAP-catalog
QSO PMN J0453-2807
fit:lin+exp
Sp. index(5 GHz)=-0.11
Sp. index(20 GHz)=-0.09
Flux [Jy]
Frequency [MHz]

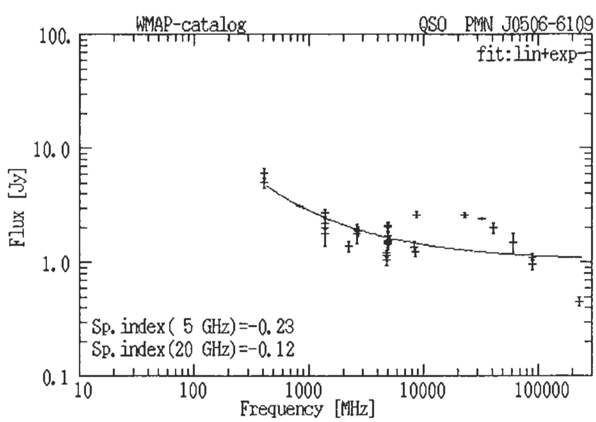

WMAP-catalog
QSO PMN J0513-2159
fit:lin+exp
Sp. index(5 GHz)=-0.10
Sp. index(20 GHz)=-0.33
Flux [Jy]
Frequency [MHz]

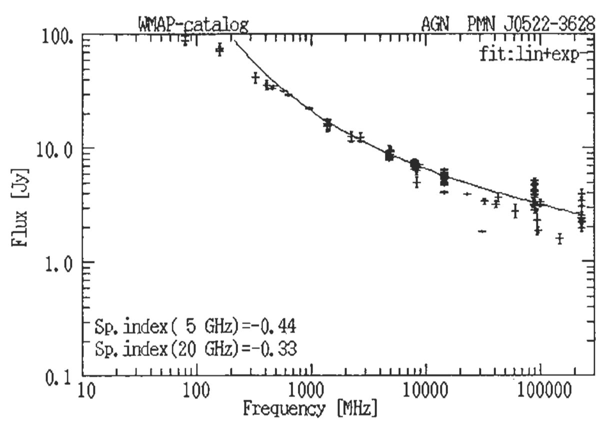

WMAP-catalog
QSO PMN J0455-4616
fit:lin+exp
Sp. index(5 GHz)=-0.32
Sp. index(20 GHz)=-0.28
Flux [Jy]
Frequency [MHz]

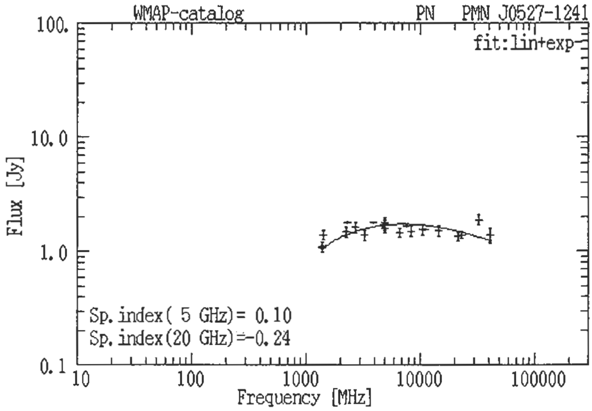

WMAP-catalog
WMAPJ0518-0546
fit:linear
Sp. index(5 GHz)= 0.34
Sp. index(20 GHz)= 0.34
Flux [Jy]
Frequency [MHz]

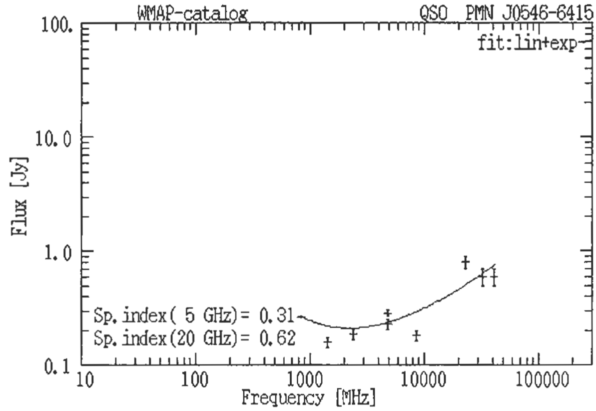

WMAP-catalog
QSO PMN J0457-2324
fit:lin+exp
Sp. index(5 GHz)=-0.06
Sp. index(20 GHz)=-0.26
Flux [Jy]
Frequency [MHz]

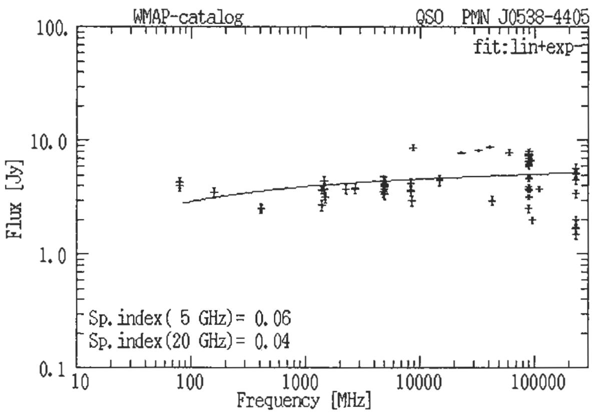

WMAP-catalog
AGN PMN J0519-4546
fit:lin+exp
Sp. index(5 GHz)=-0.73
Sp. index(20 GHz)=-0.71
Flux [Jy]
Frequency [MHz]

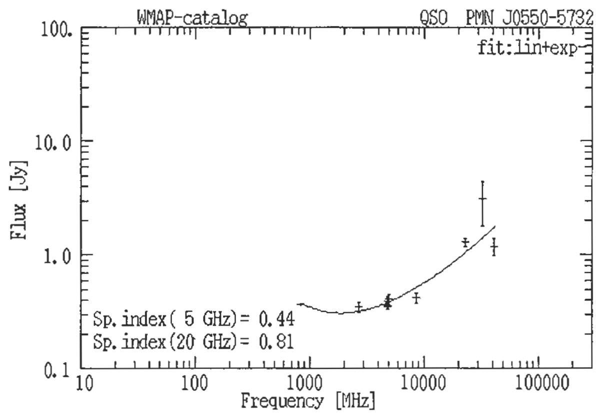

WMAP-catalog
QSO PMN J0506-6109
fit:lin+exp
Sp. index(5 GHz)=-0.23
Sp. index(20 GHz)=-0.12
Flux [Jy]
Frequency [MHz]

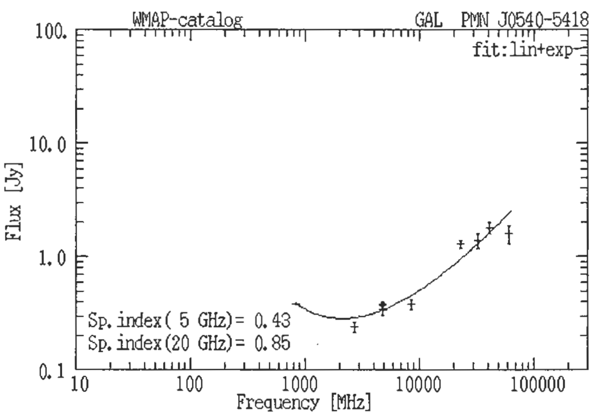

WMAP-catalog
AGN PMN J0522-3628
fit:lin+exp
Sp. index(5 GHz)=-0.44
Sp. index(20 GHz)=-0.33
Flux [Jy]
Frequency [MHz]

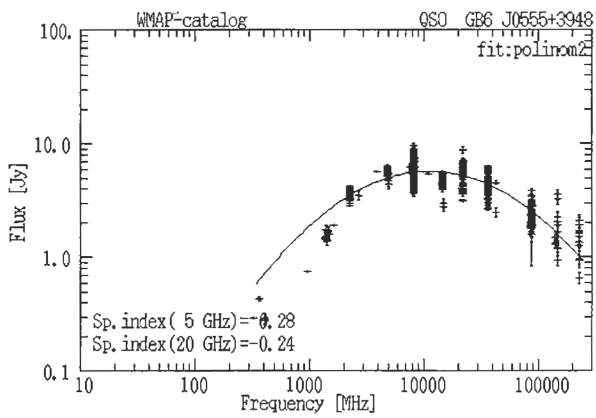

WMAP-catalog
PN PMN J0527-1241
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.10
Sp. index(20 GHz)=-0.24

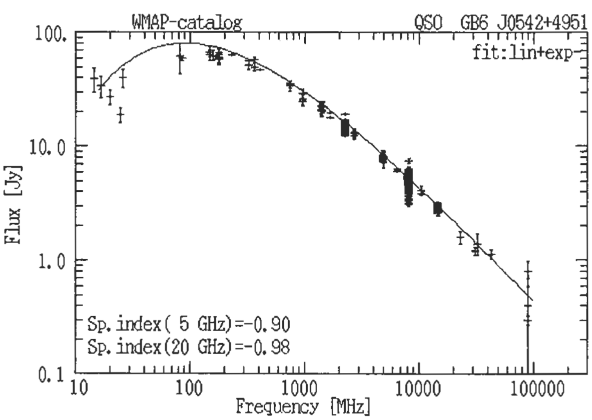

WMAP-catalog
QSO PMN J0546-6415
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.31
Sp. index(20 GHz)= 0.62

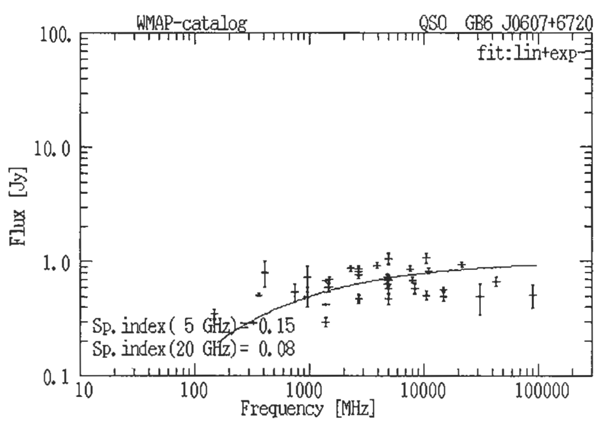

WMAP-catalog
QSO PMN J0538-4405
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.06
Sp. index(20 GHz)= 0.04

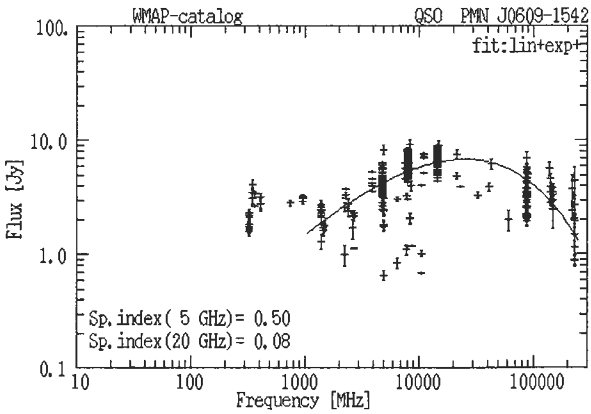

WMAP-catalog
QSO PMN J0550-5732
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.44
Sp. index(20 GHz)= 0.81

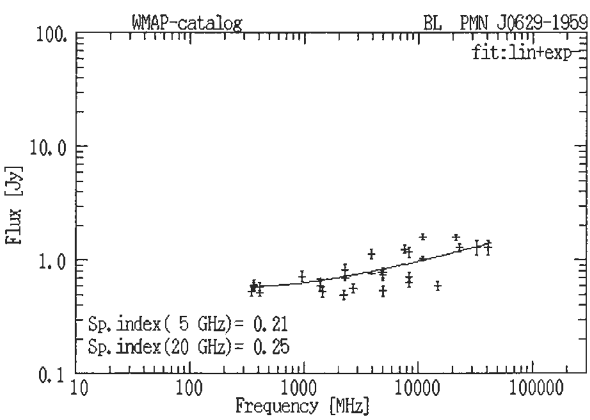

WMAP-catalog
GAL PMN J0540-5418
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.43
Sp. index(20 GHz)= 0.85

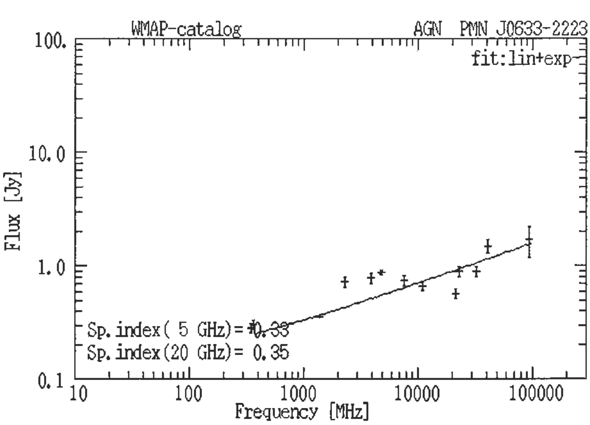

WMAP-catalog
QSO GB6 J0555+3948
fit:polinom2
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.28
Sp. index(20 GHz)=-0.24

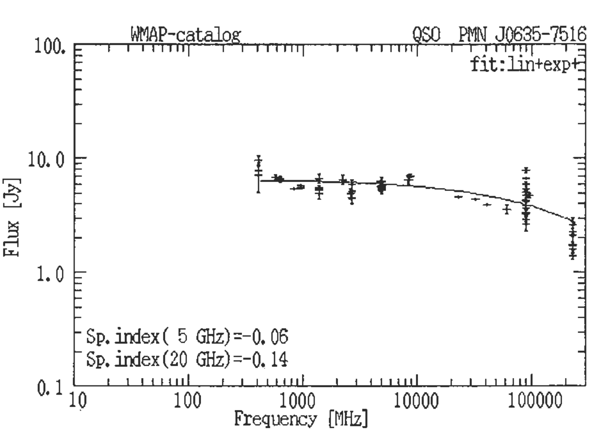

WMAP-catalog
QSO GB6 J0542+4951
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.90
Sp. index(20 GHz)=-0.98

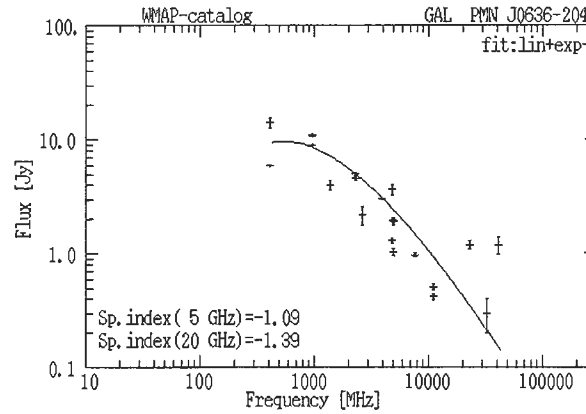

WMAP-catalog
QSO GB6 J0607+6720
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.15
Sp. index(20 GHz)= 0.08

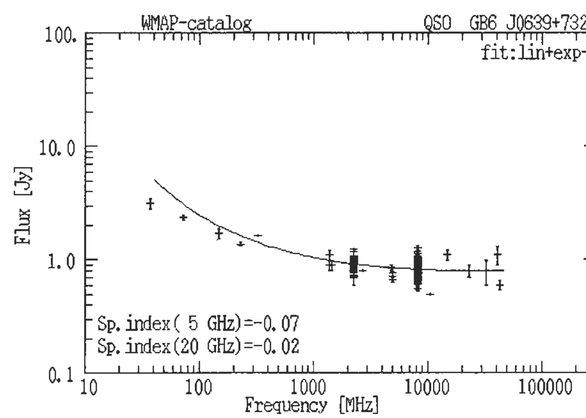

WMAP-catalog
QSO PMN J0609-1542
fit:lin+exp+
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.50
Sp. index(20 GHz)= 0.08

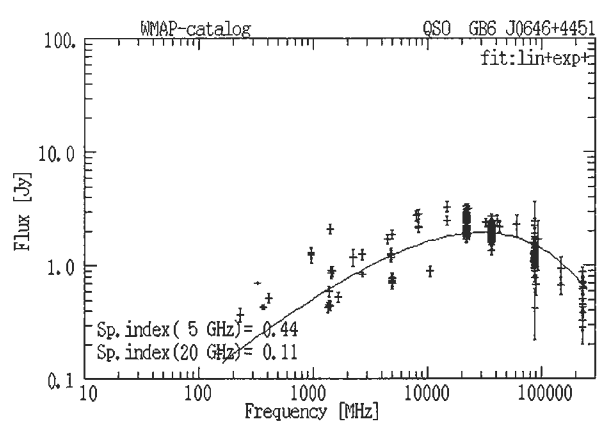

WMAP-catalog
BL PMN J0629-1959
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.21
Sp. index(20 GHz)= 0.25

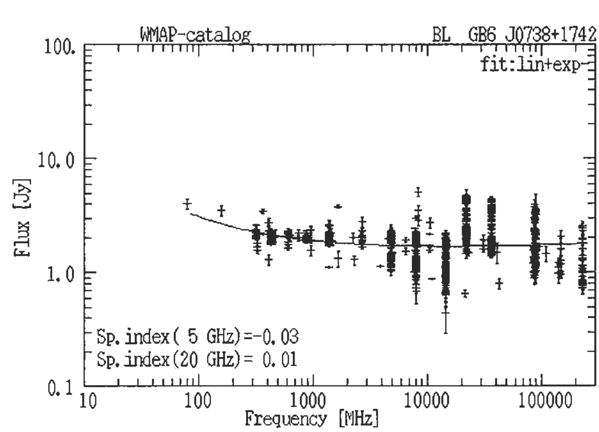

WMAP-catalog
AGN PMN J0633-2223
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.33
Sp. index(20 GHz)= 0.35

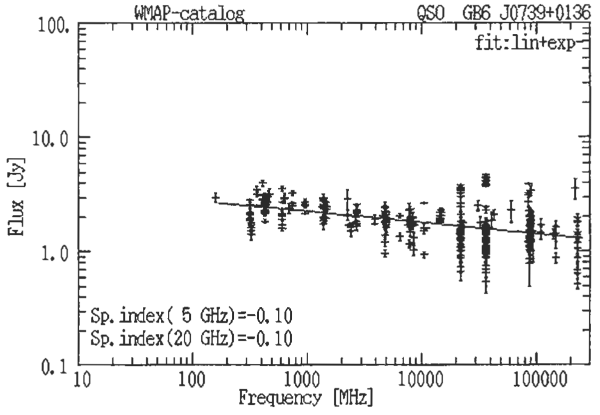

WMAP-catalog
QSO PMN J0635-7516
fit:lin+exp+
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.06
Sp. index(20 GHz)=-0.14

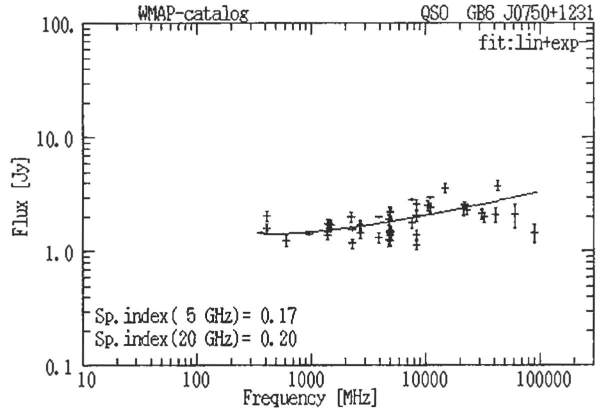

WMAP-catalog
GAL PMN J0636-2041
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-1.09
Sp. index(20 GHz)=-1.39

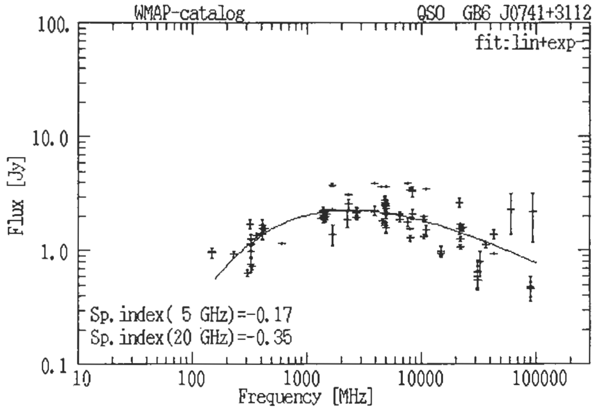

WMAP-catalog
QSO GB6 J0639+7324
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.07
Sp. index(20 GHz)=-0.02

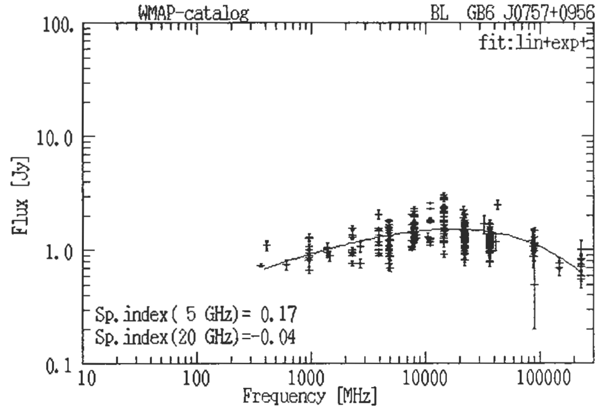

WMAP-catalog
QSO GB6 J0646+4451
fit:lin+exp+
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.44
Sp. index(20 GHz)= 0.11

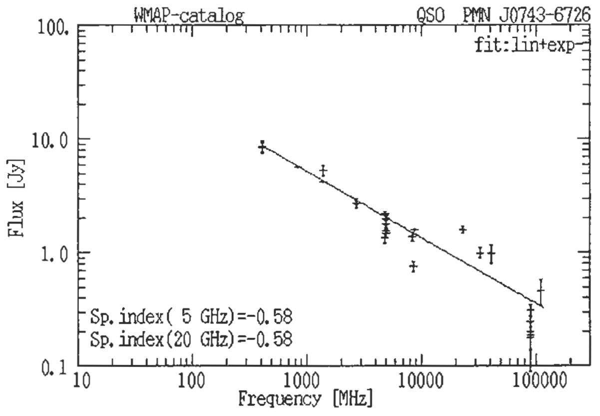

WMAP-catalog
BL GB6 J0738+1742
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.03
Sp. index(20 GHz)= 0.01

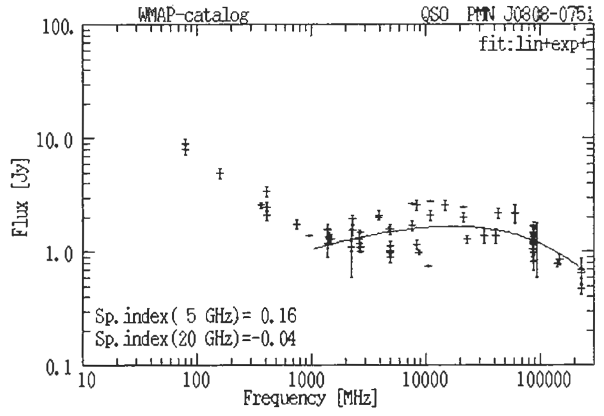

WMAP-catalog
QSO GB6 J0739+0136
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.10
Sp. index(20 GHz)=-0.10

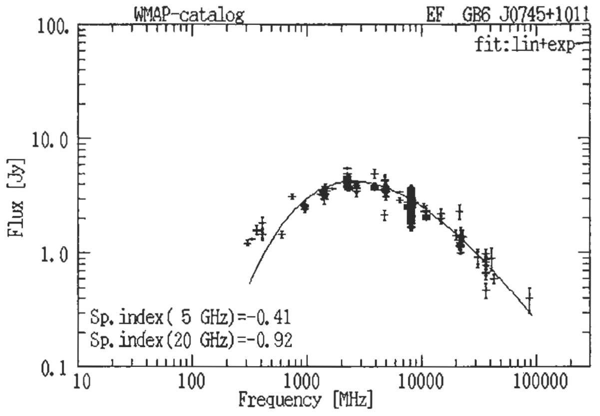

WMAP-catalog
QSO GB6 J0750+1231
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.17
Sp. index(20 GHz)= 0.20

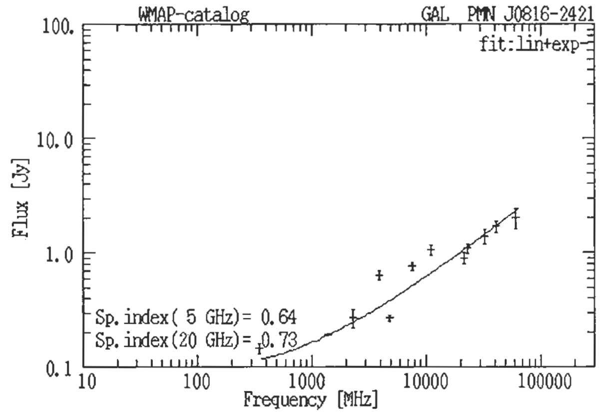

WMAP-catalog
QSO GB6 J0741+3112
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.17
Sp. index(20 GHz)=-0.35

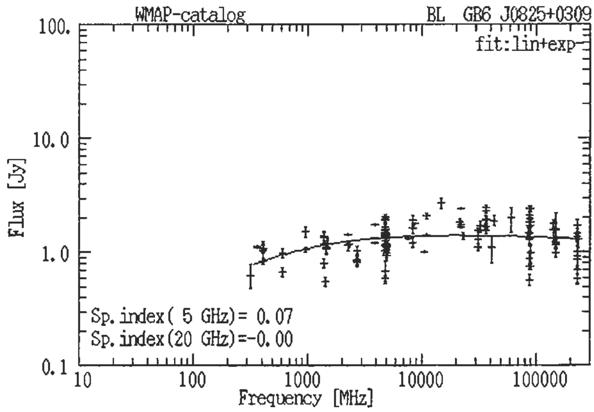

WMAP-catalog
BL GB6 J0757+0956
fit:lin+exp+
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.17
Sp. index(20 GHz)=-0.04

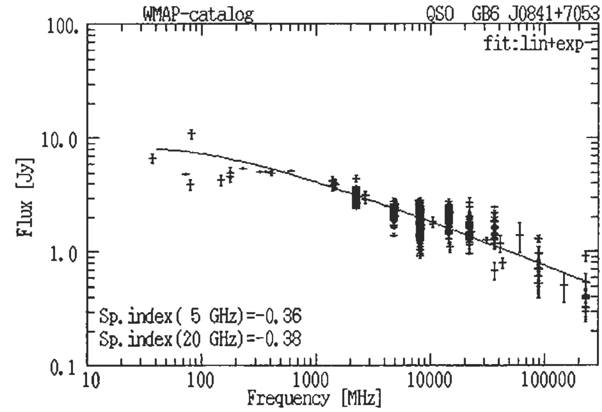

WMAP-catalog
QSO PMN J0743-6726
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.58
Sp. index(20 GHz)=-0.58

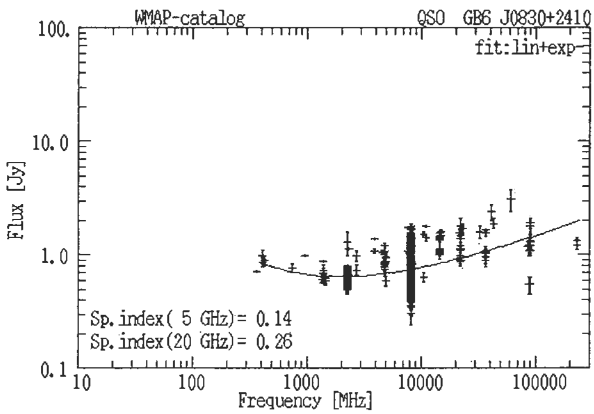

WMAP-catalog
QSO PMN J0808-0751
fit:lin+exp+
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.16
Sp. index(20 GHz)=-0.04

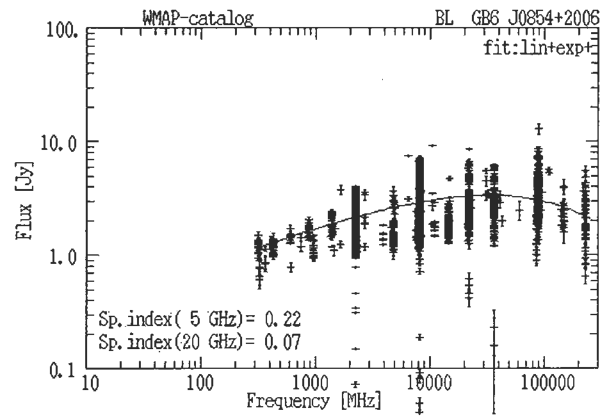

WMAP-catalog
EF GB6 J0745+1011
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.41
Sp. index(20 GHz)=-0.92

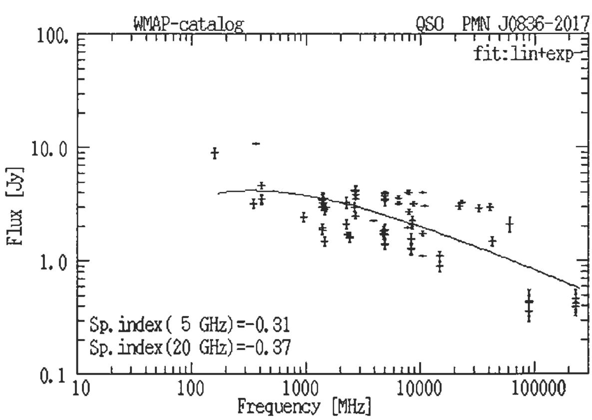

WMAP-catalog
GAL PMN J0816-2421
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.64
Sp. index(20 GHz)= 0.73

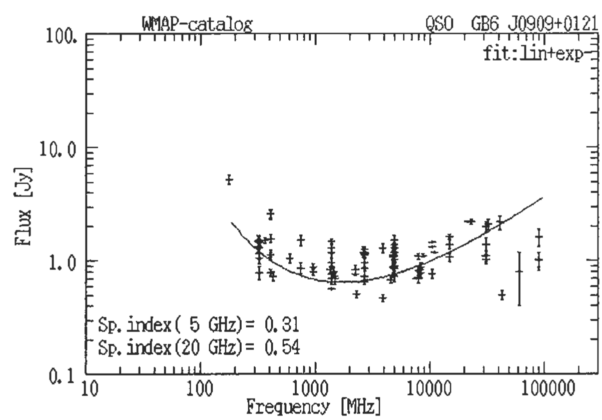

WMAP-catalog
BL GB6 J0825+0309
fit:lin+exp
Sp. index(5 GHz)= 0.07
Sp. index(20 GHz)=-0.00
Flux [Jy]
Frequency [MHz]

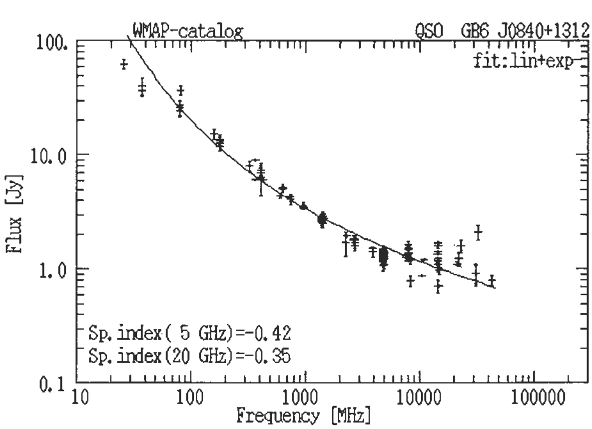

WMAP-catalog
QSO GB6 J0841+7053
fit:lin+exp
Sp. index(5 GHz)=-0.36
Sp. index(20 GHz)=-0.38
Flux [Jy]
Frequency [MHz]

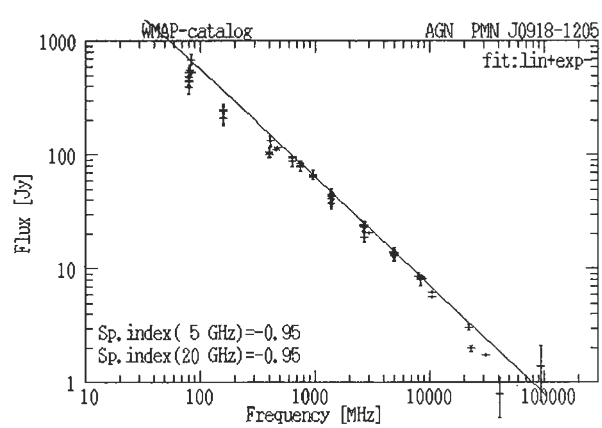

WMAP-catalog
QSO GB6 J0830+2410
fit:lin+exp
Sp. index(5 GHz)= 0.14
Sp. index(20 GHz)= 0.26
Flux [Jy]
Frequency [MHz]

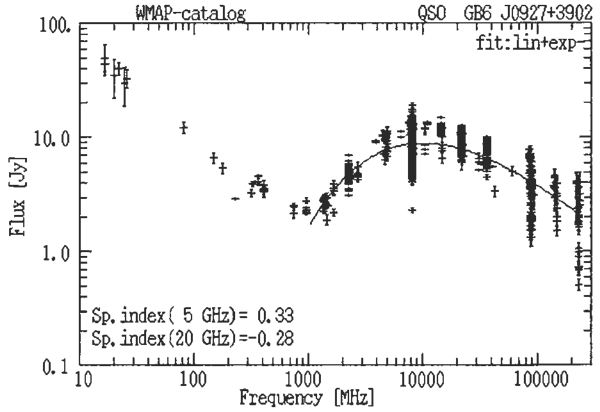

WMAP-catalog
BL GB6 J0854+2006
fit:lin+exp
Sp. index(5 GHz)= 0.22
Sp. index(20 GHz)= 0.07
Flux [Jy]
Frequency [MHz]

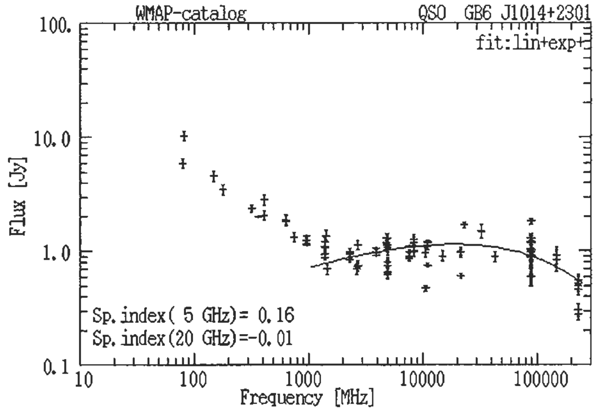

WMAP-catalog
QSO PMN J0836-2017
fit:lin+exp
Sp. index(5 GHz)=-0.31
Sp. index(20 GHz)=-0.37
Flux [Jy]
Frequency [MHz]

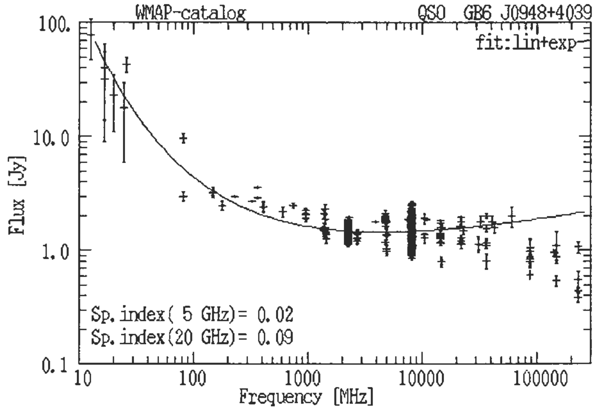

WMAP-catalog
QSO GB6 J0909+0121
fit:lin+exp
Sp. index(5 GHz)= 0.31
Sp. index(20 GHz)= 0.54
Flux [Jy]
Frequency [MHz]

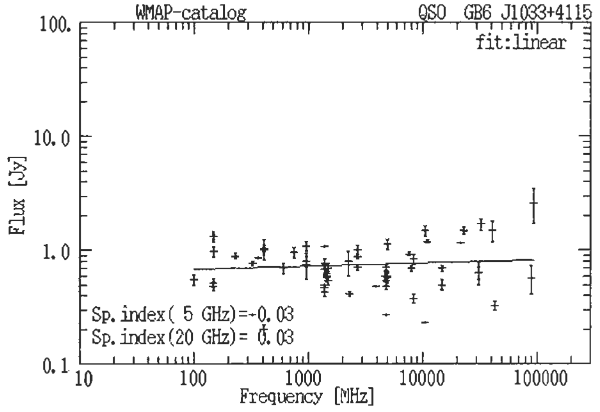

WMAP-catalog
QSO GB6 J0840+1312
fit:lin+exp
Sp. index(5 GHz)=-0.42
Sp. index(20 GHz)=-0.35
Flux [Jy]
Frequency [MHz]

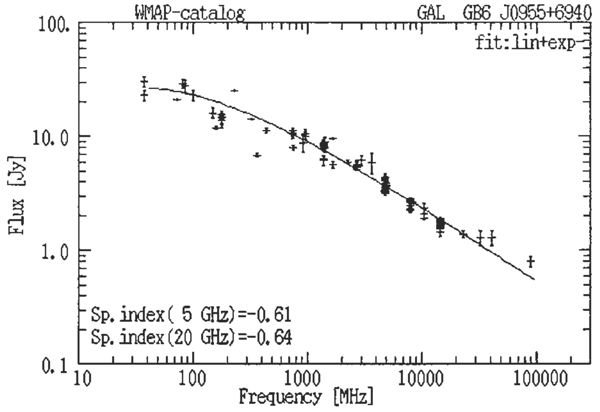

WMAP-catalog
AGN PMN J0918-1205
fit:lin+exp
Sp. index(5 GHz)=-0.95
Sp. index(20 GHz)=-0.95
Flux [Jy]
Frequency [MHz]

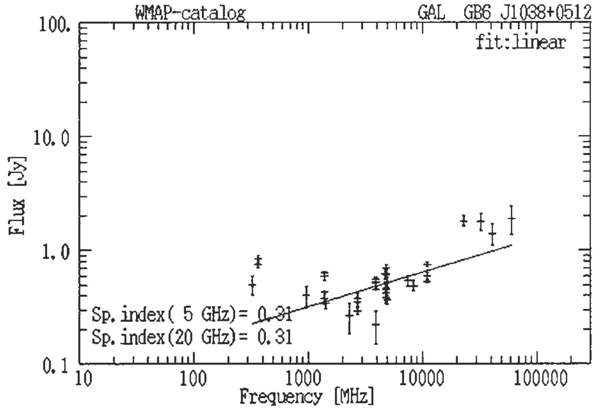

WMAP-catalog
QSO GB6 J0927+3902
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.33
Sp. index(20 GHz)=-0.28

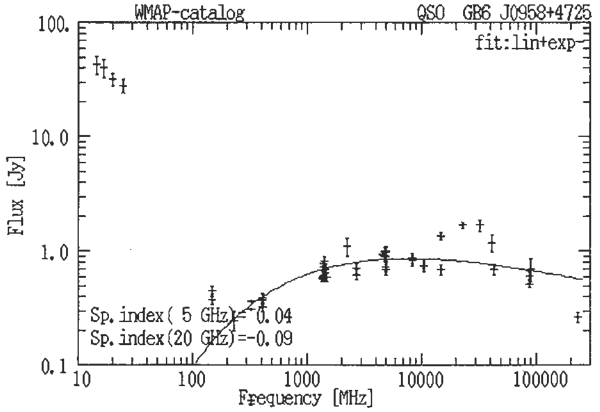

WMAP-catalog
QSO GB6 J1014+2301
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.16
Sp. index(20 GHz)=-0.01

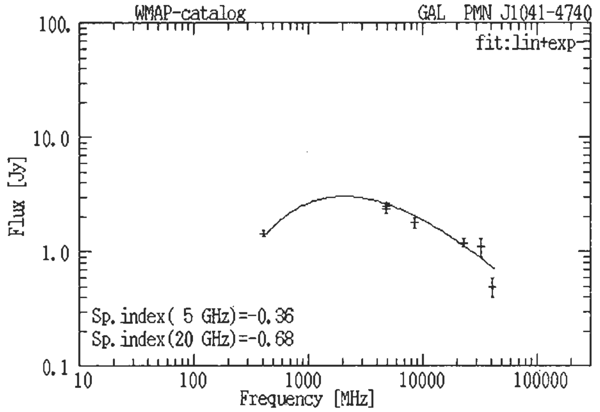

WMAP-catalog
QSO GB6 J0948+4039
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.02
Sp. index(20 GHz)= 0.09

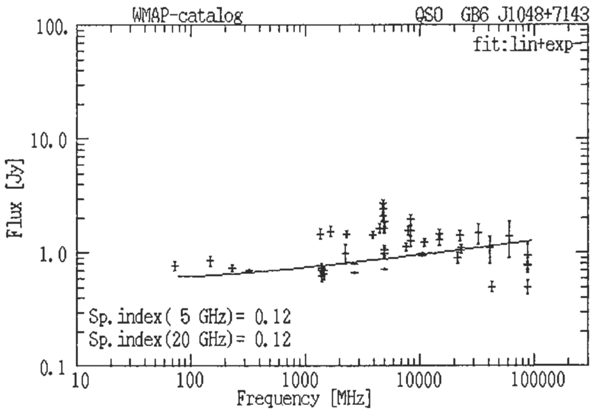

WMAP-catalog
QSO GB6 J1033+4115
fit:linear
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.03
Sp. index(20 GHz)= 0.03

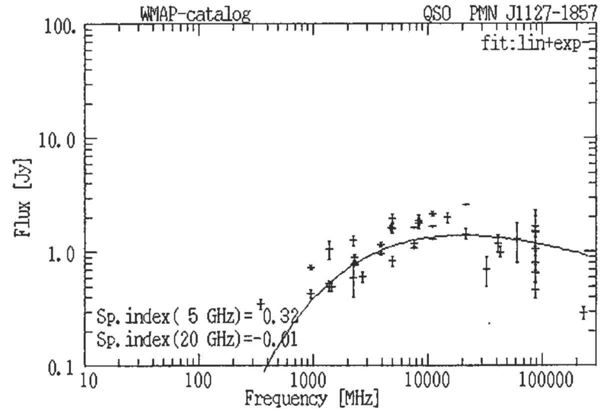

WMAP-catalog
GAL GB6 J0955+6940
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.61
Sp. index(20 GHz)=-0.64

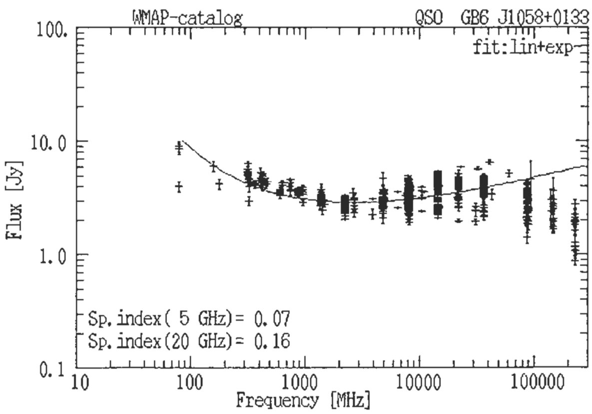

WMAP-catalog
GAL GB6 J1038+0512
fit:linear
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.31
Sp. index(20 GHz)= 0.31

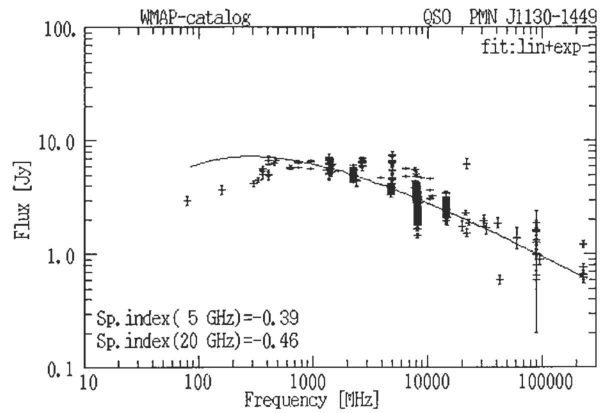

WMAP-catalog
QSO GB6 J0958+4725
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.04
Sp. index(20 GHz)=-0.09

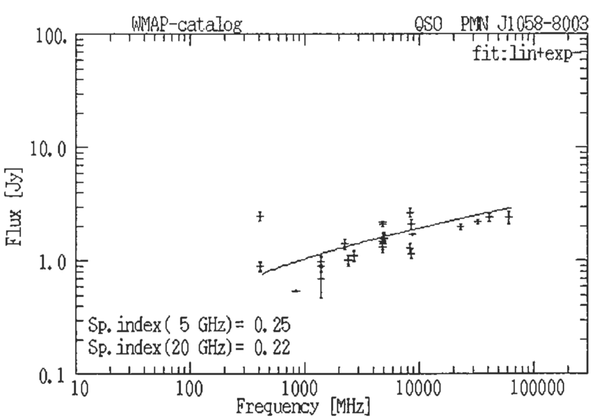

WMAP-catalog
GAL PMN J1041-4740
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.36
Sp. index(20 GHz)=-0.68

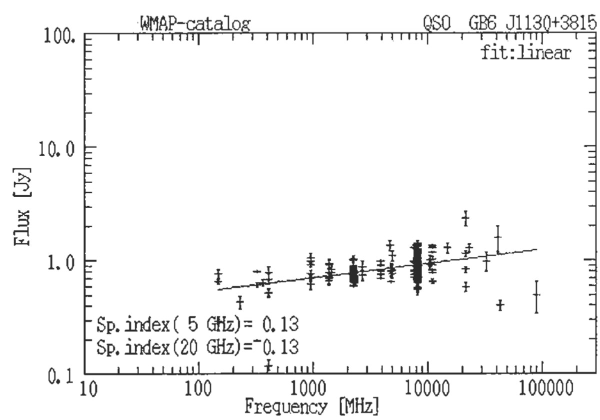

WMAP-catalog
QSO GB6 J1048+7143
fit:lin+exp
Sp.index(5 GHz)= 0.12
Sp.index(20 GHz)= 0.12
Flux [Jy]
Frequency [MHz]

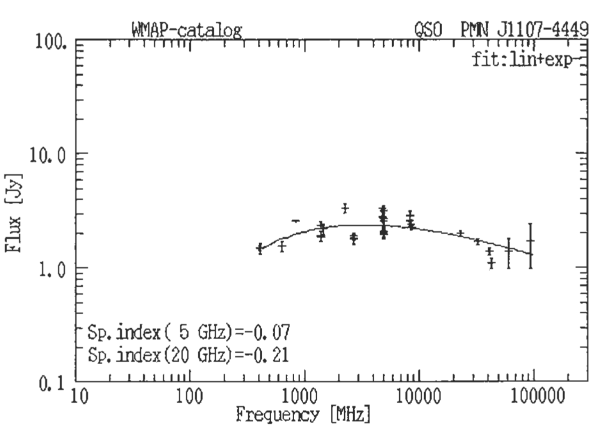

WMAP-catalog
QSO PMN J1127-1857
fit:lin+exp
Sp.index(5 GHz)= 0.32
Sp.index(20 GHz)=-0.01
Flux [Jy]
Frequency [MHz]

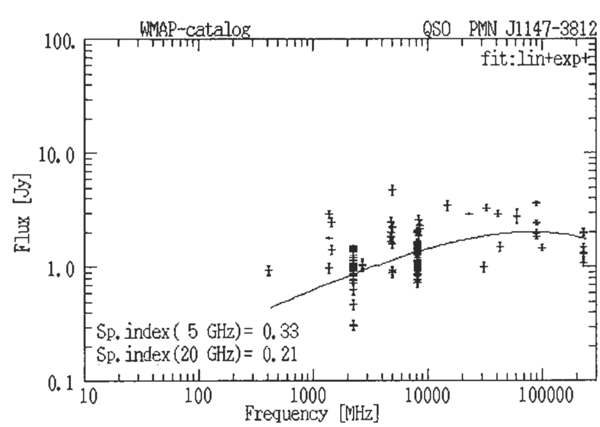

WMAP-catalog
QSO GB6 J1058+0133
fit:lin+exp
Sp.index(5 GHz)= 0.07
Sp.index(20 GHz)= 0.16
Flux [Jy]
Frequency [MHz]

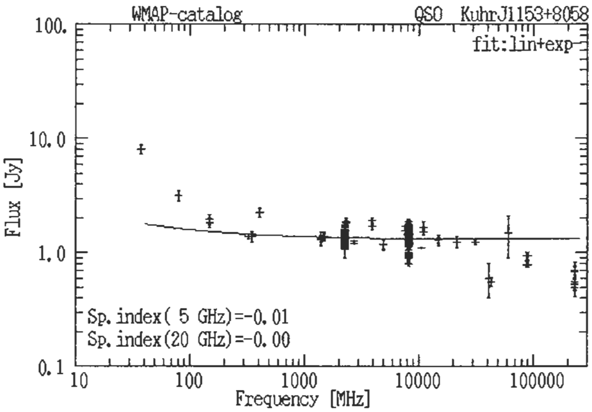

WMAP-catalog
QSO PMN J1130-1449
fit:lin+exp
Sp.index(5 GHz)=-0.39
Sp.index(20 GHz)=-0.46
Flux [Jy]
Frequency [MHz]

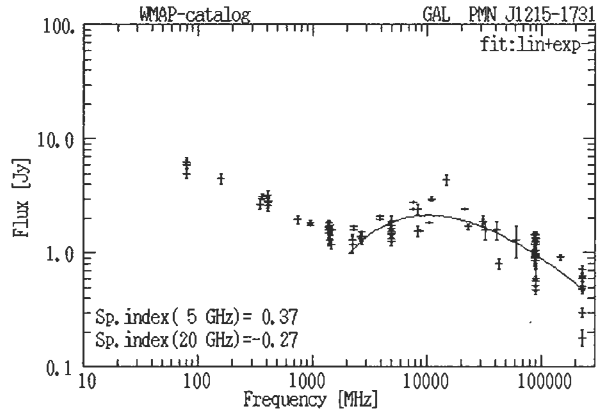

WMAP-catalog
QSO PMN J1058-8003
fit:lin+exp
Sp.index(5 GHz)= 0.25
Sp.index(20 GHz)= 0.22
Flux [Jy]
Frequency [MHz]

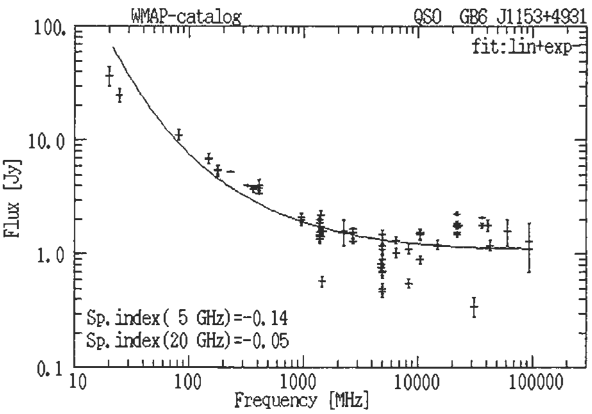

WMAP-catalog
QSO GB6 J1130+3815
fit:linear
Sp.index(5 GHz)= 0.13
Sp.index(20 GHz)= 0.13
Flux [Jy]
Frequency [MHz]

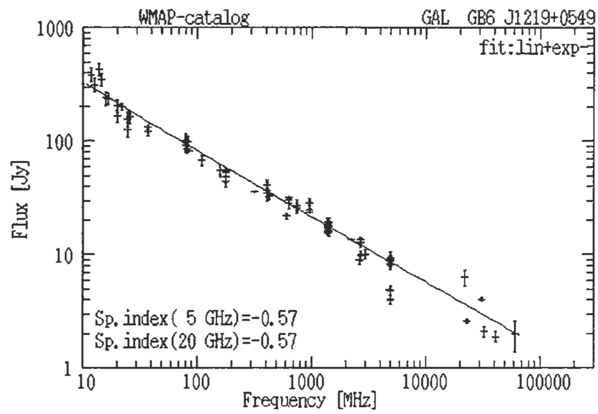

WMAP-catalog
QSO PMN J1107-4449
fit:lin+exp
Sp.index(5 GHz)=-0.07
Sp.index(20 GHz)=-0.21
Flux [Jy]
Frequency [MHz]

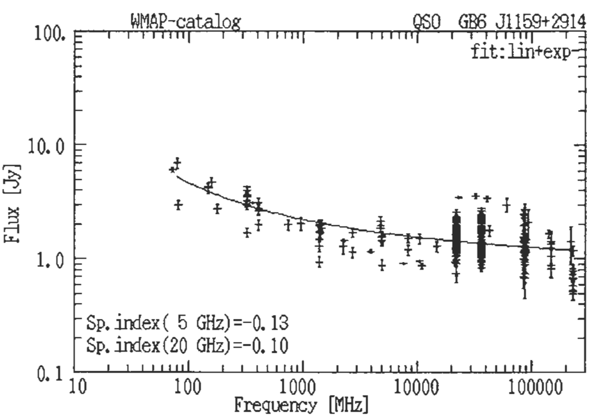

WMAP-catalog
QSO PMN J1147-3812
fit:lin+exp
Sp.index(5 GHz)= 0.33
Sp.index(20 GHz)= 0.21
Flux [Jy]
Frequency [MHz]

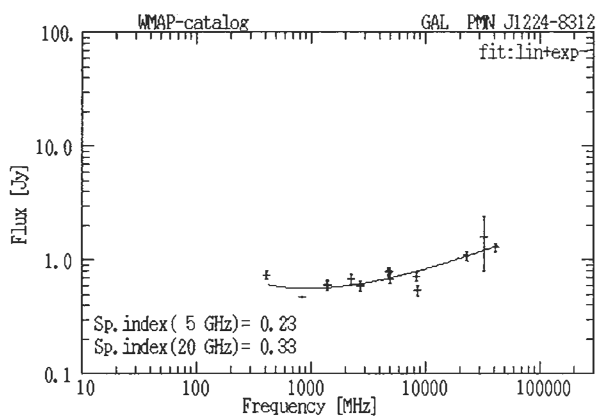

WMAP-catalog
QSO KuhrJ1153+8058
fit:lin+exp
Sp. index(5 GHz)=-0.01
Sp. index(20 GHz)=-0.00
Flux [Jy]
Frequency [MHz]

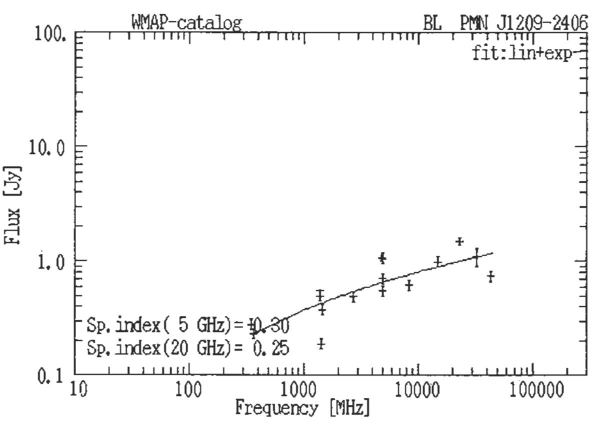

WMAP-catalog
GAL PMN J1215-1731
fit:lin+exp
Sp. index(5 GHz)= 0.37
Sp. index(20 GHz)=-0.27
Flux [Jy]
Frequency [MHz]

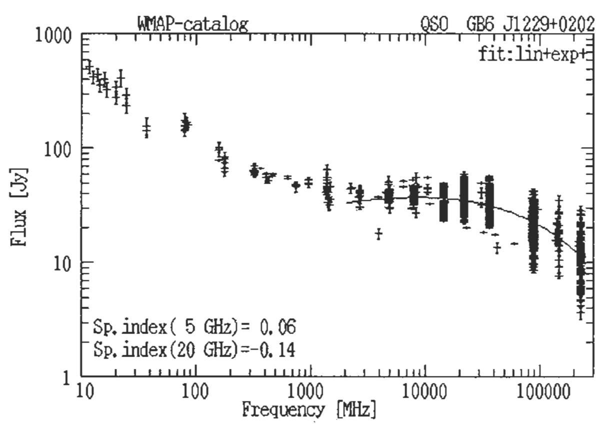

WMAP-catalog
QSO GB6 J1153+4931
fit:lin+exp
Sp. index(5 GHz)=-0.14
Sp. index(20 GHz)=-0.05
Flux [Jy]
Frequency [MHz]

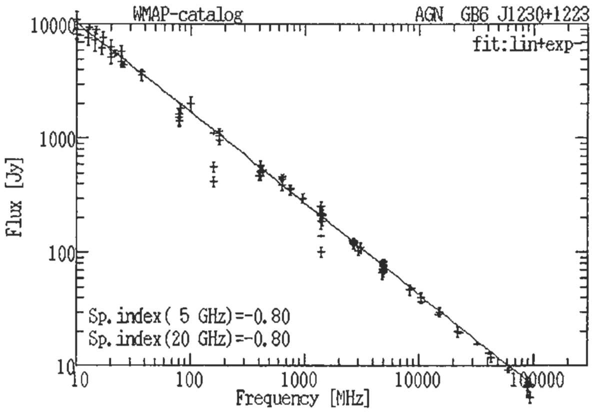

WMAP-catalog
GAL GB6 J1219+0549
fit:lin+exp
Sp. index(5 GHz)=-0.57
Sp. index(20 GHz)=-0.57
Flux [Jy]
Frequency [MHz]

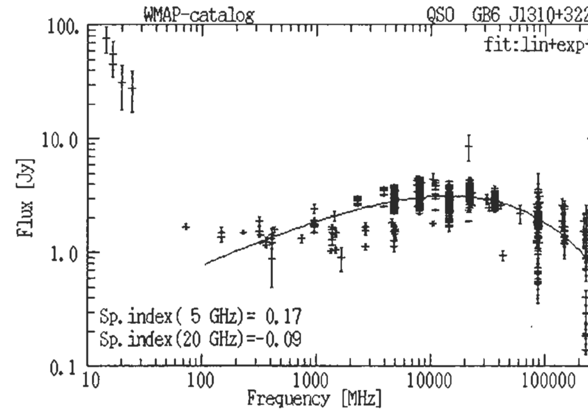

WMAP-catalog
QSO GB6 J1159+2914
fit:lin+exp
Sp. index(5 GHz)=-0.13
Sp. index(20 GHz)=-0.10
Flux [Jy]
Frequency [MHz]

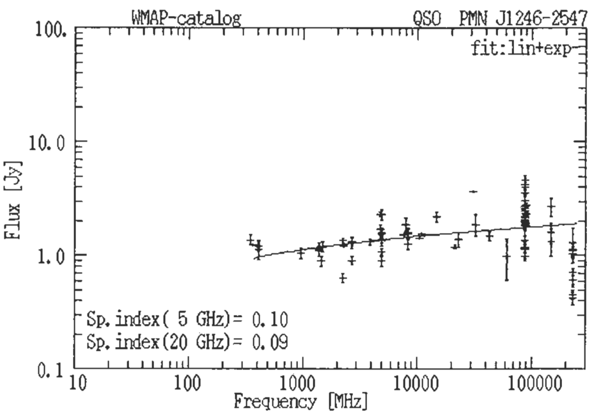

WMAP-catalog
GAL PMN J1224-8312
fit:lin+exp
Sp. index(5 GHz)= 0.23
Sp. index(20 GHz)= 0.33
Flux [Jy]
Frequency [MHz]

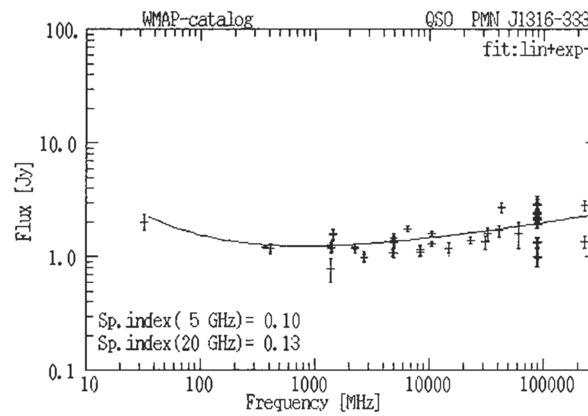

WMAP-catalog
BL PMN J1209-2406
fit:lin+exp
Sp. index(5 GHz)= 0.30
Sp. index(20 GHz)= 0.25
Flux [Jy]
Frequency [MHz]

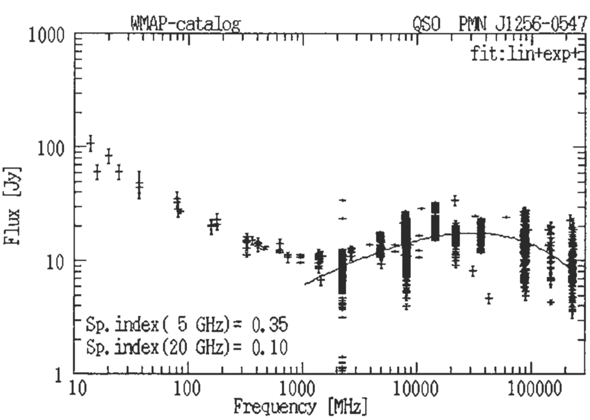

WMAP-catalog
QSO GB6 J1229+0202
fit:lin+exp
Sp. index(5 GHz)= 0.06
Sp. index(20 GHz)=-0.14
Flux [Jy]
Frequency [MHz]

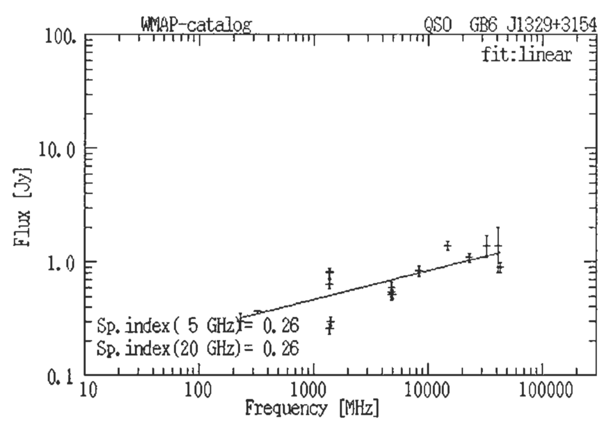

WMAP-catalog
AGN GB6 J1230+1223
fit:lin+exp
Sp.index(5 GHz)=-0.80
Sp.index(20 GHz)=-0.80
Flux [Jy]
Frequency [MHz]

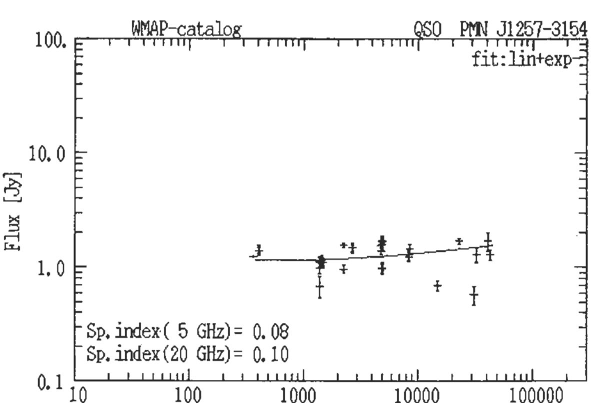

WMAP-catalog
QSO GB6 J1310+3220
fit:lin+exp
Sp.index(5 GHz)= 0.17
Sp.index(20 GHz)=-0.09
Flux [Jy]
Frequency [MHz]

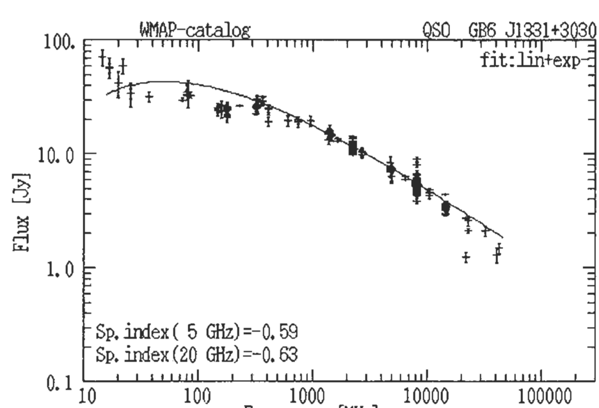

WMAP-catalog
QSO PMN J1246-2547
fit:lin+exp
Sp.index(5 GHz)= 0.10
Sp.index(20 GHz)= 0.09
Flux [Jy]
Frequency [MHz]

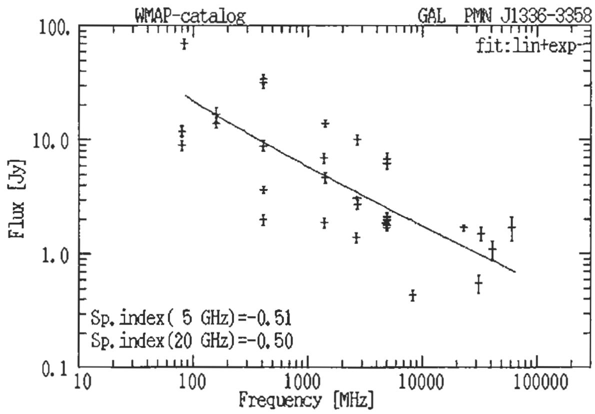

WMAP-catalog
QSO PMN J1316-3339
fit:lin+exp
Sp.index(5 GHz)= 0.10
Sp.index(20 GHz)= 0.13
Flux [Jy]
Frequency [MHz]

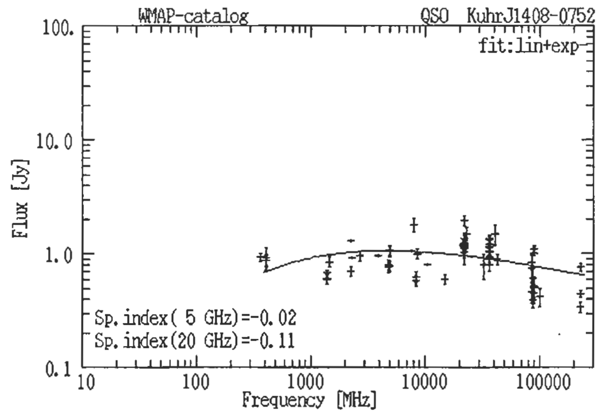

WMAP-catalog
QSO PMN J1256-0547
fit:lin+exp
Sp.index(5 GHz)= 0.35
Sp.index(20 GHz)= 0.10
Flux [Jy]
Frequency [MHz]

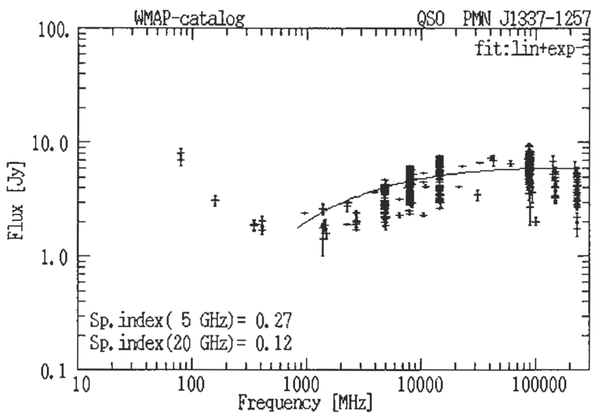

WMAP-catalog
QSO GB6 J1329+3154
fit:linear
Sp.index(5 GHz)= 0.26
Sp.index(20 GHz)= 0.26
Flux [Jy]
Frequency [MHz]

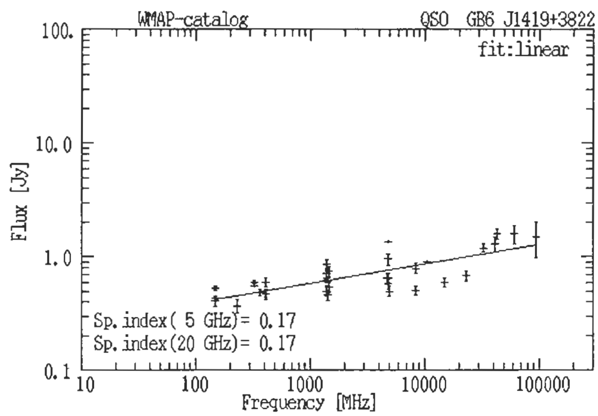

WMAP-catalog
QSO PMN J1257-3154
fit:lin+exp
Sp.index(5 GHz)= 0.08
Sp.index(20 GHz)= 0.10
Flux [Jy]
Frequency [MHz]

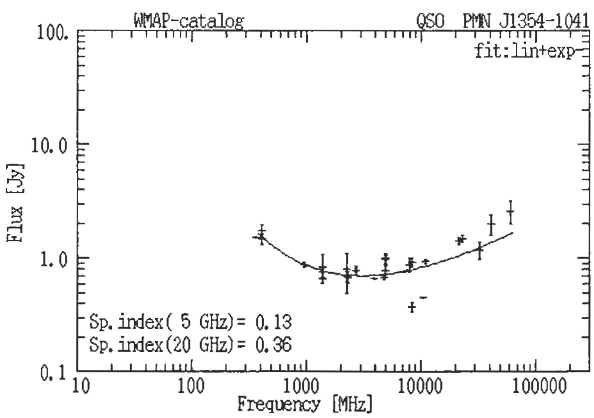

WMAP-catalog
QSO GB6 J1331+3030
fit:lin+exp
Sp.index(5 GHz)=-0.59
Sp.index(20 GHz)=-0.63
Flux [Jy]
Frequency [MHz]

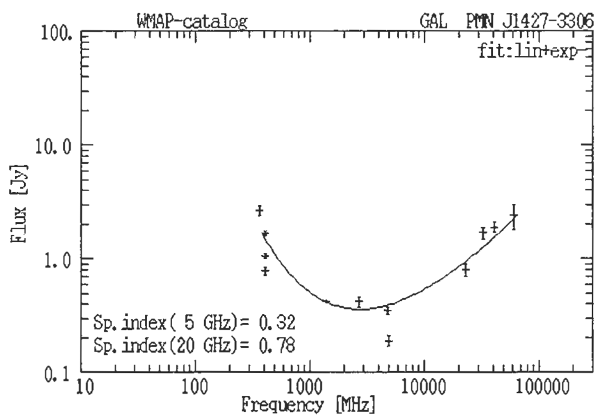

WMAP-catalog
GAL PMN J1336-3358
fit:lin+exp
Sp. index(5 GHz)=-0.51
Sp. index(20 GHz)=-0.50
Flux [Jy]
Frequency [MHz]

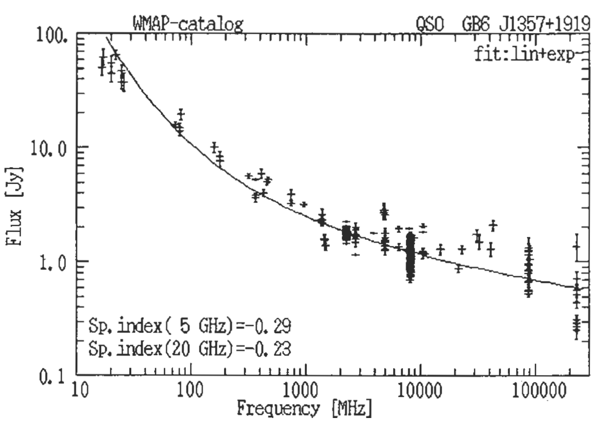

WMAP-catalog
QSO KuhrJ1408-0752
fit:lin+exp
Sp. index(5 GHz)=-0.02
Sp. index(20 GHz)=-0.11
Flux [Jy]
Frequency [MHz]

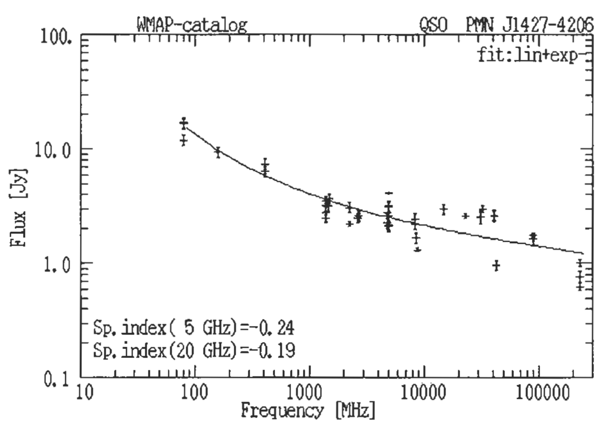

WMAP-catalog
QSO PMN J1337-1257
fit:lin+exp
Sp. index(5 GHz)= 0.27
Sp. index(20 GHz)= 0.12
Flux [Jy]
Frequency [MHz]

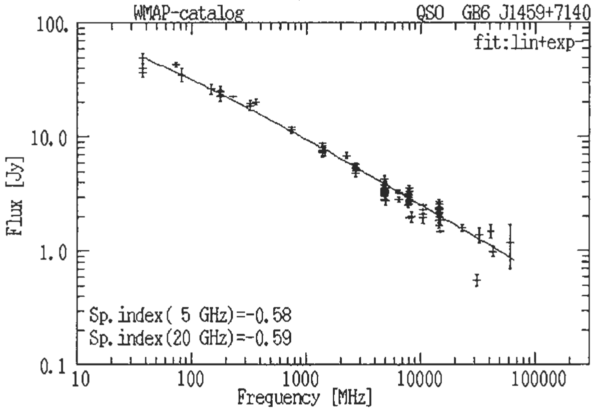

WMAP-catalog
QSO GB6 J1419+3822
fit:linear
Sp. index(5 GHz)= 0.17
Sp. index(20 GHz)= 0.17
Flux [Jy]
Frequency [MHz]

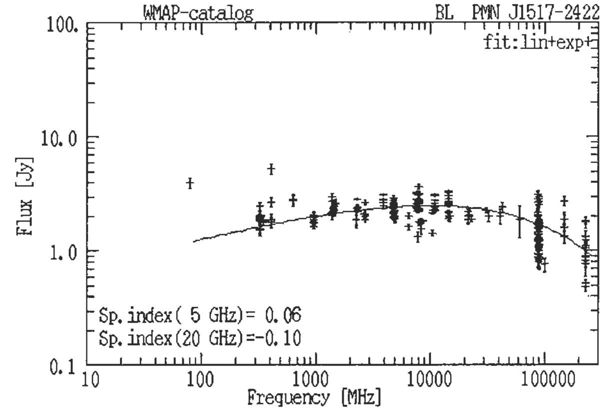

WMAP-catalog
QSO PMN J1354-1041
fit:lin+exp
Sp. index(5 GHz)= 0.13
Sp. index(20 GHz)= 0.36
Flux [Jy]
Frequency [MHz]

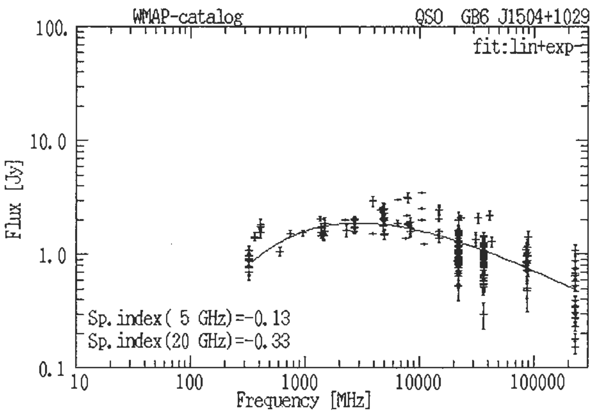

WMAP-catalog
GAL PMN J1427-3306
fit:lin+exp
Sp. index(5 GHz)= 0.32
Sp. index(20 GHz)= 0.78
Flux [Jy]
Frequency [MHz]

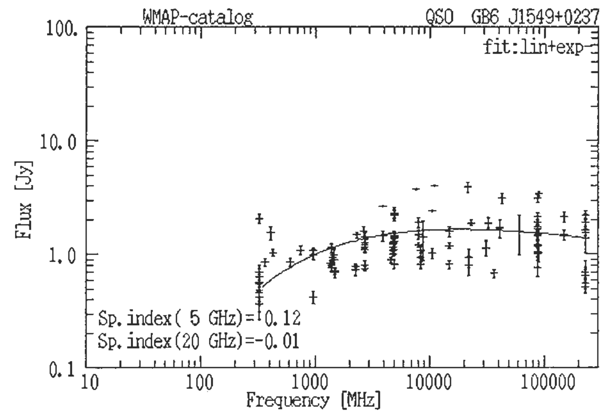

WMAP-catalog
QSO GB6 J1357+1919
fit:lin+exp
Sp. index(5 GHz)=-0.29
Sp. index(20 GHz)=-0.23
Flux [Jy]
Frequency [MHz]

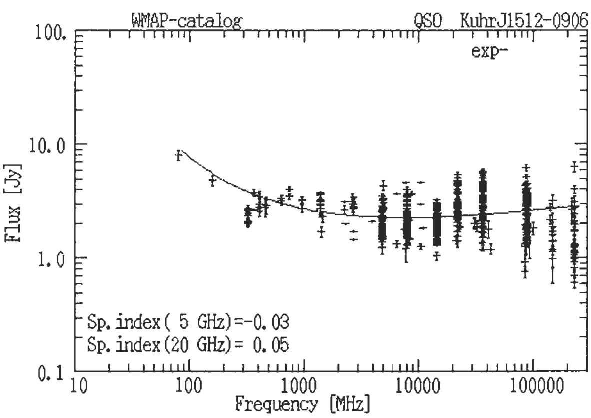

WMAP-catalog
QSO PMN J1427-4206
fit:lin+exp
Sp. index(5 GHz)=-0.24
Sp. index(20 GHz)=-0.19
Flux [Jy]
Frequency [MHz]

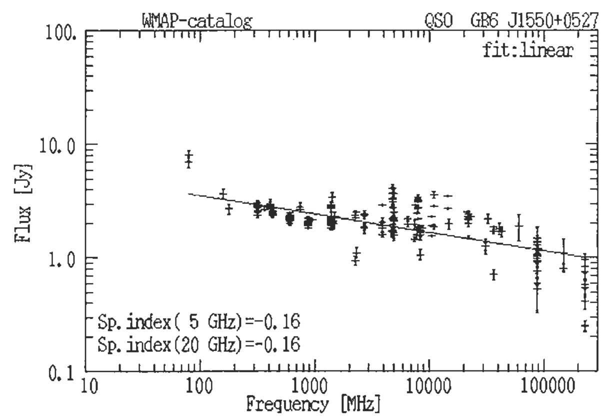

WMAP-catalog
QSO GB6 J1459+7140
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.58
Sp. index(20 GHz)=-0.59

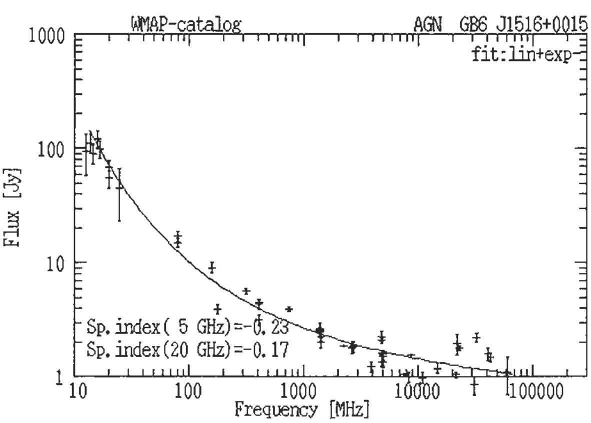

WMAP-catalog
BL PMN J1517-2422
fit:lin+exp+
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.06
Sp. index(20 GHz)=-0.10

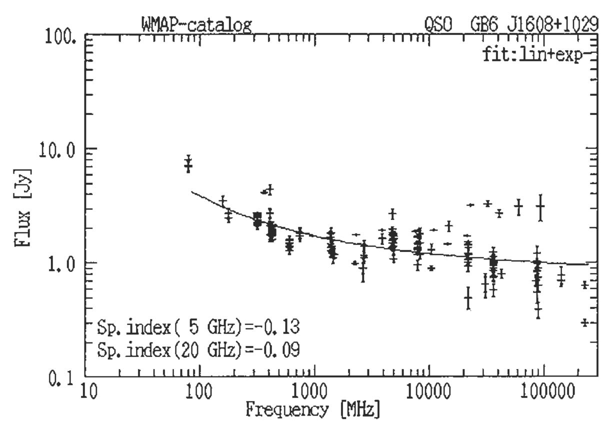

WMAP-catalog
QSO GB6 J1504+1029
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.13
Sp. index(20 GHz)=-0.33

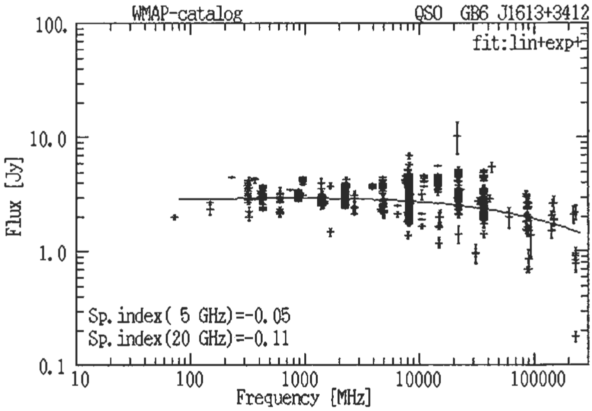

WMAP-catalog
QSO GB6 J1549+0237
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.12
Sp. index(20 GHz)=-0.01

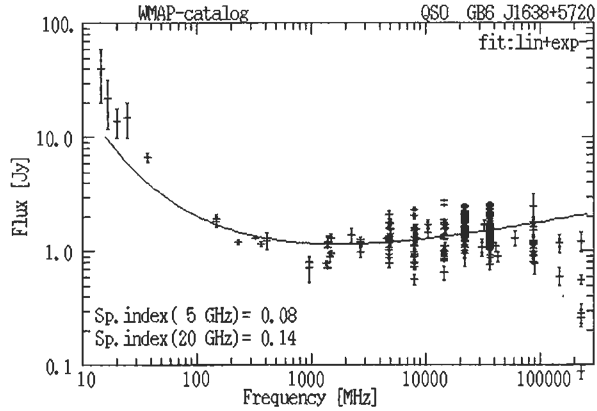

WMAP-catalog
QSO KuhrJ1512-0906
exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.03
Sp. index(20 GHz)= 0.05

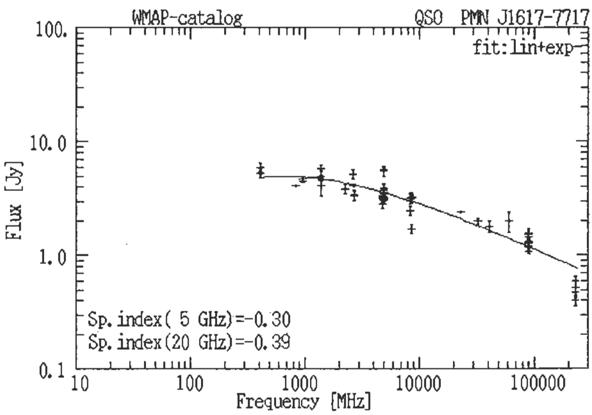

WMAP-catalog
QSO GB6 J1550+0527
fit:linear
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.16
Sp. index(20 GHz)=-0.16

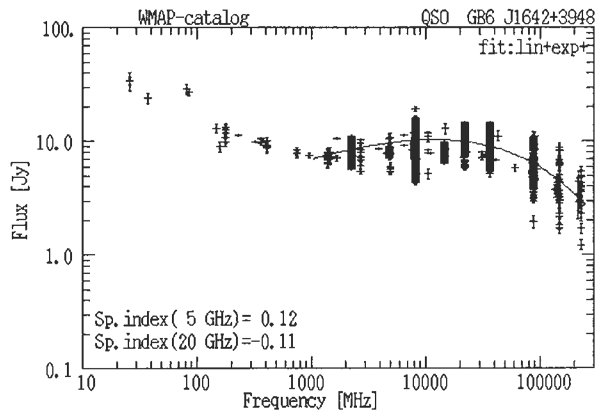

WMAP-catalog
AGN GB6 J1516+0015
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.23
Sp. index(20 GHz)=-0.17

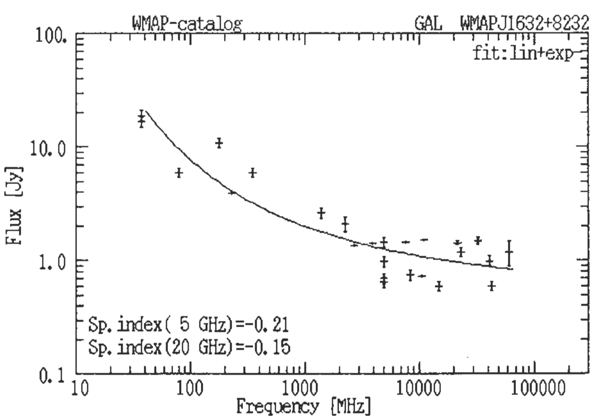

WMAP-catalog
QSO GB6 J1608+1029
fit:lin+exp-
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.13
Sp. index(20 GHz)=-0.09

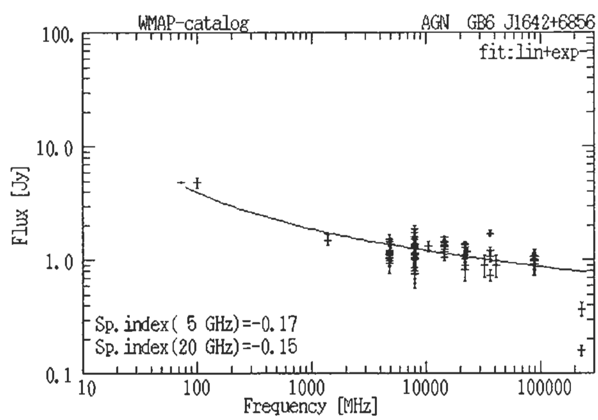

WMAP-catalog
QSO GB6 J1613+3412
fit:lin+exp
Sp. index(5 GHz)=-0.05
Sp. index(20 GHz)=-0.11
Flux [Jy]
Frequency [MHz]

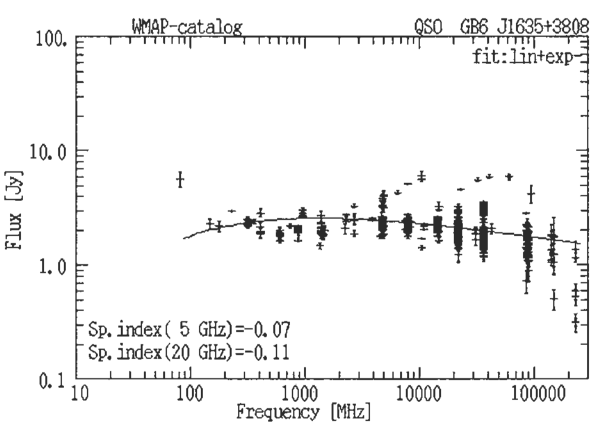

WMAP-catalog
QSO GB6 J1638+5720
fit:lin+exp
Sp. index(5 GHz)= 0.08
Sp. index(20 GHz)= 0.14
Flux [Jy]
Frequency [MHz]

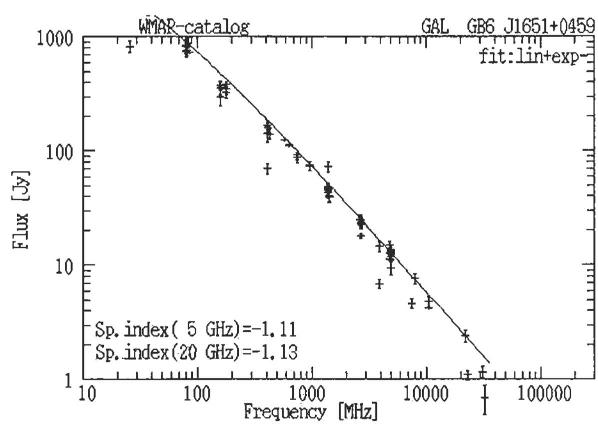

WMAP-catalog
QSO PMN J1617-7717
fit:lin+exp
Sp. index(5 GHz)=-0.30
Sp. index(20 GHz)=-0.39
Flux [Jy]
Frequency [MHz]

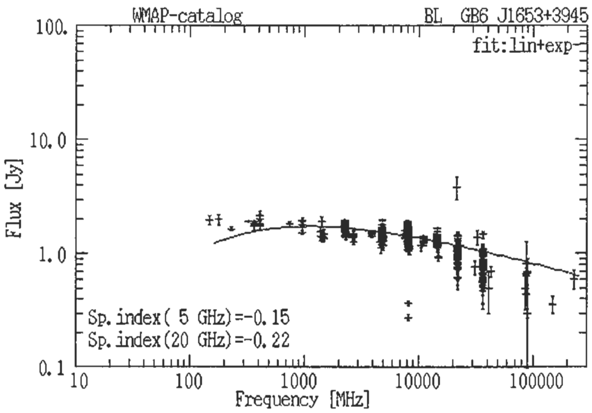

WMAP-catalog
QSO GB6 J1642+3948
fit:lin+exp
Sp. index(5 GHz)= 0.12
Sp. index(20 GHz)=-0.11
Flux [Jy]
Frequency [MHz]

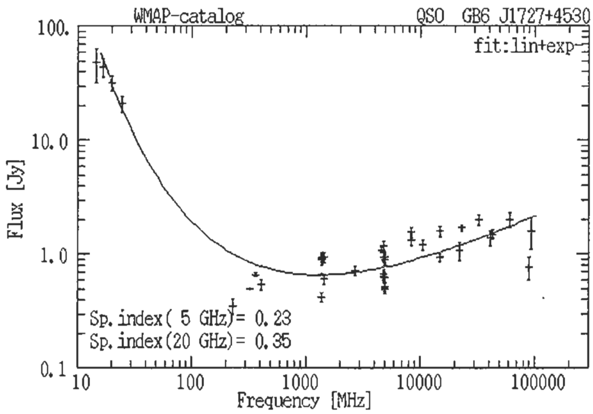

WMAP-catalog
GAL WMAPJ1632+8232
fit:lin+exp
Sp. index(5 GHz)=-0.21
Sp. index(20 GHz)=-0.15
Flux [Jy]
Frequency [MHz]

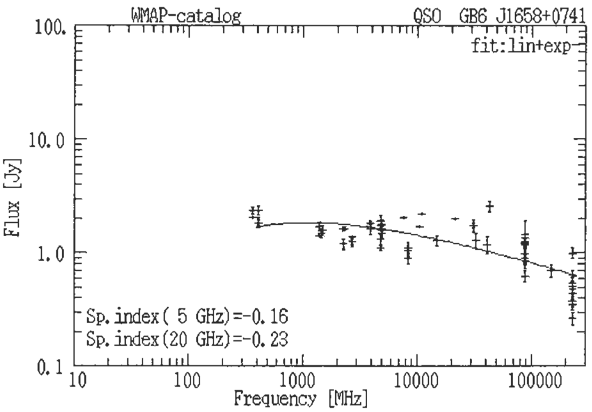

WMAP-catalog
AGN GB6 J1642+6856
fit:lin+exp
Sp. index(5 GHz)=-0.17
Sp. index(20 GHz)=-0.15
Flux [Jy]
Frequency [MHz]

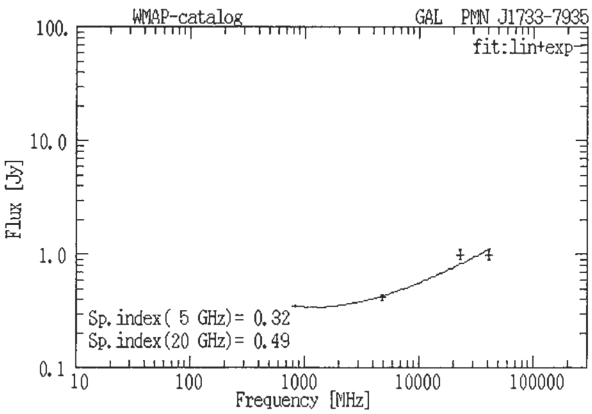

WMAP-catalog
QSO GB6 J1635+3808
fit:lin+exp
Sp. index(5 GHz)=-0.07
Sp. index(20 GHz)=-0.11
Flux [Jy]
Frequency [MHz]

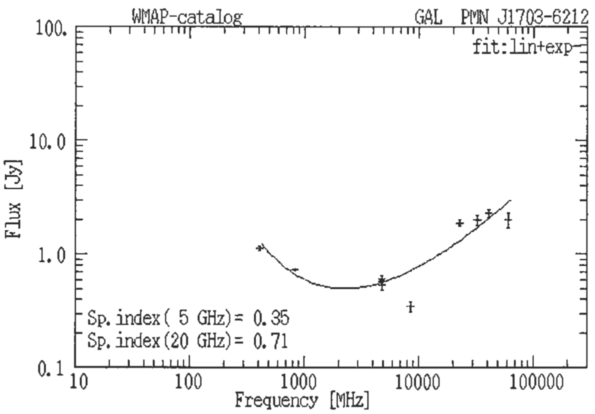

WMAP-catalog
GAL GB6 J1651+0459
fit:lin+exp
Sp. index(5 GHz)=-1.11
Sp. index(20 GHz)=-1.13
Flux [Jy]
Frequency [MHz]

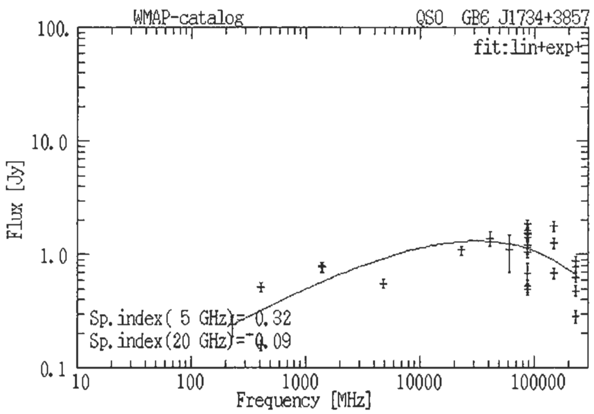

WMAP-catalog
BL GB6 J1653+3945
fit:lin+exp
Sp. index(5 GHz)=-0.15
Sp. index(20 GHz)=-0.22
Flux [Jy]
Frequency [MHz]

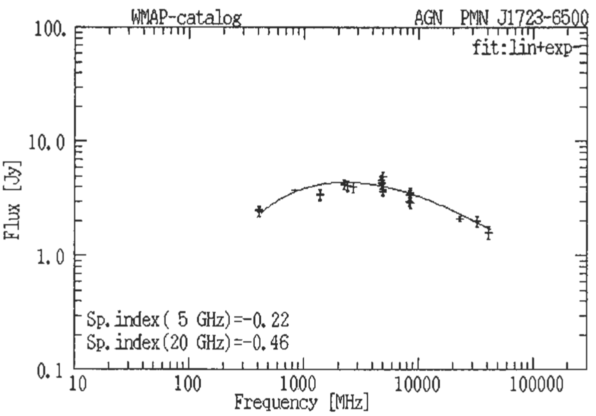

WMAP-catalog
QSO GB6 J1727+4530
fit:lin+exp
Sp. index(5 GHz)= 0.23
Sp. index(20 GHz)= 0.35
Flux [Jy]
Frequency [MHz]

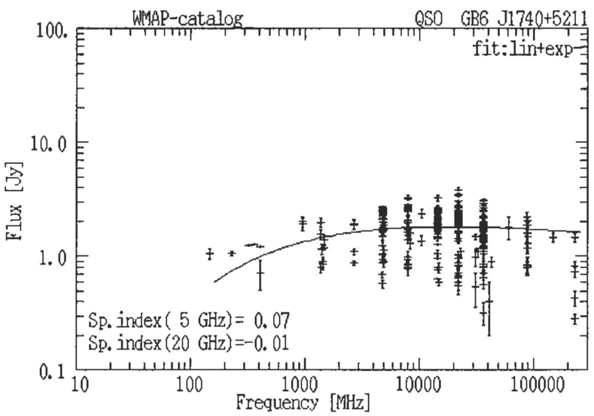

WMAP-catalog
QSO GB6 J1658+0741
fit:lin+exp
Sp. index(5 GHz)=-0.16
Sp. index(20 GHz)=-0.23
Flux [Jy]
Frequency [MHz]

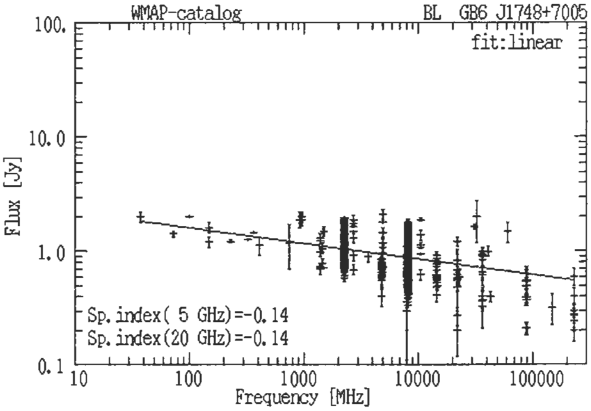

WMAP-catalog
GAL PMN J1733-7935
fit:lin+exp
Sp. index(5 GHz)= 0.32
Sp. index(20 GHz)= 0.49
Flux [Jy]
Frequency [MHz]

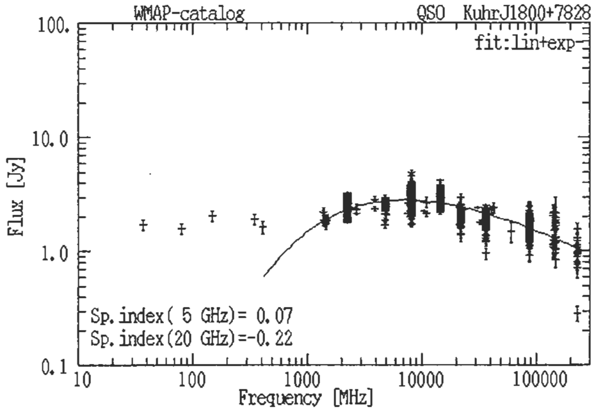

WMAP-catalog
GAL PMN J1703-6212
fit:lin+exp
Sp. index(5 GHz)= 0.35
Sp. index(20 GHz)= 0.71
Flux [Jy]
Frequency [MHz]

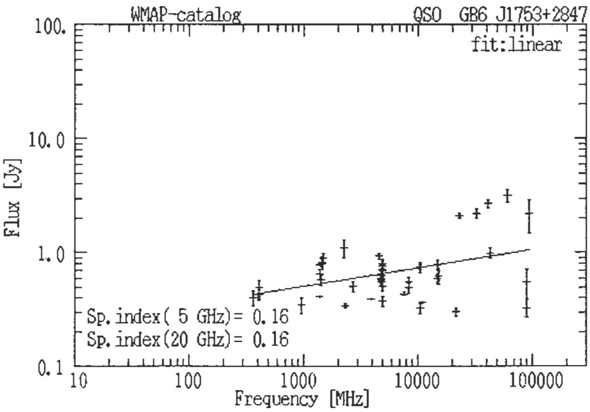

WMAP-catalog
QSO GB6 J1734+3857
fit:lin+exp
Sp. index(5 GHz)= 0.32
Sp. index(20 GHz)=-0.09
Flux [Jy]
Frequency [MHz]

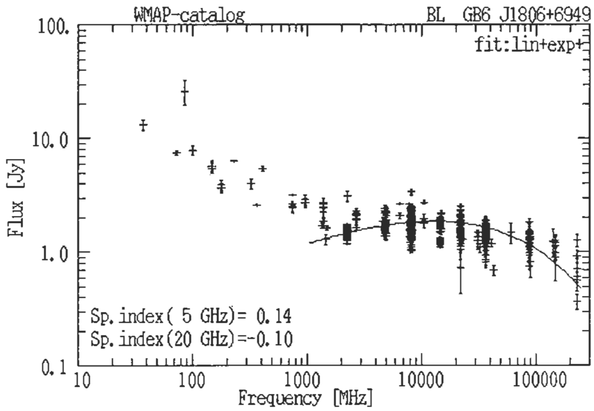

WMAP-catalog
AGN PMN J1723-6500
fit:lin+exp
Sp. index(5 GHz)=-0.22
Sp. index(20 GHz)=-0.46
Flux [Jy]
Frequency [MHz]

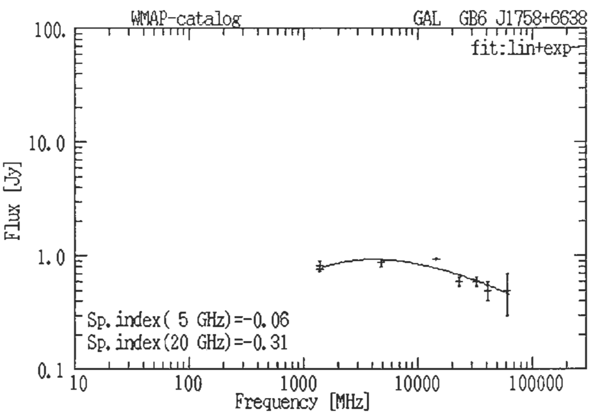

WMAP-catalog
QSO GB6 J1740+5211
fit:lin+exp
Sp. index(5 GHz)= 0.07
Sp. index(20 GHz)=-0.01
Flux [Jy]
Frequency [MHz]

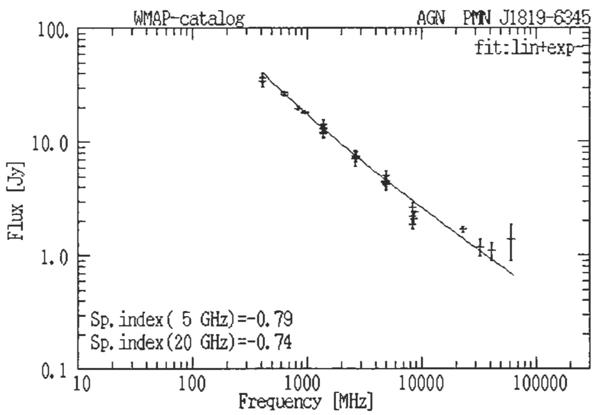

WMAP-catalog
BL GB6 J1748+7005
fit:linear
Sp. index(5 GHz)=-0.14
Sp. index(20 GHz)=-0.14
Flux [Jy]
Frequency [MHz]

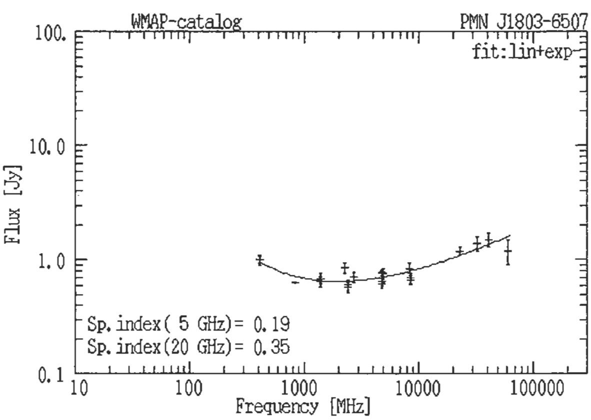

WMAP-catalog
QSO KuhrJ1800+7828
fit:lin+exp
Sp. index(5 GHz)= 0.07
Sp. index(20 GHz)=-0.22
Flux [Jy]
Frequency [MHz]

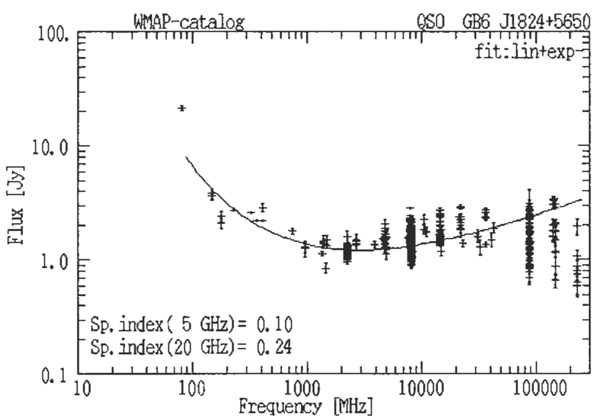

WMAP-catalog
QSO GB6 J1753+2847
fit:linear
Sp. index(5 GHz)= 0.16
Sp. index(20 GHz)= 0.16
Flux [Jy]
Frequency [MHz]

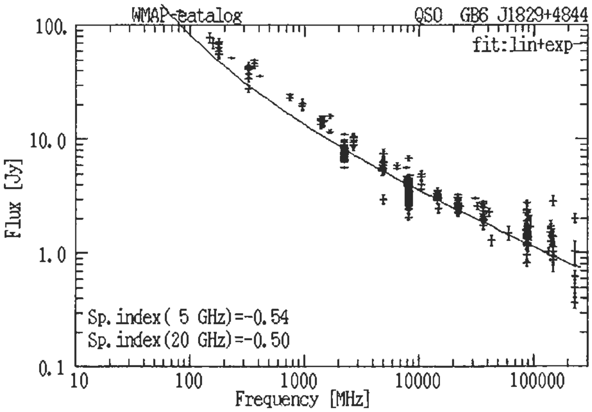

WMAP-catalog
BL GB6 J1806+6949
fit:lin+exp
Sp. index(5 GHz)= 0.14
Sp. index(20 GHz)=-0.10
Flux [Jy]
Frequency [MHz]

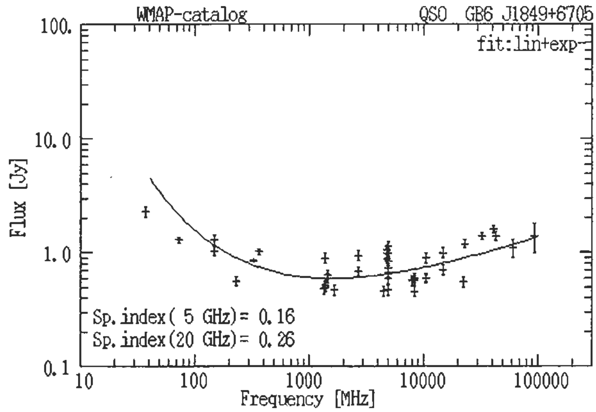

WMAP-catalog
GAL GB6 J1758+6638
fit:lin+exp
Sp. index(5 GHz)=-0.06
Sp. index(20 GHz)=-0.31
Flux [Jy]
Frequency [MHz]

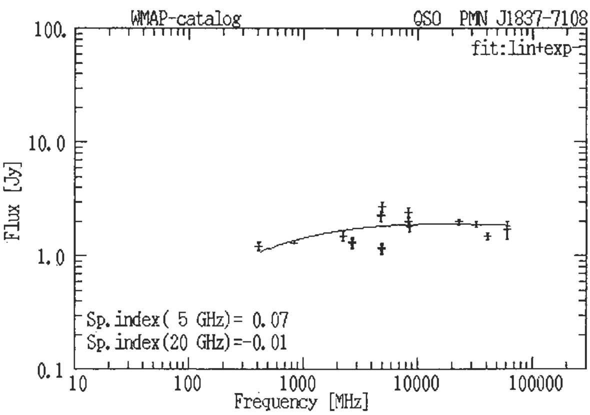

WMAP-catalog
AGN PMN J1819-6345
fit:lin+exp
Sp. index(5 GHz)=-0.79
Sp. index(20 GHz)=-0.74
Flux [Jy]
Frequency [MHz]

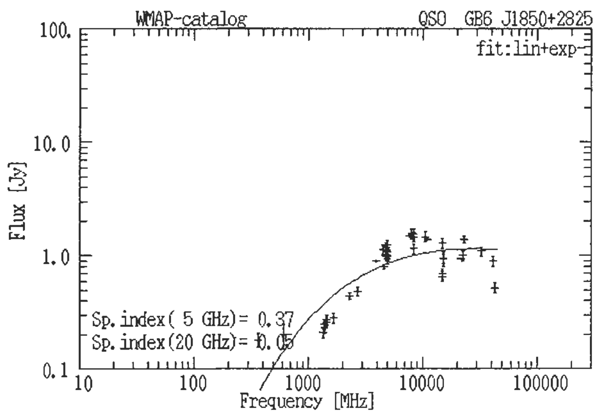

WMAP-catalog
PMN J1803-6507
fit:lin+exp
Sp. index(5 GHz)= 0.19
Sp. index(20 GHz)= 0.35
Flux [Jy]
Frequency [MHz]

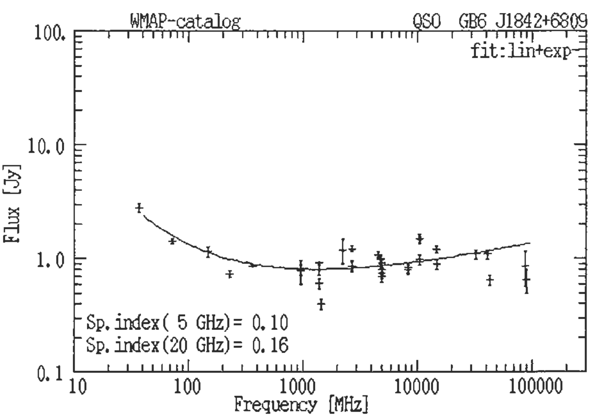

WMAP-catalog
QSO GB6 J1824+5650
fit:lin+exp
Sp. index(5 GHz)= 0.10
Sp. index(20 GHz)= 0.24
Flux [Jy]
Frequency [MHz]

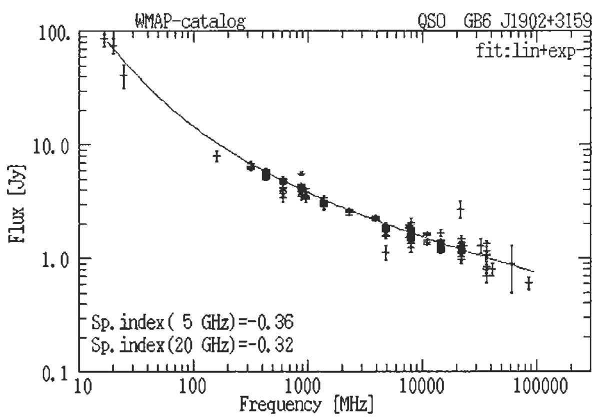

WMAP-catalog
QSO GB6 J1829+4844
fit:lin+exp
Sp. index(5 GHz)=-0.54
Sp. index(20 GHz)=-0.50
Flux [Jy]
Frequency [MHz]

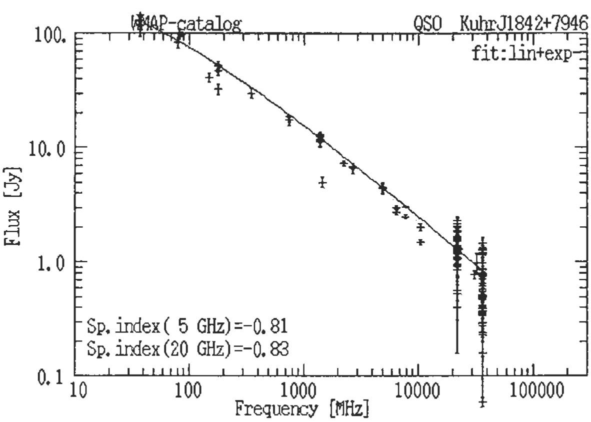

WMAP-catalog
QSO GB6 J1849+6705
fit:lin+exp
Sp. index(5 GHz)= 0.16
Sp. index(20 GHz)= 0.26
Flux [Jy]
Frequency [MHz]

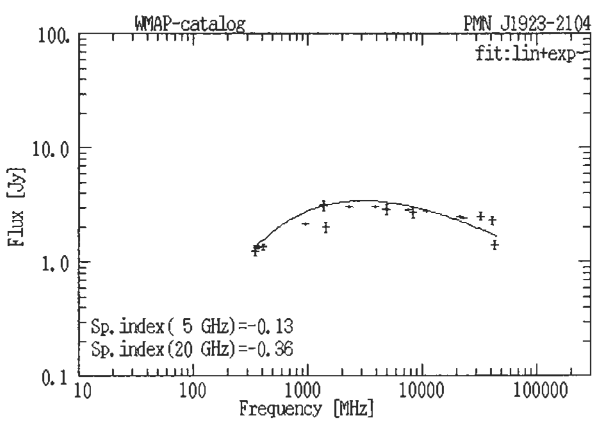

WMAP-catalog
QSO PMN J1837-7108
fit:lin+exp
Sp. index(5 GHz)= 0.07
Sp. index(20 GHz)=-0.01
Flux [Jy]
Frequency [MHz]

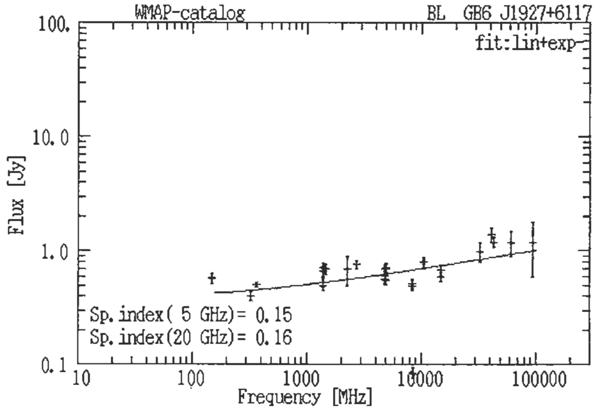

WMAP-catalog
QSO GB6 J1850+2825
fit:lin+exp
Sp. index(5 GHz)= 0.37
Sp. index(20 GHz)= 0.05
Flux [Jy]
Frequency [MHz]

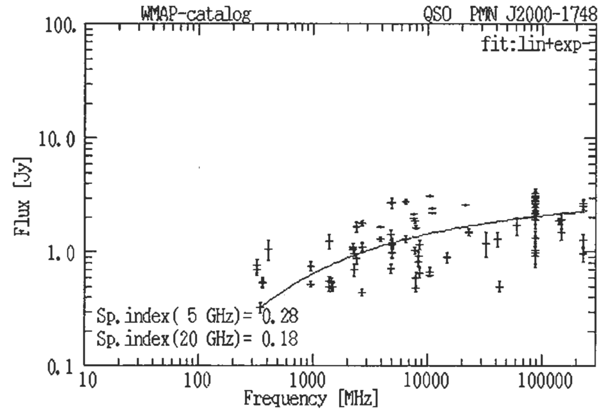

WMAP-catalog
QSO GB6 J1842+6809
fit:lin+exp
Sp. index(5 GHz)= 0.10
Sp. index(20 GHz)= 0.16
Flux [Jy]
Frequency [MHz]

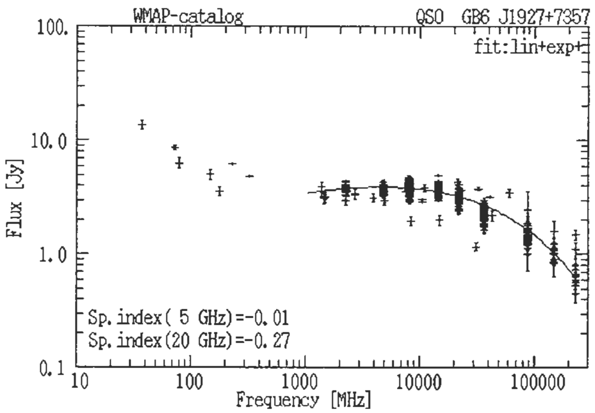

WMAP-catalog
QSO GB6 J1902+3159
fit:lin+exp
Sp. index(5 GHz)=-0.36
Sp. index(20 GHz)=-0.32
Flux [Jy]
Frequency [MHz]

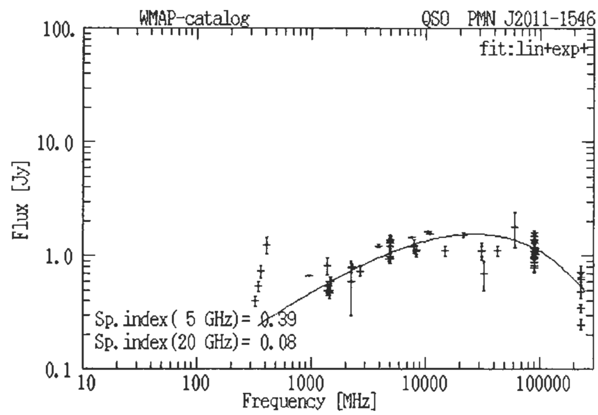

WMAP-catalog
QSO KuhrJ1842+7946
fit:lin+exp
Sp. index(5 GHz)=-0.81
Sp. index(20 GHz)=-0.83
Flux [Jy]
Frequency [MHz]

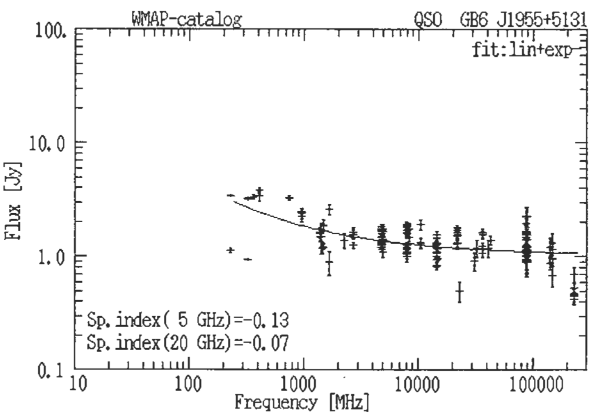

WMAP-catalog
PMN J1923-2104
fit:lin+exp
Sp. index(5 GHz)=-0.13
Sp. index(20 GHz)=-0.36
Flux [Jy]
Frequency [MHz]

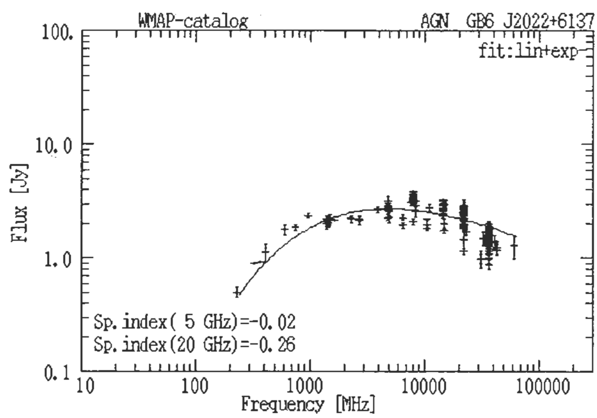

WMAP-catalog
BL GB6 J1927+6117
fit:lin+exp
Sp. index(5 GHz)= 0.15
Sp. index(20 GHz)= 0.16
Flux [Jy]
Frequency [MHz]

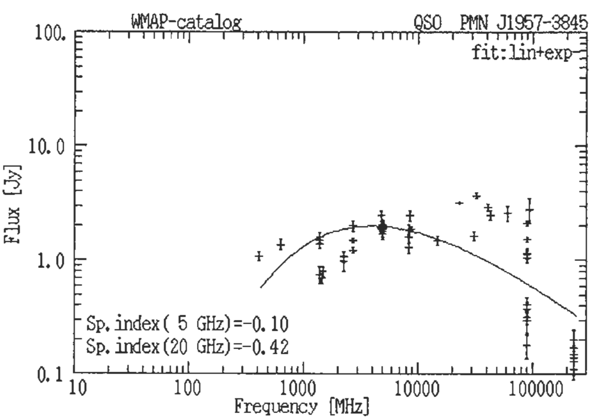

WMAP-catalog
QSO PMN J2000-1748
fit:lin+exp
Sp. index(5 GHz)= 0.28
Sp. index(20 GHz)= 0.18
Flux [Jy]
Frequency [MHz]

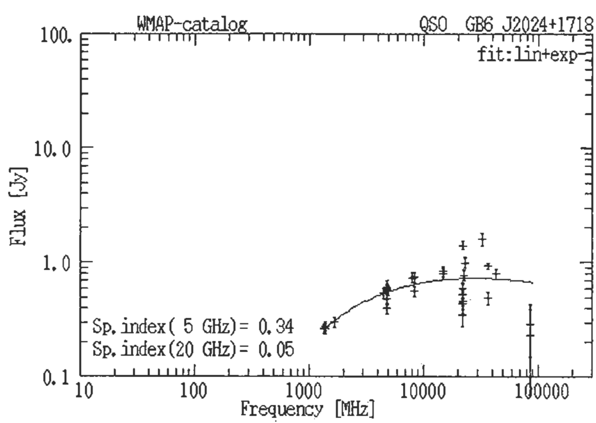

WMAP-catalog
QSO GB6 J1927+7357
fit:lin+exp
Sp. index(5 GHz)=-0.01
Sp. index(20 GHz)=-0.27
Flux [Jy]
Frequency [MHz]

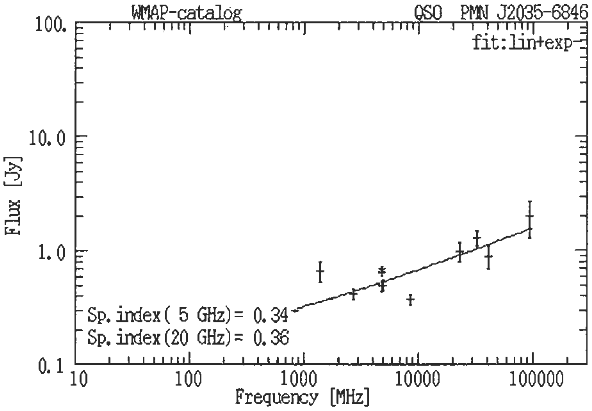

WMAP-catalog
QSO PMN J2011-1546
fit:lin+exp
Sp. index(5 GHz)= 0.39
Sp. index(20 GHz)= 0.08
Flux [Jy]
Frequency [MHz]

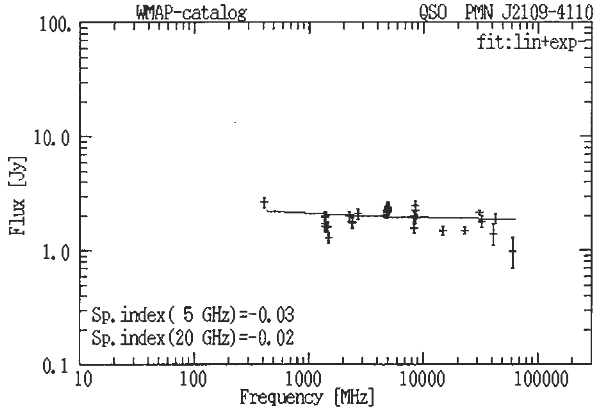

WMAP-catalog
QSO GB6 J1955+5131
fit:lin+exp
Sp. index(5 GHz)=-0.13
Sp. index(20 GHz)=-0.07
Flux [Jy]
Frequency [MHz]

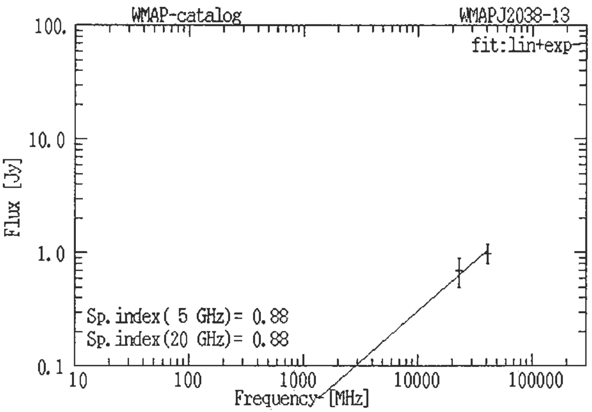

WMAP-catalog
AGN GB6 J2022+6137
fit:lin+exp
Sp. index(5 GHz)=-0.02
Sp. index(20 GHz)=-0.26
Flux [Jy]
Frequency [MHz]

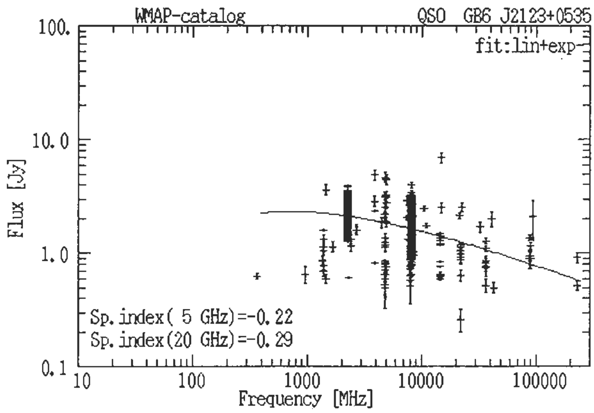

WMAP-catalog
QSO PMN J1957-3845
fit:lin+exp
Sp. index(5 GHz)=-0.10
Sp. index(20 GHz)=-0.42
Flux [Jy]
Frequency [MHz]

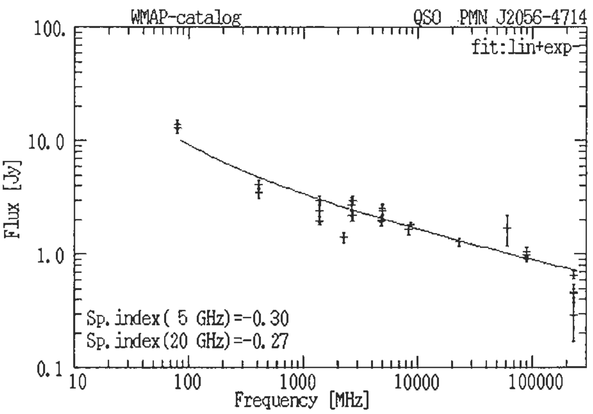

WMAP-catalog
QSO GB6 J2024+1718
fit:lin+exp
Sp. index(5 GHz)= 0.34
Sp. index(20 GHz)= 0.05
Flux [Jy]
Frequency [MHz]

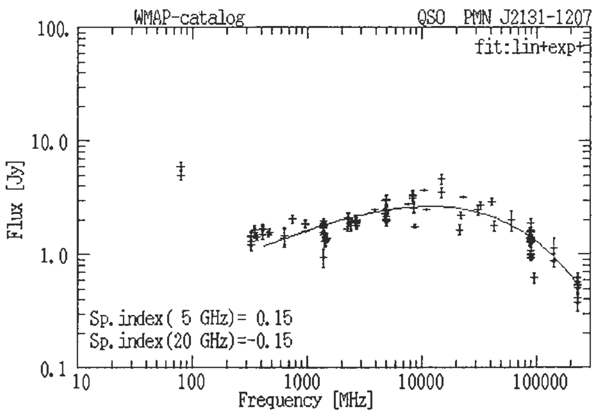

WMAP-catalog
QSO PMN J2035-6846
fit:lin+exp
Sp. index(5 GHz)= 0.34
Sp. index(20 GHz)= 0.36
Flux [Jy]
Frequency [MHz]

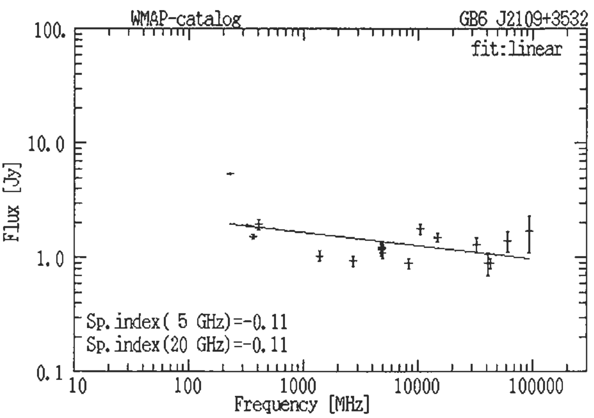

WMAP-catalog
QSO PMN J2109-4110
fit:lin+exp
Sp. index(5 GHz)=-0.03
Sp. index(20 GHz)=-0.02
Flux [Jy]
Frequency [MHz]

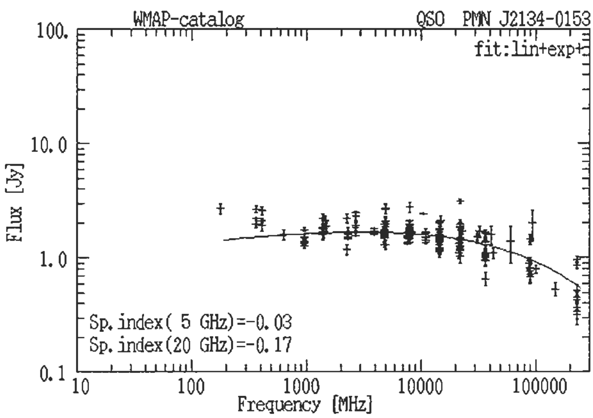

WMAP-catalog
WMAPJ2038-13
fit:lin+exp
Sp. index(5 GHz)= 0.88
Sp. index(20 GHz)= 0.88
Flux [Jy]
Frequency [MHz]

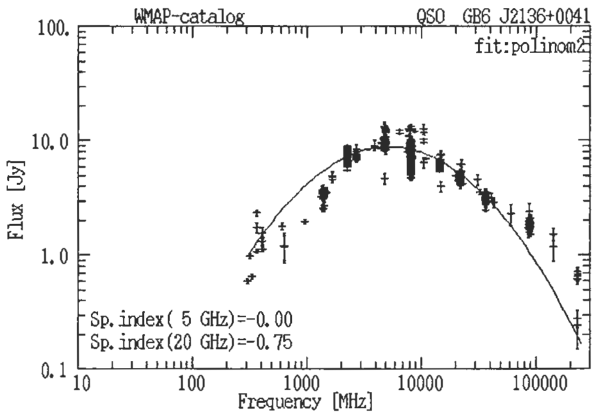

WMAP-catalog
QSO GB6 J2123+0535
fit:lin+exp
Sp. index(5 GHz)=-0.22
Sp. index(20 GHz)=-0.29
Flux [Jy]
Frequency [MHz]

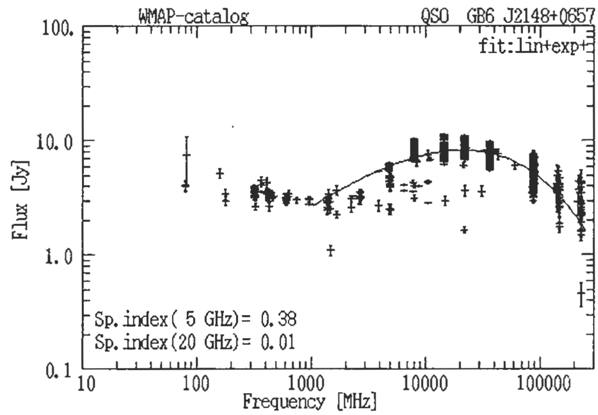

WMAP-catalog
QSO PMN J2056-4714
fit:lin+exp
Sp. index(5 GHz)=-0.30
Sp. index(20 GHz)=-0.27
Flux [Jy]
Frequency [MHz]

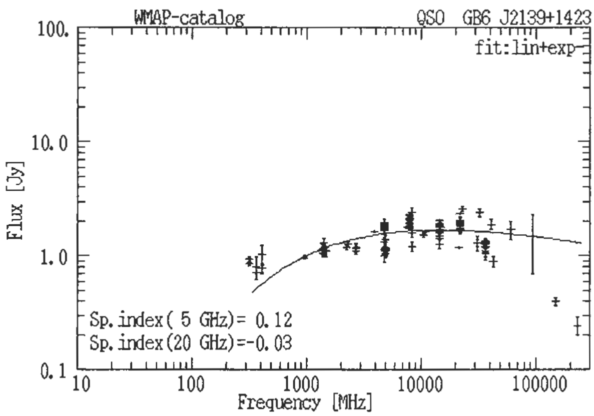

WMAP-catalog
QSO PMN J2131-1207
fit:lin+exp
Sp. index(5 GHz)= 0.15
Sp. index(20 GHz)=-0.15
Flux [Jy]
Frequency [MHz]

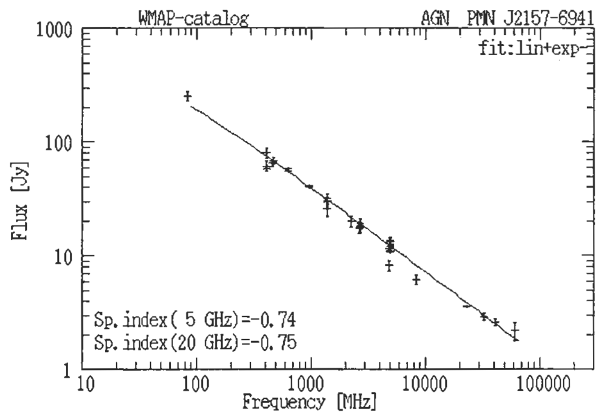

WMAP-catalog
GB6 J2109+3532
fit:linear
Sp. index(5 GHz)=-0.11
Sp. index(20 GHz)=-0.11
Flux [Jy]
Frequency [MHz]

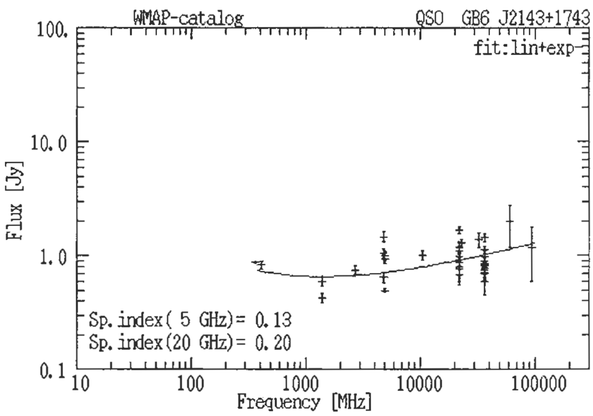

WMAP-catalog
QSO PMN J2134-0153
fit:lin+exp
Sp. index(5 GHz)=-0.03
Sp. index(20 GHz)=-0.17
Flux [Jy]
Frequency [MHz]

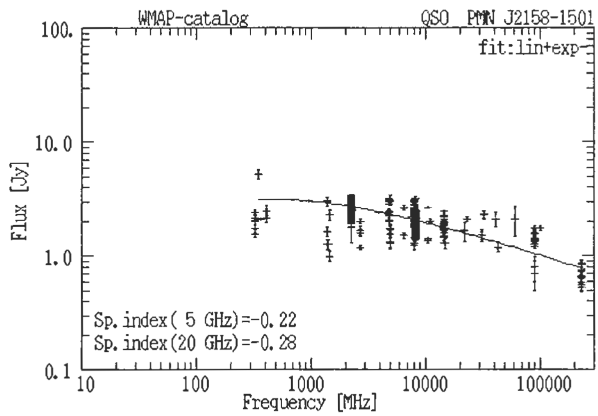

WMAP-catalog
QSO GB6 J2136+0041
fit:polinom2
Sp.index(5 GHz)=-0.00
Sp.index(20 GHz)=-0.75
Flux [Jy]
Frequency [MHz]

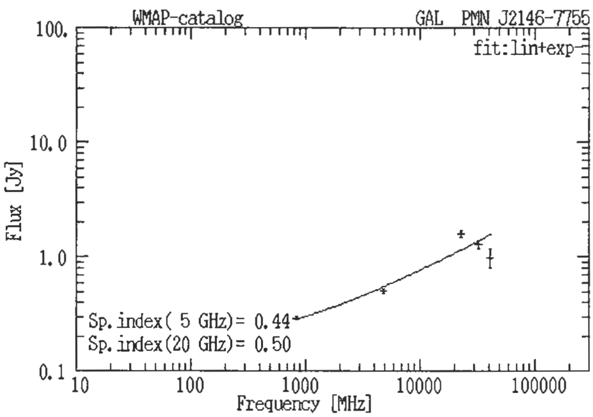

WMAP-catalog
QSO GB6 J2148+0657
fit:lin+exp
Sp.index(5 GHz)= 0.38
Sp.index(20 GHz)= 0.01
Flux [Jy]
Frequency [MHz]

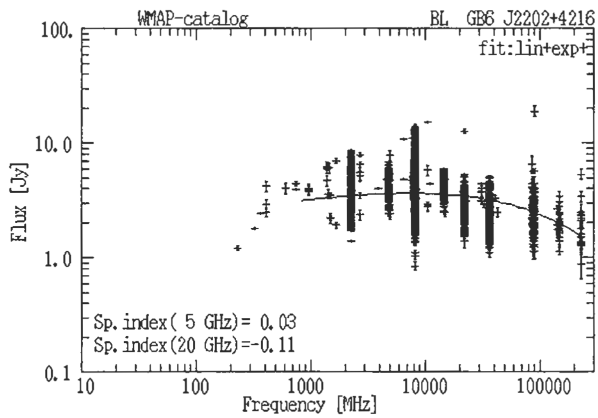

WMAP-catalog
QSO GB6 J2139+1423
fit:lin+exp
Sp.index(5 GHz)= 0.12
Sp.index(20 GHz)=-0.03
Flux [Jy]
Frequency [MHz]

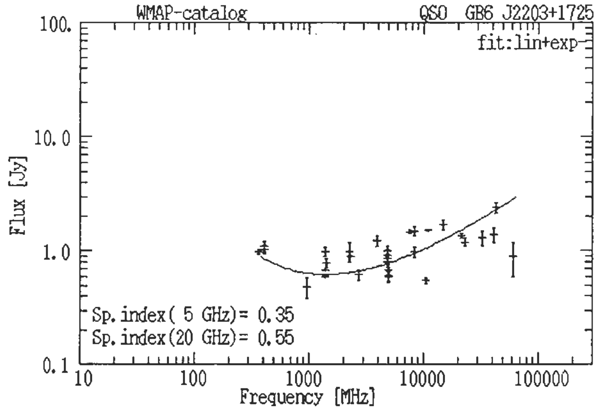

WMAP-catalog
AGN PMN J2157-6941
fit:lin+exp
Sp.index(5 GHz)=-0.74
Sp.index(20 GHz)=-0.75
Flux [Jy]
Frequency [MHz]

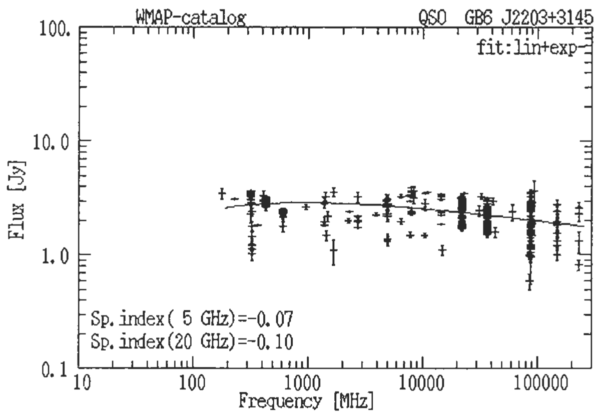

WMAP-catalog
QSO GB6 J2143+1743
fit:lin+exp
Sp.index(5 GHz)= 0.13
Sp.index(20 GHz)= 0.20
Flux [Jy]
Frequency [MHz]

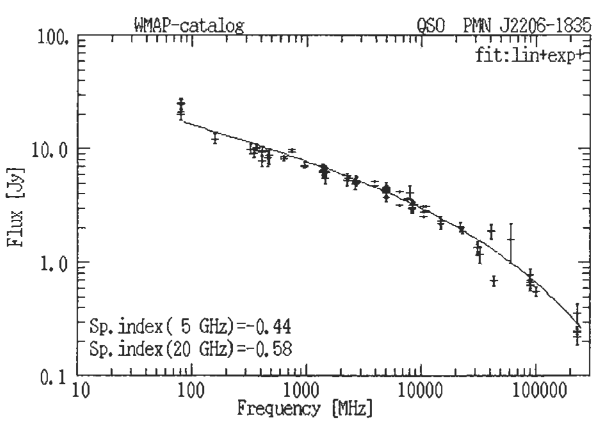

WMAP-catalog
QSO PMN J2158-1501
fit:lin+exp
Sp.index(5 GHz)=-0.22
Sp.index(20 GHz)=-0.28
Flux [Jy]
Frequency [MHz]

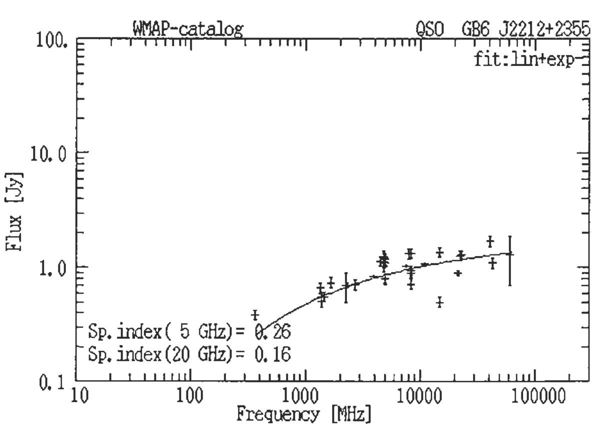

WMAP-catalog
GAL PMN J2146-7755
fit:lin+exp
Sp.index(5 GHz)= 0.44
Sp.index(20 GHz)= 0.50
Flux [Jy]
Frequency [MHz]

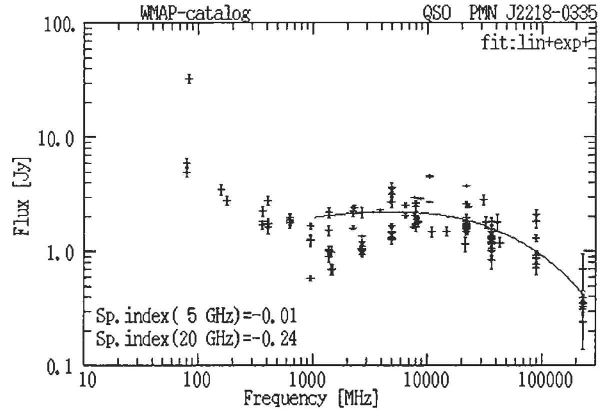

WMAP-catalog
BL GB6 J2202+4216
fit:lin+exp
Sp.index(5 GHz)= 0.03
Sp.index(20 GHz)=-0.11
Flux [Jy]
Frequency [MHz]

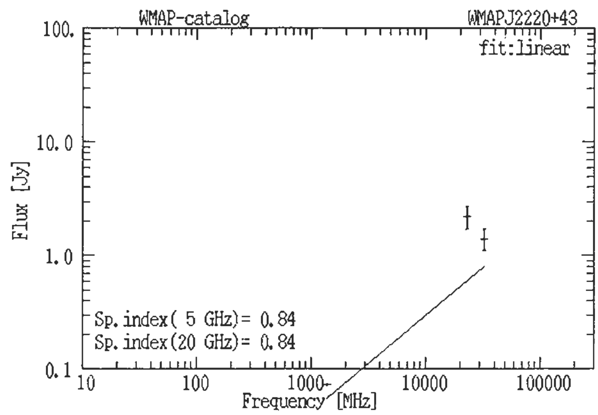

WMAP-catalog
QSO GB6 J2203+1725
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.35
Sp. index(20 GHz)= 0.55

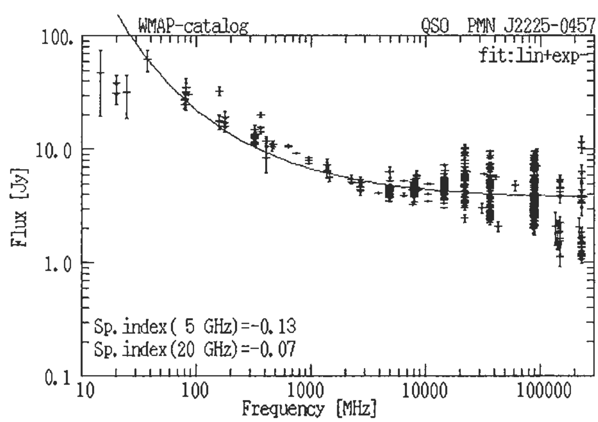

WMAP-catalog
QSO GB6 J2203+3145
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.07
Sp. index(20 GHz)=-0.10

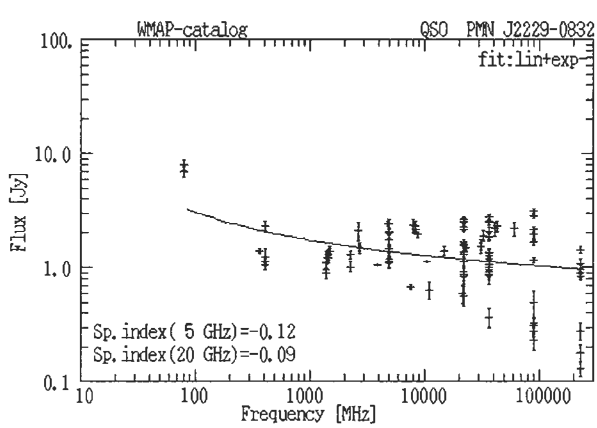

WMAP-catalog
QSO PMN J2206-1835
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.44
Sp. index(20 GHz)=-0.58

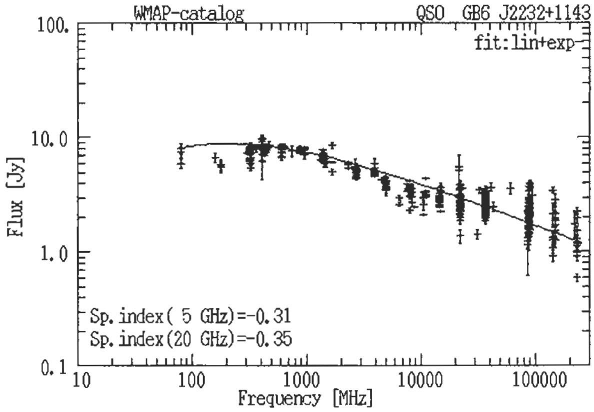

WMAP-catalog
QSO GB6 J2212+2355
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.26
Sp. index(20 GHz)= 0.16

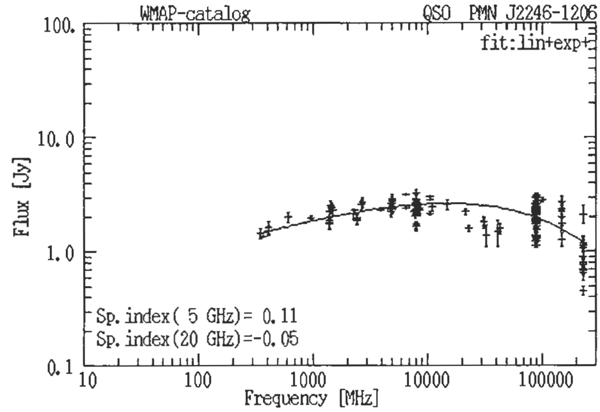

WMAP-catalog
QSO PMN J2218-0335
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.01
Sp. index(20 GHz)=-0.24

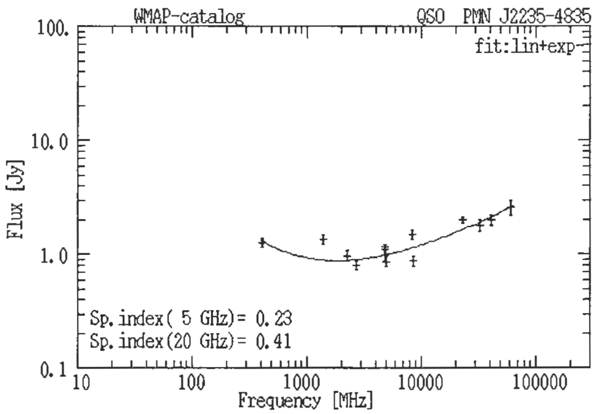

WMAP-catalog
WMAPJ2220+43
fit:linear
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.84
Sp. index(20 GHz)= 0.84

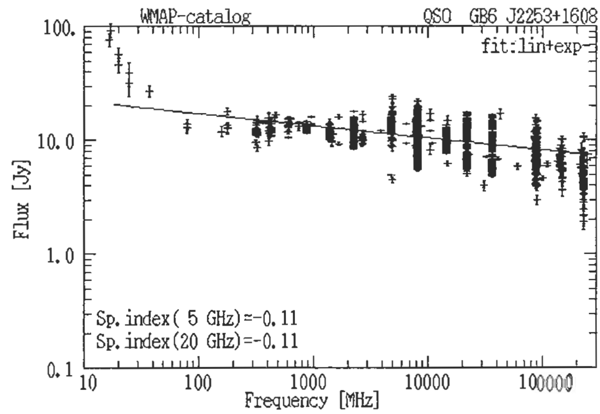

WMAP-catalog
QSO PMN J2225-0457
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.13
Sp. index(20 GHz)=-0.07

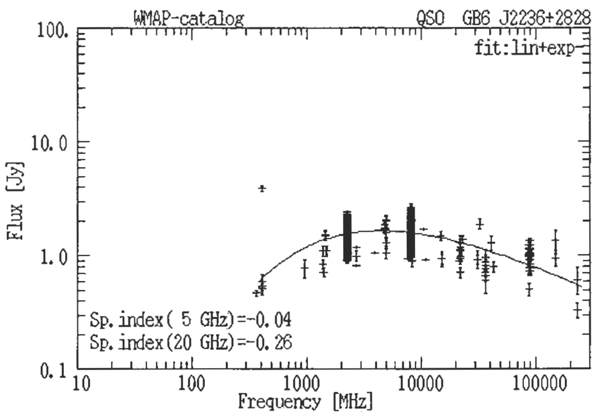

WMAP-catalog
QSO PMN J2229-0832
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.12
Sp. index(20 GHz)=-0.09

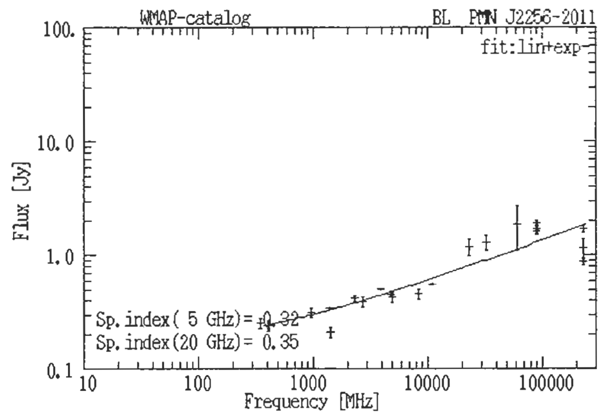

WMAP-catalog
QSO GB6 J2232+1143
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.31
Sp. index(20 GHz)=-0.35

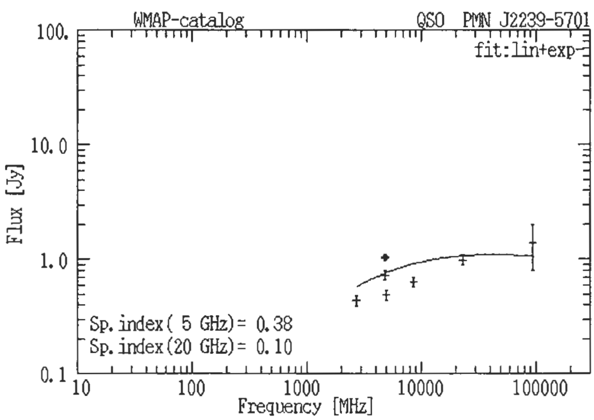

WMAP-catalog
QSO PMN J2246-1206
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.11
Sp. index(20 GHz)=-0.05

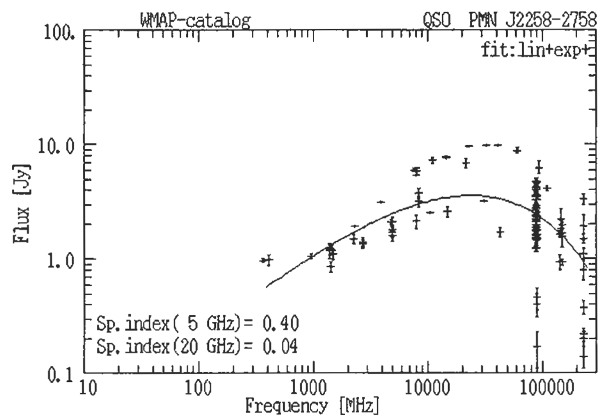

WMAP-catalog
QSO PMN J2235-4835
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.23
Sp. index(20 GHz)= 0.41

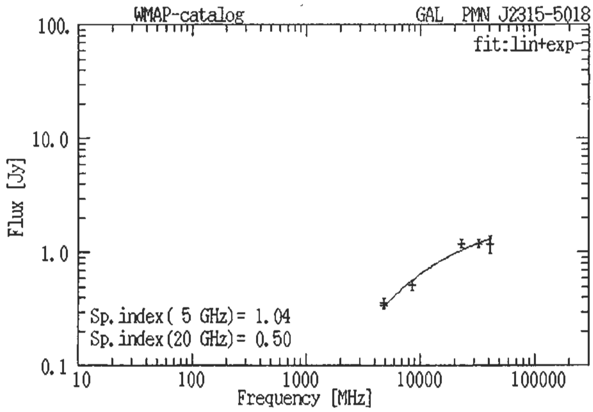

WMAP-catalog
QSO GB6 J2253+1608
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.11
Sp. index(20 GHz)=-0.11

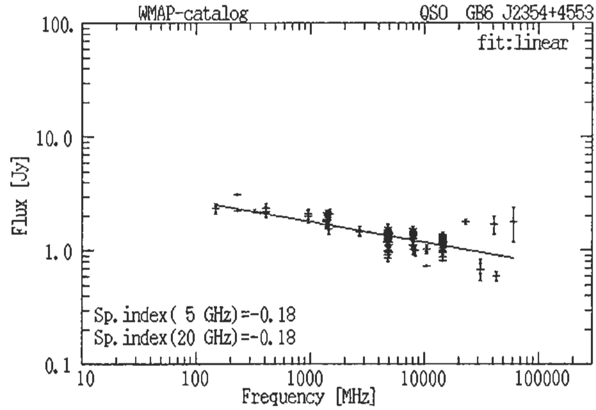

WMAP-catalog
QSO GB6 J2236+2828
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)=-0.04
Sp. index(20 GHz)=-0.26

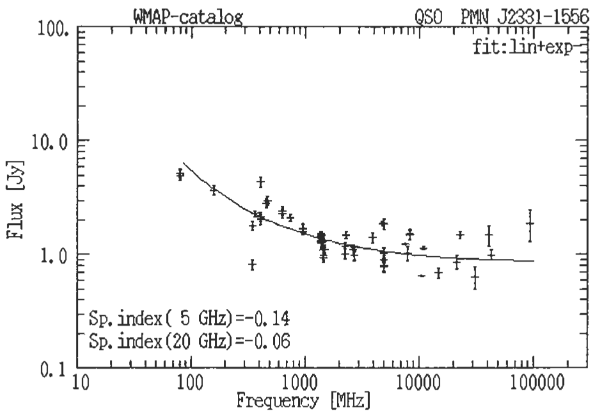

WMAP-catalog
BL PMN J2256-2011
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.32
Sp. index(20 GHz)= 0.35

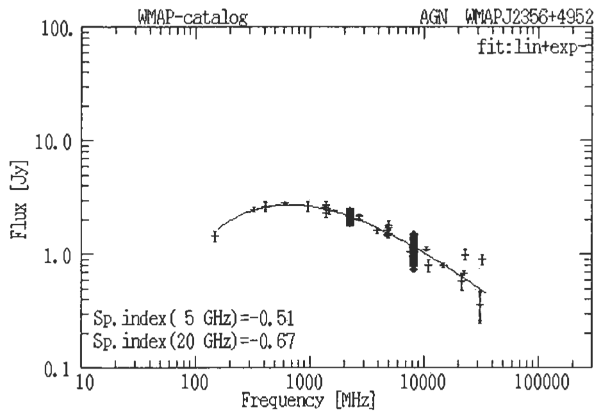

WMAP-catalog
QSO PMN J2239-5701
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.38
Sp. index(20 GHz)= 0.10

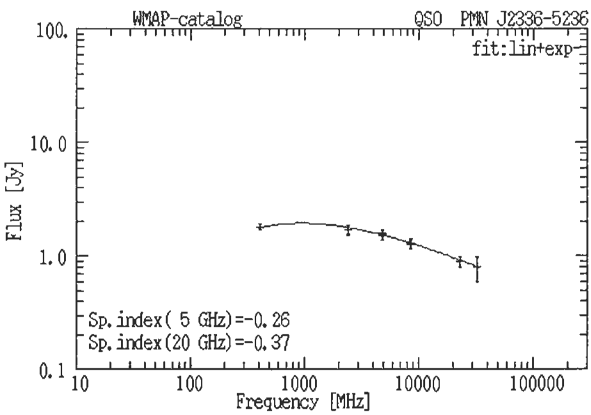

WMAP-catalog
QSO PMN J2258-2758
fit:lin+exp
Flux [Jy]
Frequency [MHz]
Sp. index(5 GHz)= 0.40
Sp. index(20 GHz)= 0.04

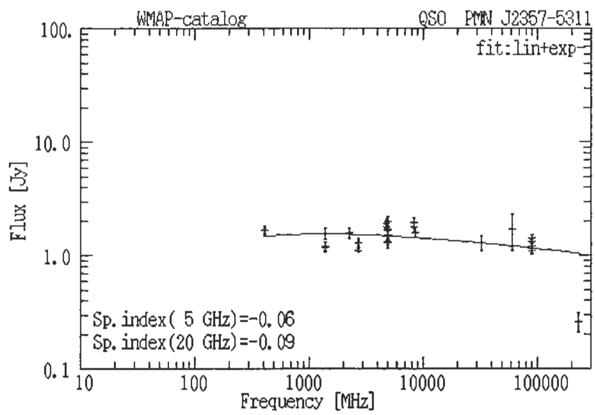

WMAP-catalog
GAL PMN J2315-5018
fit:lin+exp
Sp.index(5 GHz)= 1.04
Sp.index(20 GHz)= 0.50
Flux [Jy]
Frequency [MHz]

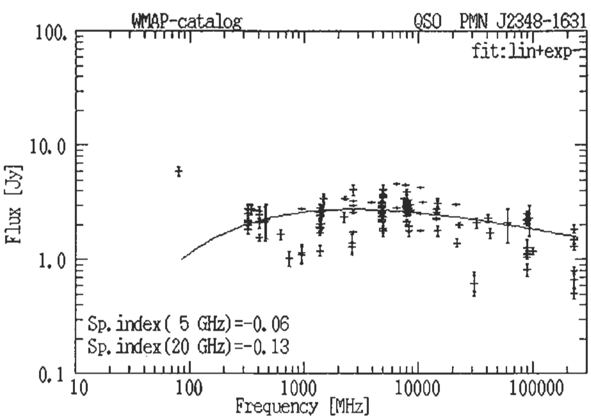

WMAP-catalog
QSO GB6 J2354+4553
fit:linear
Sp.index(5 GHz)=-0.18
Sp.index(20 GHz)=-0.18
Flux [Jy]
Frequency [MHz]

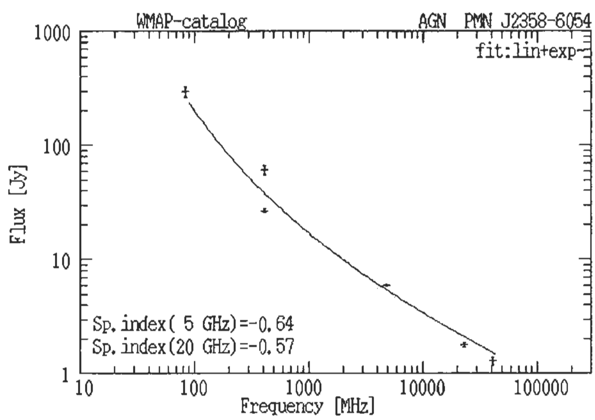

WMAP-catalog
QSO PMN J2331-1556
fit:lin+exp
Sp.index(5 GHz)=-0.14
Sp.index(20 GHz)=-0.06
Flux [Jy]
Frequency [MHz]


WMAP-catalog
AGN WMAPJ2356+4952
fit:lin+exp
Sp.index(5 GHz)=-0.51
Sp.index(20 GHz)=-0.67
Flux [Jy]
Frequency [MHz]


WMAP-catalog
QSO PMN J2336-5236
fit:lin+exp
Sp.index(5 GHz)=-0.26
Sp.index(20 GHz)=-0.37
Flux [Jy]
Frequency [MHz]


WMAP-catalog
QSO PMN J2357-5311
fit:lin+exp
Sp.index(5 GHz)=-0.06
Sp.index(20 GHz)=-0.09
Flux [Jy]
Frequency [MHz]


WMAP-catalog
QSO PMN J2348-1631
fit:lin+exp
Sp.index(5 GHz)=-0.06
Sp.index(20 GHz)=-0.13
Flux [Jy]
Frequency [MHz]


WMAP-catalog
AGN PMN J2358-6054
fit:lin+exp
Sp.index(5 GHz)=-0.64
Sp.index(20 GHz)=-0.57
Flux [Jy]
Frequency [MHz]