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The lower limit of the Doppler factor for a Fermi blazar sample [*]

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Abstract We selected 457 blazars (193 flat spectrum radio quasars, 61 low-synchrotron peaked blazars, 69 intermediate-synchrotron peaked blazars and 134 high-synchrotron peaked blazars) from the second *Fermi*-LAT catalog (2FGL) of γ-ray sources, which have X-ray observations. We calculated the lower limits for their Doppler factors, δ_γ, and compared the lower limits with the available Doppler factors and the apparent superluminal velocities in the literature.

Key words: galaxies: BL Lacertae objects — galaxies: quasars — galaxies: jets — gamma-rays: galaxies

1 INTRODUCTION

Blazars represent a very special subclass of active galactic nuclei (AGNs) with luminous brightness, rapid and high amplitude variability, high and variable polarization, superluminal motion, strong γ-ray emission, etc (Fan et al. 2013, and references therein). In turn, blazars can be divided into two subclasses, namely flat spectrum radio quasars (FSRQs) and BL Lacertae objects (BL Lacs). The main difference between the two subclasses is the fact that FSRQs feature strong emission lines, while BL Lacs have only weak lines or no lines at all. Taking into account many inputs from different surveys, BL Lacs are also subdivided into radio-selected BL Lacertae objects (RBLs) and X-ray selected BL Lacertae objects (XBLs) while, by inspecting the behavior of their spectral energy distributions (SEDs), BL Lacs are also classified as high-energy cutoff BL Lacs (HBLs) or low-energy cutoff BL Lacs (LBLs) (Padovani & Giommi 1995). Quite generally, RBLs correspond to LBLs while XBLs correspond to HBLs. Actually, there is no continuous solution between LBLs and HBLs, so a third, intermediate class (IBLs) was introduced by Nieppola et al. (2006).

Despite starting with the missions SAS-2 (1972-73 Fichtel et al. 1975) and COS-B (1975-82 Swanenburg et al. 1981) that had limited abilities, gamma-ray astronomy had a real boost with the

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Energetic Gamma Ray Experiment Telescope (EGRET), outfitting the satellite Compton Gamma-Ray Observatory (CGRO), that detected many γ-ray sources (Hartman et al. 1999). The γ-ray emissions in the γ-ray loud blazars were investigated and found to be strongly beamed by the correlations between the emissions in γ-rays and those at lower energy bands (Dondi & Ghisellini 1995; Xie et al. 1997; Fan et al. 1998; Huang et al. 1999; Cheng et al. 2000). The γ-ray emissions have also been used to estimate beaming factors (Doppler factors) for some γ-ray loud sources (see examples in Mattox et al. 1993; von Montigny et al. 1995; Cheng et al. 1999; Fan et al. 1999; Fan 2005). Very recently, following the work by Mattox et al. (1993), the lower limits of the Doppler factors were evaluated for a sample of 138 Fermi blazars by assuming a timescale of one day (Fan et al. 2013). It is clear that the Doppler factors are important for the discussions of the emissions in blazars.

After EGRET followed the Large Area Telescope (LAT) onboard the satellite *Fermi*, currently the latest generation of γ-ray detectors in space. Thanks to the LAT, many new blazars are now observed at γ-ray energies (Abdo et al. 2010a; Ackermann et al. 2011; Nolan et al. 2012). The picture that is emerging is that blazar emissions can reach high energies and are extremely variable. The majority of blazars detected by Fermi are variable with high significance, with the variation amplitudes for FSRQs, low-synchrotron peaked blazars (LSPs) and intermediate-synchrotron peaked blazars (ISPs) being larger (Abdo et al. 2010d). Many characteristics of blazars may only be correctly interpreted in a multi-wavelength framework, and, among others, we found the Roma BZCAT (*http://www.asdc.asi.it/bzcat/*) to be a very valuable source of information (see Massaro et al. 2011). In addition, we used the second *Fermi*-LAT catalog of sources, the so-called 2FGL (Nolan et al. 2012). For many reasons, *Fermi*-LAT blazars are better described mirroring the division into the classes described above that used the position of the synchrotron peak (the subclasses named HBL, IBL and LBL). Extending the classes to embrace all types of AGNs that are dominated by non-thermal emission (see Abdo et al. 2010c, for some scientific advantages), we are led to three new sub-classes: high-, intermediate- and low-synchrotron peaked blazars (HSPs, ISPs and LSPs, respectively). The 2FGL catalog follows this classification, and we also employ it throughout this paper.

Browsing the two catalogs, we can compile a sample of 457 LAT γ-ray blazars that have available X-ray data. The present sample is greater than the previous sample (Fan et al. 2013). It is interesting to estimate the γ-ray Doppler factors for those blazars. To do so, we still follow the work by Mattox et al. (1993) as we did in Fan et al. (2013). This work is arranged as follows. We will estimate the Doppler factors for those blazars in Section 2. In Section 3, we will discuss the results. In Section 4, we will draw a brief conclusion. Throughout the paper, we adopt $H_0 = 73$ km s^{-1} Mpc^{-1}, and we define the spectral index, α, in such a way that the SED is $f_\nu \propto \nu^{-\alpha}$.

2 SAMPLE AND RESULTS

2.1 Lower Limit of the Doppler Factor

The particular observational properties of blazars can be explained by a relativistic beaming model. The high-energy γ-rays detected from blazars imply the existence of the beaming effect in those sources, otherwise the γ-rays should have been absorbed due to pair-production on collision with the lower-energy photons populating the region. Following Mattox et al. (1993), we assume that:

- X-rays are produced in the same region as γ rays, and that when γ rays are observed, X-ray and γ-ray intensities are similar;
- the emission region is spherical;
- the emission is isotropic, and the size of the emission region is constrained by the timescale of the time variations, ΔT, to be $R = c\delta\Delta T/(1+z)$, where c is the speed of light, δ is a Doppler factor and z is the redshift.

Then we can obtain the optical depth for the pair-production. If we assume that the optical depth does not exceed unity as it did in Mattox et al. (1993), then the lower limit of the Doppler factor, δ, can be expressed by (Fan et al. 2013)

$$\delta \geq \left[1.54 \times 10^{-3}(1+z)^{4+2\alpha}\left(\frac{d_{\rm L}}{\rm Mpc}\right)^{2}\left(\frac{\Delta T}{\rm h}\right)^{-1}\left(\frac{F_{\rm keV}}{\mu{\rm Jy}}\right)\left(\frac{E_{\gamma}}{\rm GeV}\right)^{\alpha}\right]^{\frac{1}{4+2\alpha}}, \tag{1}$$

where α is the X-ray spectral index, ΔT is the timescale in units of hour, $F_{\rm keV}$ is the flux density at 1 keV in units of μJy, E_{γ} is the energy, at which the γ-rays are detected, in units of GeV, while $d_{\rm L}$ is the luminosity distance in units of Mpc, which can be expressed in the form

$$d_{\rm L} = \frac{c}{H_0}\int_{1}^{1+z}\frac{{\rm d}x}{\sqrt{\Omega_{\rm M}x^3 + 1 - \Omega_{\rm M}}} \tag{2}$$

from the Λ-CDM model (Capelo & Natarajan 2007) with $\Omega_{\Lambda} \simeq 0.7$, $\Omega_{\rm M} \simeq 0.3$ and $\Omega_{K} \simeq 0.0$, c is the speed of light, H_0 is the Hubble constant and z is the redshift.

2.2 Sample

Based on the 2FGL catalog and the Roma BZCAT (*http://www.asdc.asi.it/bzcat/*) (see Massaro et al. 2011), we compiled the available X-ray data from the literature for 457 Fermi blazars (193 FSRQs, 61 LBLs, 69 IBLs and 134 HBLs), and listed them in Table 1 (the full Table 1 is available in the online version).

Table 1 Sample

Name (1)	Other Name (2)	Class (3)	z (4)	F_{γ} (5)	α_{γ} (6)	$F_{\rm 1keV}$ (7)	$\alpha_{\rm X}$ (8)	Ref (9)	$\langle E_{\gamma}\rangle$ (10)	$\log \nu L_{\nu}$ (11)	$\delta_{\gamma}^{\rm 6h}$ (12)	$\delta_{\gamma}^{\rm 1d}$ (13)
J0000.9−0748	J0001−0746	BL Lac		5.2	2.39	0.039		BZCAT	2.98	45.89	5.00	4.02
J0004.7−4736	PKS 0002−478	FSRQ	0.880	9.4	2.45	0.095		BZCAT	2.82	46.31	6.40	5.16
J0006.1+3821	S4 0003+38	FSRQ	0.229	9.6	2.60	0.078	$2.32^{+1.26}_{-0.87}$	B97a	2.50	44.80	2.38	1.93
J0007.8+4713	J000800+4712	IBL	0.280	21.3	2.10	0.059		BZCAT	4.09	45.51	2.82	2.27
J0008.7−2344	RBS 0016	HBL	0.147	3.2	1.62	0.269		BZCAT	8.23	44.33	2.91	2.35
J0011.3+0054	J0011+0058	FSRQ	1.493	5.4	2.43	0.031		BZCAT	2.87	46.70	8.81	7.09
J0017.4−0018	S3 0013−00	FSRQ	1.574	4.1	2.60	0.026		BZCAT	2.50	46.65	8.77	7.06
J0017.6−0510	J0017−0512	FSRQ	0.226	13.9	2.44	0.089		BZCAT	2.85	44.99	2.49	2.01
J0018.5+2945	RBS 0042	HBL	0.100	2.1	1.24	0.655		BZCAT	15.20	44.04	3.16	2.55
J0030.2−4223	PKS 0027−426	FSRQ	0.495	9.7	2.61	0.117	$2.62^{+0.14}_{-0.12}$	B97a	2.48	45.64	3.86	3.19
J0033.5−1921	KUV 00311−1938	HBL	0.610	31.2	1.76	0.938		BZCAT	6.60	46.63	7.99	6.43
J0035.2+1515	J0035.2+1515	HBL		10.8	1.62	0.336		BZCAT	8.23	46.46	8.46	6.81
J0035.8+5951	1ES 0033+595	HBL	0.086	24.3	1.87	1.661	$2.06^{+0.03}_{-0.03}$	D05	5.59	44.56	2.86	2.28
J0038.3−2457	PKS 0035−252	FSRQ	1.196	8.1	2.39	0.324	$1.24^{+0.58}_{-0.88}$	B97a	2.98	46.61	15.87	11.64
J0045.3+2127	J0045+2127	HBL		15.1	1.95	0.454	$2.16^{+0.25}_{-0.24}$	B97b	4.98	46.47	8.15	6.54
J0049.7−5738	PKS 0047−579	FSRQ	1.797	5.1	2.23	0.155		B97a	3.51	46.89	14.16	11.40
J0050.6−0929	PKS 0048−09	LBL	0.635	38.5	2.14	0.770	$2.57^{+0.07}_{-0.07}$	D01	3.89	46.62	6.65	5.48
J0108.6+0135	4C +01.02	FSRQ	2.099	63.5	2.26	0.085	$1.54^{+0.74}_{-1.48}$	B97a	3.39	48.16	19.39	14.76
J0109.0+1817	J010908+1816	HBL	0.145	5.0	1.99	1.189	$1.94^{+0.2}_{-0.18}$	B97b	4.72	44.29	3.37	2.66
J0112.1+2245	S2 0109+22	IBL	0.265	71.3	2.07	0.160	2.96	D01	4.24	46.00	3.09	2.59
...	...	...	...	...	...	...	...	...	...	...	...	...

Notes: Col. (1) 2FGL name, Col. (2) other name, Col. (3) classification, Col. (4) redshift, Col. (5) flux (F_{γ}) in the bin 1–100 GeV in units of $10^{-9}\gamma\ {\rm cm}^{-2}\ {\rm s}^{-1}$ (from 2FGL), Col. (6) the γ-ray photon spectral index (from 2FGL), Col. (7) the X-ray flux density in units of μJy at 1 keV, Col. (8) the X-ray photon index, α_p, Col. (9) reference for Cols. (7) and (8), B97a: Brinkmann et al. (1997a), B97b: Brinkmann et al. (1997b), B00: Brinkmann et al. (2000), D01: Donato et al. (2001), D05: Donato et al. (2005), G02: Giommi et al. (2002), G07: Giommi et al. (2007), U96: Urry et al. (1996), NED: *http://ned.ipac.caltech.edu/forms/byname.html*, BZCAT: *http://www.asdc.asi.it/bzcat*, Col. (10) average γ-ray photon energy, $\langle E_{\gamma}\rangle$ in units of GeV, Col. (11) the integrated γ-ray luminosity ($1 - 100$ GeV) in erg s^{-1}, Col. (12) the derived lower limit for the γ-ray Doppler factor ($\Delta T = 6$ h), $\delta_{\gamma}^{\rm 6h}$, Col. (13) the derived lower limit for the γ-ray Doppler factor ($\Delta T = 1$ d), $\delta_{\gamma}^{\rm 1d}$.

2.3 Calculations

To estimate the lower limit of δ, one should know the redshift z, the X-ray behavior that is characterized by the spectral index $\alpha_{\rm X}$ and the flux density $F_{\rm keV}$, the behavior in gamma rays that is characterized by the average energy in gamma rays $\langle E_\gamma \rangle$, and the timescale of the variations ΔT.

In our calculation, we used an averaged redshift value, $\langle z \rangle = 0.765$, for the sources with unknown redshifts, and an averaged photon spectral index, $\langle \Gamma \rangle = 2.13$, for the sources without a sound evaluation of the X-ray spectral index. The average energy E_γ can be calculated by $\langle E \rangle = \int E{\rm d}N / \int {\rm d}N$. As for the timescale ΔT, it is not available for most sources, but ranges from $< 2\,{\rm h}$ to $12\,{\rm h}$ (e.g. Foschini et al. (2011) and references therein). If, for the sake of simplicity, we take $\Delta T = 6$ h for our calculation, the lower limit of the γ-ray Doppler factor can be estimated and the value is listed in Column (12) of Table 1. From Table 1, we can get the average γ-ray Doppler factor for different subclasses as follows: $\langle \delta|^{\rm FSRQs} \rangle = 9.30 \pm 7.76$ for the 193 FSRQs, $\langle \delta|^{\rm LBLs} \rangle = 5.05 \pm 2.48$ for the 61 LBLs, $\langle \delta|^{\rm IBLs} \rangle = 5.21 \pm 2.59$ for the 69 IBLs and $\langle \delta|^{\rm HBLs} \rangle = 5.51 \pm 2.57$ for the 134 HBLs.

3 DISCUSSION

The LAT, onboard *Fermi*, has detected a lot of blazars (see 1FGL, Abdo et al. 2010a, and 2FGL, Nolan et al. 2012), which provide us with a good opportunity to investigate the emission mechanism and the beaming effects in the γ-ray band. As we discussed in our previous work (Fan et al. 2013), the γ-ray emission is mainly due to soft photons upscattered by Inverse Compton onto relativistic electrons, or to synchrotron emission/pion decay of secondary particles produced in a proton-induced cascade (Mannheim & Biermann 1992; Mannheim 1993; Cheng & Ding 1994).

The relativistic beaming effect plays an important role in the γ-ray emissions; in particular, for blazars detected by *Fermi*, Arshakian et al. (2012) found that the γ-ray luminosity is correlated with both radio and optical bands. The correlation between the γ-ray and the radio, $\log L_{\rm VLBA} = (0.83 \pm 0.03) \log L_\gamma + (5.96 \pm 0.26)$, holds at a high confidence level ($p > 99.9\%$). The γ-ray flux closely correlates with the parsec-scale radio emissions (Kovalev et al. 2009; Kovalev 2009). Pushkarev et al. (2010) found that γ-ray and radio emissions are correlated, but with γ-ray leading radio mostly by 1.2 months, and explained this time delay in terms of the synchrotron opacity. Fan et al. (2009) found that, for sources detected by *Fermi*, the γ-ray luminosity correlates well with the radio Doppler factor $\log \nu L_\nu = (0.47 \pm 0.19) \log \delta_R^{3+\alpha} + 45.44 \pm 0.68$. In addition, the jets of *Fermi* blazars have higher-than-average apparent speeds and a higher variability in Doppler factors (Lister et al. 2009a). Savolainen et al. (2010) estimated the Doppler factors for 62 superluminal AGNs, and calculated their Lorentz factor and viewing angles. They found that the *Fermi* blazars have, on average, higher Doppler factors, $\delta = 17.1 \pm 1.6$, with respect to non-Fermi blazars, $\delta = 12.2 \pm 1.2$ and have a narrower distribution for the viewing angles, typically in the range of $1^\circ < \theta < 5^\circ$.

Hovatta et al. (2010) found that when the sources are detected by *Fermi*-LAT, they are in a higher polarization state. The brightness temperatures of sources detected by *Fermi*-LAT are higher than those of sources that are not detected by *Fermi*-LAT (Kovalev 2009). This difference can be explained by the beaming effect (Kovalev et al. 2009; Lister & Homan 2005; Lister et al. 2009a; Savolainen et al. 2010). However, the beaming effect is mostly investigated using the Doppler factor determined from radio emissions (Ghisellini et al. 1993; Lähteenmäki & Valtaoja 1999; Fan et al. 2009; Hovatta et al. 2009; Lister et al. 2009a; Savolainen et al. 2010). It is possible that the radio Doppler factors, $\delta_{\rm R}$, are not the same as the ones determined in γ-rays, δ_γ.

Observations suggest that the γ-ray loud blazars are variable on timescales of hours although there is no preferred scale for the variation time of any source. For example, LAT detected a $\sim$12-hour variability timescale for PKS 1454−354 (Abdo et al. 2009), a doubling time of roughly 4 h for PKS 1502+105 (Abdo et al. 2010b), and timescales as short as 2–3 h were detected in 3C 454.3, 3C 273, PKS 1510+089 and PKS B1222+216 (Ackermann et al. 2010; Foschini et al. 2011; Tavecchio et al. 2010). Short timescales were also detected by EGRET, like the doubling times of about 4 h for PKS 1622−297 (Mattox et al. 1997), and ~ 8 h for 3C 279 (Wehrle et al. 1998). The timescales for those sources are in the range of 2 h to 12 h with an average value of about 5 h. The observed short timescales may be due to relativistic beaming (Kovalev et al. 2009; Arshakian et al. 2010; Savolainen et al. 2010; Pushkarev et al. 2010). In the present paper, we calculated the γ-ray Doppler factors for the *Fermi*-LAT detected sources with available X-ray data by adopting a variability timescale of $\Delta T = 1/4$ d, which is roughly 5 h. If a variability timescale of $\Delta T = 1$ d is adopted in the calculation as done in Ghisellini et al. (1998), the resulting Doppler factor will be slightly smaller than that for $\Delta T = 6$ h, namely $\delta_{\rm 1d} \sim 0.744\delta_{\rm 6\,h} + 0.355$. The γ-ray Doppler factors, $\delta_\gamma^{\rm 1d}$, corresponding to 1 d, are listed in Column (13) in Table 1.

For cross-checking, we compared our results for the two sources (1633+382 and 3C 279) with those by Mattox et al. (1993) in our previous work (Fan et al. 2013). Because the distance used in the present work is different from the one used in Mattox et al. (1993), the Doppler factor estimated in our work is slightly greater. We can also compare the obtained γ-ray Doppler factor (δ_γ) with the available Doppler factors in the literature.

Table 2 Comparison between δ_γ in This Work and δ from Literature

2FGL Name (1)	Other Name (2)	Class (3)	$\delta_{\rm R}^{\rm H99}$ (4)	$\delta_{\rm R}^{\rm F09}$ (5)	$\delta_{\rm R}^{\rm H09}$ (6)	$\delta_{\rm R}^{\rm S10}$ (7)	$\delta^{\rm Z12}$ (8)	$\delta^{\rm Z13}$ (9)	δ_γ (10)
2FGLJ0050.6−0929	PKS 0048−09	LBL		4.73	9.6				6.65
2FGLJ0108.6+0135	4C +01.02	FSRQ		4.83	18.4	18.2			19.39
2FGLJ0112.1+2245	S2 0109+22	IBL				9.1			3.09
2FGLJ0136.9+4751	OC 457	FSRQ		6.59	20.7	20.5		13.1 ± 1.2	8.93
2FGLJ0152.6+0148	PMN J0152+0146	HBL					22		2.35
2FGLJ0217.7+7353	S5 0212+73	FSRQ		9.23	8.5	8.4			16.99
2FGLJ0222.6+4302	3C 66A	IBL			2.6				6.23
2FGLJ0237.8+2846	4C +28.07	FSRQ	16.6		16.1	16		14.6 ± 1.1	7.30
2FGLJ0238.7+1637	AO 0235+164	LBL	6.5	20.74	24	23.8			9.85
2FGLJ0303.5+4713	4C +47.08	LBL		4.33					3.60
2FGLJ0309.1+1027	PKS 0306+102	FSRQ		2.79	12.3				3.76
2FGLJ0337.0+3200	NRAO 140	FSRQ			22.2	22			10.78
2FGLJ0339.4−0144	PKS 0336−01	FSRQ	15.6	5.85	17.4	17.2			6.35
2FGLJ0423.2−0120	PKS 0420−01	FSRQ	14	7.49	19.9	19.7		12.8 ± 0.7	8.92
2FGLJ0424.7+0034	PKS 0422+00	LBL		6.11	1.7^l				2.99
2FGLJ0442.7−0017	PKS 0440−00	FSRQ			12.9				6.90
2FGLJ0530.8+1333	PKS 0528+134	FSRQ	32.5	19.84	31.2	30.9		18.4 ± 1.3	32.75
2FGLJ0538.8−4405	PKS 0537−441	LBL	6.8						9.67
2FGLJ0608.0−0836	PKS 0605−08	FSRQ		4.05	7.6	7.5			6.40
2FGLJ0710.5+5908	1H 0658+595	HBL					19		3.75
2FGLJ0721.9+7120	S5 0716+71	IBL	7		10.9	10.8	22		4.31
2FGLJ0738.0+1742	PKS 0735+17	LBL	2	3.92	3.8				4.46
2FGLJ0739.2+0138	PKS 0736+01	FSRQ			8.6	8.5			3.41
2FGLJ0757.1+0957	PKS 0754+100	IBL		7.33	5.6	5.5			4.02
2FGLJ0809.8+5218	1ES 0806+524	HBL					22		3.72
2FGLJ0818.2+4223	S4 0814+42	LBL		1.71	4.6^l	4.6			4.79
2FGLJ0830.5+2407	S3 0827+24	FSRQ			13.1	13			8.49
2FGLJ0831.9+0429	PKS 0829+046	LBL		3.8					2.98
2FGLJ0841.6+7052	4C +71.07	FSRQ	8	3.12	16.3	16.1			38.61
2FGLJ0854.8+2005	OJ 287	LBL		7.76	17	16.8			4.22
2FGLJ0920.9+4441	S4 0917+44	FSRQ						18.2 ± 1.3	31.95
2FGLJ0948.8+0020	PMN J0948+0022	FSRQ						9.8 ± 0.6	4.36
2FGLJ0948.8+4040	4C +40.24	FSRQ			6.4	6.3			9.18
2FGLJ0956.9+2516	OK 290	FSRQ			4.3				5.25
2FGLJ0957.7+5522	4C +55.17	FSRQ			4.63^l				9.01
2FGLJ0958.6+6533	S4 0954+65	LBL	5.1	5.93	6.2				4.41

Table 2 — *Continued*

2FGL Name (1)	Other Name (2)	Class (3)	$\delta_{\rm R}^{\rm H99}$ (4)	$\delta_{\rm R}^{\rm F09}$ (5)	$\delta_{\rm R}^{\rm H09}$ (6)	$\delta_{\rm R}^{\rm S10}$ (7)	$\delta^{\rm Z12}$ (8)	$\delta^{\rm Z13}$ (9)	δ_γ (10)
2FGLJ1015.1+4925	1H 1013+498	HBL					22		4.55
2FGLJ1103.4−2330	1ES 1101−232	HBL					24		5.66
2FGLJ1104.4+3812	Mkn 421	HBL	1.1	9.63			27		3.32
2FGLJ1130.3−1448	PKS 1127−14	FSRQ	12	3.22					15.14
2FGLJ1136.7+7009	Mkn 180	HBL					18		2.51
2FGLJ1159.5+2914	Ton 599	FSRQ	6.4	9.63	28.5	28.2		11.6 ± 1	6.76
2FGLJ1221.3+3010	PG 1218+304	HBL					25		5.55
2FGLJ1221.4+2814	W Comae	LBL	1.3	0.94	1.2		28		2.36
2FGLJ1224.9+2122	4C +21.35	FSRQ		6.02	5.2	5.2			5.00
2FGLJ1229.1+0202	3C 273	FSRQ	6	6.05	17	16.8		7.4 ± 0.9	4.51
2FGLJ1256.1−0547	3C 279	FSRQ	18	4.16	24	23.8		12 ± 0.5	7.18
2FGLJ1309.3+1154	4C +12.46	LBL		1.22					5.84
2FGLJ1326.8+2210	B2 1324+22	FSRQ			21.2	21			8.40
2FGLJ1337.7−1257	PKS 1335−127	FSRQ		6.38		8.3			6.05
2FGLJ1420.2+5422	OQ 530	LBL		2.79	5.1				1.51
2FGLJ1427.0+2347	PKS 1424+240	IBL					25		8.96
2FGLJ1428.6+4240	H 1426+428	HBL					20		4.75
2FGLJ1457.4−3540	PKS 1454−354	FSRQ						20.2 ± 1.8	9.83
2FGLJ1504.3+1029	PKS 1502+106	FSRQ			12	11.9		27 ± 2.3	13.27
2FGLJ1512.8−0906	PKS 1510−08	FSRQ	14.4	7.64	16.7	16.5		11 ± 0.5	4.89
2FGLJ1540.4+1438	4C +14.60	LBL		3.34	4.3	4.3			5.36
2FGLJ1555.7+1111	PG 1553+113	HBL							7.49
2FGLJ1608.5+1029	4C +10.45	FSRQ		6.56	25	24.8			8.39
2FGLJ1613.4+3409	OS 319	FSRQ	7.1	3.36	13.7	13.6			13.61
2FGLJ1635.2+3810	4C +38.41	FSRQ	12	5.29	21.5	21.3			20.04
2FGLJ1642.9+3949	3C 345	FSRQ		7.57	7.8	7.7			6.90
2FGLJ1653.9+3945	Mkn 501	IBL					19		2.54
2FGLJ1719.3+1744	PKS 1717+177	LBL		1.94					2.88
2FGLJ1728.2+0429	PKS 1725+044	FSRQ			3.8				2.82
2FGLJ1733.1−1307	PKS 1730−13	FSRQ	11	11.84	10.7	10.6			13.00
2FGLJ1740.2+5212	4C +51.37	FSRQ	7.3		26.5	26.3			10.51
2FGLJ1748.8+7006	S4 1749+70	IBL		3.75					6.42
2FGLJ1800.5+7829	S5 1803+784	LBL		4.7	12.2	12.1			7.69
2FGLJ1806.7+6948	3C 371	LBL		1.05	1.1	1.1			1.76
2FGLJ1824.0+5650	4C +56.27	LBL		2.5	6.4	6.3			6.39
2FGLJ1924.8−2912	PKS B1921−293	FSRQ		9.51					5.15
2FGLJ2000.0+6509	1ES 1959+650	HBL					21		2.81
2FGLJ2004.5+7754	S5 2007+77	LBL		4.68	7.9				3.94
2FGLJ2007.9−4430	PKS 2004−447	FSRQ						6 ± 0.4	2.16
2FGLJ2009.5−4850	PKS 2005−489	HBL					22		4.08
2FGLJ2133.8−0154	PKS 2131−021	LBL		7					8.65
2FGLJ2143.5+1743	OX 169	FSRQ						8 ± 1	2.68
2FGLJ2148.2+0659	4C +06.69	FSRQ		4.35	15.6	15.5			11.22
2FGLJ2157.9−1501	PKS 2155−152	FSRQ		2.23					6.19
2FGLJ2158.8−3013	PKS 2155−304	HBL					29		5.03
2FGLJ2202.8+4216	BL Lacertae	LBL	4.4	2.77	7.3	7.2	22		2.61
2FGLJ2225.6−0454	3C 446	FSRQ		9.93	16	15.9			15.08
2FGLJ2232.4+1143	CTA 102	FSRQ	1.9	8.02	15.6	15.5			13.90
2FGLJ2236.4+2828	B2 2234+28A	LBL			6				6.05
2FGLJ2253.9+1609	3C 454.3	FSRQ	8.8	9.38	33.2	32.9		17.6 ± 0.6	12.51
2FGLJ2327.5+0940	PKS 2325+093	FSRQ						17.6 ± 1.6	12.46
2FGLJ2347.0+5142	1ES 2344+514	HBL					18		2.75
2FGLJ2359.0−3037	H 2356−309	HBL					27		2.18

Notes: Col. (1): 2FGL name, Col. (2): other name, Col. (3): classification, Col. (4): the radio Doppler factors from H99, Col. (5): the radio Doppler factors from F09, Col. (6): the radio Doppler factors from H09, where the data marked with ^{l} are from Lähteenmäki & Valtaoja (1999), Col. (7): the radio Doppler factors from S10, Col. (8): the Doppler factors from Z12, Col. (9): the Doppler factors from Z13, Col. (10): the γ-ray Doppler factors obtained in this work.

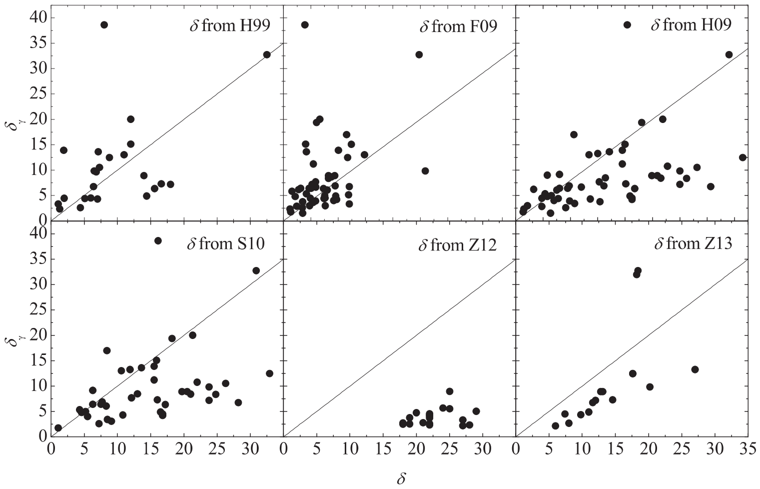

Fig. 1 Plot of the γ-Doppler factor, δ_γ, against the Doppler factor from other methods, δ, for some blazars observed by *Fermi*. The line stands for equality, meaning $\delta_\gamma = \delta$. The upper left panel is a plot of δ_γ versus the radio Doppler factor δ_R from Huang et al. (1999), the upper middle panel is a plot of δ_γ versus the Doppler factor δ from Fan et al. (2009), the upper right panel is a plot of δ_γ versus the radio Doppler factor δ_R from Hovatta et al. (2009), the lower left panel is a plot of δ_γ versus the radio Doppler factor δ_R from Savolainen et al. (2010), the lower middle panel is a plot of δ_γ versus the Doppler factor δ_R from Zhang et al. (2012) and the lower right panel is a plot of δ_γ versus the Doppler factor δ_R from Zhang et al. (2013).

There are 24 sources in common with Huang et al. (1999); 49 in common with Fan et al. (2009); 54 in common with Hovatta et al. (2009), out of which three (PKS 0422+00, $\delta_R = 1.7$; S4 0814+42, $\delta_R = 4.6$; 4C+55.17, $\delta_R = 4.63$) are from Lähteenmäki & Valtaoja (1999), and the two evaluations of the Doppler factors are related by $\delta_\gamma = (0.40 \pm 0.10)\delta_{\rm R}^{\rm H09} + (3.56 \pm 1.60)$ with a correlation coefficient $r = 0.47$ and a chance probability of $p = 3.41 \times 10^{-4}$; 42 in common with the sample by Savolainen et al. (2010); 19 in common with Zhang et al. (2012) and 16 in common with Zhang et al. (2013). All plots that show comparisons are displayed in Figure 1.

It is clear that there are some discrepancies between the derived values in the present work and those from the literature. The reasons may be due to the facts that (1) the derived value is a lower value, and (2) the timescale of $\Delta T = 6\,$h used here is smaller than the real timescale for the sources whose derived values are above the line, and it is larger than the real timescale for the sources whose derived values are below the line. In addition, the non-simultaneous observations will also result in some discrepancies.

As noticed by von Montigny et al. (1995) the γ-ray loud blazars also show superluminal motions. From the available literature, we can compile the superluminal velocities for some sources of the present sample and show them in Table 3; the superluminal velocities are from the papers by Britzen et al. (2008)[B08], Hovatta et al. (2009)[H09], Karouzos et al. (2011)[K11], Lister et al. (2009a,b)[L09a, L09b] and Savolainen et al. (2010)[S10].

We can find that the estimated Doppler factors increase with the superluminal velocities as shown in Figure 2. This association suggests that the γ-ray emissions are strongly beamed.

In the present sample, 15 sources have an averaged energy higher than 10 GeV. For those sources, two sources (2FGLJ1351+1115 and 2FGLJ2055.4-0023) have UV observations (Atlee & Gould 2007). The UV radiations should collide with the higher energetic γ-ray photons to produce pairs. Following the consideration by Mattox et al. (1993), we can derive an analogous result for

Table 3 Fermi Blazars with Superluminal Motion Detections

2FGL name (1)	Other Name (2)	Redshift (3)	Class (4)	δ_γ (5)	β (6)	Ref (7)
2FGLJ0006.1+3821	S4 0003+38	0.229	FSRQ	2.38	4.899	K11
2FGLJ0108.6+0135	4C +01.02	2.099	FSRQ	19.39	26.5	S10
2FGLJ0113.7+4948	S4 0110+49	0.395	FSRQ	3.20	1.049	K11
2FGLJ0136.9+4751	OC 457	0.859	FSRQ	8.93	15.4	H09
2FGLJ0217.7+7353	S5 0212+73	2.367	FSRQ	16.99	16.068	K11
2FGLJ0222.6+4302	3C 66A	0.444	IBL	6.23	14.04	B08
2FGLJ0237.8+2846	4C +28.07	1.206	FSRQ	7.30	12.3	S10
2FGLJ0337.0+3200	NRAO 140	1.259	FSRQ	10.78	13.1	H09
2FGLJ0339.4−0144	PKS 0336−01	0.852	FSRQ	6.35	22.4	L09a
2FGLJ0405.8−1309	PKS 0403−13	0.571	FSRQ	6.86	19.7	L09a
2FGLJ0423.2−0120	PKS 0420−01	0.916	FSRQ	8.92	7.35	L09b
2FGLJ0530.8+1333	PKS 0528+134	2.070	FSRQ	32.75	19.2	L09a
2FGLJ0608.0−0836	PKS 0605−08	0.872	FSRQ	6.40	19.79	L09a
2FGLJ0721.9+7120	S5 0716+71	0.300	IBL	4.31	43.6	H09
2FGLJ0739.2+0138	PKS 0736+01	0.189	FSRQ	3.41	14.44	L09a
2FGLJ0750.6+1230	OI 280	0.889	FSRQ	7.54	18.37	L09a
2FGLJ0757.1+0957	PKS 0754+100	0.266	IBL	4.02	14.4	S10
2FGLJ0818.2+4223	S4 0814+42	0.530	LBL	4.79	1.71	L09a
2FGLJ0825.9+0308	PKS 0823+033	0.506	IBL	5.05	17.8	L09a
2FGLJ0830.5+2407	S3 0827+24	0.942	FSRQ	8.49	22	S10
2FGLJ0831.9+0429	PKS 0829+046	0.174	LBL	2.98	10.11	L09a
2FGLJ0841.6+7052	4C +71.07	2.218	FSRQ	38.61	30.59	K11
2FGLJ0854.8+2005	OJ 287	0.306	LBL	4.22	15.2	H09
2FGLJ0909.1+0121	PKS 0906+01	1.026	FSRQ	5.72	20.66	L09a
2FGLJ0920.9+4441	S4 0917+44	2.189	FSRQ	31.95	14.246	K11
2FGLJ0948.8+4040	4C +40.24	1.249	FSRQ	9.18	20.2	H09
2FGLJ0958.6+6533	S4 0954+65	0.367	LBL	4.41	9.874	K11
2FGLJ1017.0+3531	B2 1015+35B	1.228	FSRQ	8.81	10.273	K11
2FGLJ1023.6+3947	4C +40.25	1.254	FSRQ	7.81	13.169	K11
2FGLJ1040.7+0614	4C +06.41	1.264	FSRQ	10.24	11.87	L09a
2FGLJ1042.6+8053	S5 1039+81	1.260	FSRQ	10.02	3.039	K11
2FGLJ1104.4+3812	Mkn 421	0.031	HBL	3.32	0.187	K11
2FGLJ1130.3−1448	PKS 1127−14	1.184	FSRQ	15.14	14.18	L09a
2FGLJ1159.5+2914	Ton 599	0.725	FSRQ	6.76	24.9	S10
2FGLJ1222.4+0413	4C +04.42	0.966	FSRQ	9.15	2.35	L09a
2FGLJ1224.9+2122	4C +21.35	0.434	FSRQ	5.00	26.8	H09
2FGLJ1229.1+0202	3C 273	0.158	FSRQ	4.51	14.9	H09
2FGLJ1256.1−0547	3C 279	0.536	FSRQ	7.18	20.6	H09
2FGLJ1308.5+3547	5C 12.291	1.055	FSRQ	6.68	4.611	K11
2FGLJ1337.7−1257	PKS 1335−127	0.539	FSRQ	6.05	10.26	S10
2FGLJ1419.4+3820	B3 1417+385	1.831	FSRQ	16.14	15.4	L09a
2FGLJ1420.2+5422	OQ 530	0.153	LBL	1.51	2.562	K11
2FGLJ1504.3+1029	PKS 1502+106	1.839	FSRQ	13.27	17.9	H09
2FGLJ1512.8−0906	PKS 1510−08	0.360	FSRQ	4.89	27.8	H09
2FGLJ1540.4+1438	4C +14.60	0.605	LBL	5.36	8.73	L09a
2FGLJ1549.5+0237	PKS 1546+027	0.414	FSRQ	5.07	12.1	L09a
2FGLJ1608.5+1029	4C +10.45	1.232	FSRQ	8.39	18.9	H09
2FGLJ1613.4+3409	OS 319	1.400	FSRQ	13.61	14.1	H09
2FGLJ1635.2+3810	4C +38.41	1.813	FSRQ	20.04	29.5	L09b
2FGLJ1640.7+3945	NRAO 512	1.660	FSRQ	11.42	12.3	L09a
2FGLJ1642.9+3949	3C 345	0.593	FSRQ	6.90	19.3	S10
2FGLJ1653.9+3945	Mkn 501	0.034	IBL	2.54	0.898	K11
2FGLJ1700.2+6831	TXS 1700+685	0.301	FSRQ	2.27	1.037	K11
2FGLJ1727.1+4531	S4 1726+45	0.717	FSRQ	4.43	5.686	K11
2FGLJ1733.1−1307	PKS 1730−13	0.902	FSRQ	13.00	35.7	S10
2FGLJ1734.3+3858	B2 1732+38A	0.975	FSRQ	7.95	12.065	K11
2FGLJ1740.2+5212	4C +51.37	1.379	FSRQ	10.51	11.475	K11

Table 3 — *Continued*

2FGL name (1)	Other Name (2)	Redshift (3)	Class (4)	δ_γ (5)	β (6)	Ref (7)
2FGLJ1748.8+7006	S4 1749+70	0.770	IBL	6.42	4.992	K11
2FGLJ1800.5+7829	S5 1803+784	0.680	LBL	7.69	13.567	K11
2FGLJ1801.7+4405	S4 1800+44	0.663	FSRQ	7.71	15.41	L09a
2FGLJ1806.7+6948	3C 371	0.051	LBL	1.76	0.104	L09a
2FGLJ1824.0+5650	4C +56.27	0.664	LBL	6.39	26.2	H09
2FGLJ1849.4+6706	S4 1849+67	0.657	FSRQ	4.80	30.6	L09a
2FGLJ2000.8−1751	PKS 1958−179	0.652	FSRQ	6.46	1.9	L09a
2FGLJ2004.5+7754	S5 2007+77	0.342	LBL	3.94	1.953	K11
2FGLJ2133.8−0154	PKS 2131−021	1.284	LBL	8.65	13.94	L09a
2FGLJ2148.2+0659	4C +06.69	0.999	FSRQ	11.22	2.5	L09a
2FGLJ2157.9−1501	PKS 2155−152	0.672	FSRQ	6.19	18.1	L09a
2FGLJ2202.8+4216	BL Lacertae	0.069	LBL	2.61	10.57	L09a
2FGLJ2203.4+1726	PKS 2201+171	1.076	FSRQ	9.87	3.9	L09a
2FGLJ2225.6−0454	3C 446	1.404	FSRQ	15.08	20.3	H09
2FGLJ2232.4+1143	CTA 102	1.037	FSRQ	13.90	15.41	L09a
2FGLJ2253.9+1609	3C 454.3	0.859	FSRQ	12.51	14.2	S10
2FGLJ2334.3+0734	TXS 2331+073	0.401	FSRQ	3.70	4.47	L09a
2FGLJ2347.9−1629	PKS 2345−16	0.576	FSRQ	4.88	13.45	L09a

Notes: Col. (1) 2FGL name, Col. (2): other name, Col. (3): redshift, Col. (4): classification, Col. (5): the γ-ray Doppler factor obtained in this work, Col. (6): the superluminal velocity $\beta = v/c$, Col. (7): the reference for β.

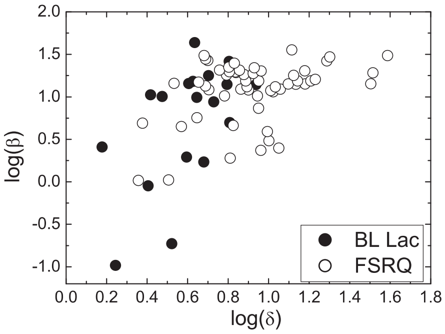

Fig. 2 Plot of the γ-Doppler factor, δ_γ, against the superluminal velocity for the present sample. Filled points represent BL Lacs while open circles represent FSRQs.

the relativistic beaming effect by considering the UV radiations. Assuming the UV photons have the same flux as the 1 keV photons, then the UV photon flux density at about 2×10^{15} GHz should be $1\text{keV} \times 1\,\mu\text{Jy}/\nu_{\rm UV} \sim 0.1$ mJy. Then the lower limit of the Doppler factor can be expressed as

$$\delta \geq \left[1.54 \times 10^{-2}(1+z)^{4+2\alpha}\left(\frac{d_{\rm L}}{\rm Mpc}\right)^2\left(\frac{\Delta T}{\rm h}\right)^{-1}\left(\frac{F_{\rm UV}}{\rm mJy}\right)\left(\frac{E_\gamma}{\rm GeV}\right)^\alpha\right]^{\frac{1}{4+2\alpha}}, \tag{3}$$

where F_{UV} is the UV flux density in units of mJy. For the two sources (2FGLJ1351+1115 and 2FGLJ2055.4–0023), their flux densities are $(2.36 \pm 0.63) \times 10^{-2}$ mJy and $(7.05 \pm 0.584) \times 10^{-2}$ mJy at 1.96×10^{15} GHz and 1.32×10^{15} GHz respectively for 2FGLJ1351+1115, and $(6.14\pm0.17)\times10^{-2}$ mJy and $(10.0\pm0.01)\times10^{-2}$ mJy at 1.96×10^{15} GHz and 1.32×10^{15}GHz respectively for 2FGLJ2055.4–0023 (Atlee & Gould 2007). We can obtain their spectral indexes to be 2.77 and 1.23 for 2FGLJ1351+1115 and 2FGLJ2055.4–0023. When relation (3) is adopted for the two sources, in the case of $\Delta T = 6\,\mathrm{h}$, we have $\delta_\gamma \geq 7.41$ and $\delta_\gamma \geq 9.87$ for 2FGLJ1351+1115 and 2FGLJ2055.4–0023; in the case of $\Delta T = 24\,\mathrm{h}$, we have $\delta_\gamma \geq 6.41$ and $\delta_\gamma \geq 7.96$ for 2FGLJ1351+1115 and 2FGLJ2055.4–0023. The Doppler factors obtained based on the X-ray data, in the case of $\Delta T = 6$ h, are $\delta_\gamma \geq 8.39$ and $\delta_\gamma \geq 9.92$ for 2FGLJ1351+1115 and 2FGLJ2055.4–0023; in the case of $\Delta T = 24$ h, they are $\delta_\gamma \geq 6.75$ and $\delta_\gamma \geq 7.99$ for 2FGLJ1351+1115 and 2FGLJ2055.4–0023. The Doppler factors obtained based on the UV data are quite consistent with those based on the X-ray data for the two sources, see Table 4.

Table 4 Doppler Factors for UV and X-ray Data

2FGL name (1)	Data (2)	$\delta_\gamma^{6\mathrm{h}}$ (3)	$\delta_\gamma^{24\mathrm{h}}$ (4)
2FGLJ1351+1115	UV data	7.41	6.41
	X-ray data	8.39	6.75
2FGLJ2055.4–0023	UV data	9.87	7.96
	X-ray data	9.92	7.99

4 CONCLUSIONS

In this paper, we compiled the X-ray data for a sample of *Fermi* blazars, calculated their γ-ray Doppler factors and compared the γ-ray Doppler factors with the available Doppler factors in the literature and the superluminal velocities. From our discussions, we drew the conclusions that our present Doppler factors are associated with other Doppler factor determinations, that the present Doppler factors are correlated with the superluminal velocity, and that the γ-rays are strongly beamed.

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Table 1: Sample

Name (1)	Other Name (2)	Class (3)	z (4)	F_γ (5)	α_γ (6)	$F_{\rm 1keV}$ (7)	$\alpha_{\rm X}$ (8)	Ref (9)	$\langle E_\gamma \rangle$ (10)	$\log \nu L_\nu$ (11)	$\delta_\gamma^{\rm 6h}$ (12)	$\delta_\gamma^{\rm 1d}$ (13)
J0000.9−0748	J0001−0746	BL Lac		5.2	2.39	0.039		BZCAT	2.98	45.89	5.00	4.02
J0004.7−4736	PKS 0002−478	FSRQ	0.880	9.4	2.45	0.095		BZCAT	2.82	46.31	6.40	5.16
J0006.1+3821	S4 0003+38	FSRQ	0.229	9.6	2.60	0.078	$2.32^{+1.26}_{-0.87}$	B97a	2.50	44.80	2.38	1.93
J0007.8+4713	J000800+4712	IBL	0.280	21.3	2.10	0.059		BZCAT	4.09	45.51	2.82	2.27
J0008.7−2344	RBS 0016	HBL	0.147	3.2	1.62	0.269		BZCAT	8.23	44.33	2.91	2.35
J0011.3+0054	J0011+0058	FSRQ	1.493	5.4	2.43	0.031		BZCAT	2.87	46.70	8.81	7.09
J0017.4−0018	S3 0013−00	FSRQ	1.574	4.1	2.60	0.026		BZCAT	2.50	46.65	8.77	7.06
J0017.6−0510	J0017−0512	FSRQ	0.226	13.9	2.44	0.089		BZCAT	2.85	44.99	2.49	2.01
J0018.5+2945	RBS 0042	HBL	0.100	2.1	1.24	0.655		BZCAT	15.20	44.04	3.16	2.55
J0030.2−4223	PKS 0027−426	FSRQ	0.495	9.7	2.61	0.117	$2.62^{+0.14}_{-0.12}$	B97a	2.48	45.64	3.86	3.19
J0033.5−1921	KUV 00311−1938	HBL	0.610	31.2	1.76	0.938		BZCAT	6.60	46.63	7.99	6.43
J0035.2+1515	J0035.2+1515	HBL		10.8	1.62	0.336		BZCAT	8.23	46.46	8.46	6.81
J0035.8+5951	1ES 0033+595	HBL	0.086	24.3	1.87	1.661	$2.06^{+0.03}_{-0.03}$	D05	5.59	44.56	2.86	2.28
J0038.3−2457	PKS 0035−252	FSRQ	1.196	8.1	2.39	0.324	$1.24^{+0.58}_{-0.88}$	B97a	2.98	46.61	15.87	11.64
J0045.3+2127	J0045+2127	HBL		15.1	1.95	0.454	$2.16^{+0.25}_{-0.24}$	B97b	4.98	46.47	8.15	6.54
J0049.7−5738	PKS 0047−579	FSRQ	1.797	5.1	2.23	0.155		B97a	3.51	46.89	14.16	11.40
J0050.6−0929	PKS 0048−09	LBL	0.635	38.5	2.14	0.770	$2.57^{+0.07}_{-0.07}$	D01	3.89	46.62	6.65	5.48
J0108.6+0135	4C +01.02	FSRQ	2.099	63.5	2.26	0.085	$1.54^{+0.74}_{-1.48}$	B97a	3.39	48.16	19.39	14.76
J0109.0+1817	J010908+1816	HBL	0.145	5.0	1.99	1.189	$1.94^{+0.2}_{-0.18}$	B97b	4.72	44.29	3.37	2.66
J0112.1+2245	S2 0109+22	IBL	0.265	71.3	2.07	0.160	2.96	D01	4.24	46.00	3.09	2.59
J0112.8+3208	4C 31.03	FSRQ	0.603	45.6	2.31	0.487		BZCAT	3.22	46.59	6.25	5.03
J0113.7+4948	S4 0110+49	FSRQ	0.395	8.6	2.26	0.068	$3.24^{+0.83}_{-1.71}$	B97a	3.39	45.42	3.20	2.72
J0115.7+2518	J0115.7+2519	HBL	0.350	12.9	2.00	0.708	$1.84^{+0.41}_{-0.34}$	B97b	4.65	45.57	5.20	4.08
J0116.0−1134	PKS 0113−118	FSRQ	0.671	15.0	2.44	0.173	$1.98^{+0.74}_{-0.98}$	B97a	2.85	46.20	5.94	4.71
J0118.8−2142	PKS 0116−219	FSRQ	1.165	43.3	2.12	0.016		BZCAT	3.99	47.34	6.62	5.33
J0120.4−2700	PKS 0118−272	LBL	0.559	43.5	1.93	0.280	$2.74^{+0.74}_{-0.74}$	D01	5.12	46.61	5.48	4.56
J0122.6+3425	1ES 0120+340	HBL	0.272	3.5	1.53	5.739	$2.24^{+0.08}_{-0.08}$	B97b	9.52	45.01	6.60	5.33
J0132.8−1654	PKS 0130−17	FSRQ	1.020	21.3	2.45	0.030		BZCAT	2.82	46.84	6.09	4.91
J0136.5+3905	B3 0133+388	HBL	0.765	45.3	1.69	0.640	$2.58^{+0.07}_{-0.06}$	D05	7.36	47.05	8.56	7.05
J0136.9+4751	OC 457	FSRQ	0.859	72.0	2.15	0.316	$1.82^{+0.25}_{-0.22}$	B97a	3.84	47.22	8.93	6.98
J0137.6−2430	PKS 0135−247	FSRQ	0.835	10.5	2.42	0.229	$2.14^{+0.06}_{-0.06}$	B97a	2.90	46.30	7.18	5.76
J0141.5−0928	PKS 0139−09	BL Lac	0.733	16.4	2.03	0.208	2.15	NED	4.47	46.44	6.85	5.49
J0145.1−2732	PKS 0142−278	FSRQ	1.148	20.6	2.58	0.056		BZCAT	2.54	46.96	7.32	5.90
J0152.6+0148	J0152+0146	HBL	0.080	7.7	1.79	0.469	$2.48^{+0.16}_{-0.17}$	B97b	6.30	44.05	2.35	1.92
J0158.3−3931	J0158−3932	LBL		9.1	2.07	0.021		BZCAT	4.24	46.21	4.85	3.91
J0159.5+1046	J0159.5+1047	HBL	0.195	10.6	2.15	0.630	$1.73^{+0.63}_{-0.63}$	D01	3.84	44.83	3.52	2.73
J0159.6−2741	J0159−2739	LBL		5.7	2.12	0.042		BZCAT	3.99	45.99	5.34	4.30
J0203.6+7235	S5 0159+723	HBL		9.9	2.02	0.210		BZCAT	4.53	46.26	7.03	5.66
J0205.3−1657	PKS 0202−17	FSRQ	1.739	7.4	2.68	0.161	$1.40^{+0.38}_{-0.48}$	B97a	2.36	47.04	18.52	13.87
J0206.5−1149	J0206−1150	FSRQ	1.663	6.6	2.09	0.021		BZCAT	4.14	46.93	9.89	7.96
J0209.5−5229	J020922.2−52292	HBL	0.999	14.5	1.91	0.888		BZCAT	5.27	46.47	9.06	7.30
J0213.1+2245	J021252+2246	HBL	0.459	10.4	2.03	0.158		BZCAT	4.47	45.74	4.57	3.68
J0217.4+0836	ZS 0214+083	IBL	1.400	15.7	1.94	0.116	$2.58^{+0.84}_{-1.62}$	B97a	5.05	47.14	10.43	8.60
J0217.7+7353	S5 0212+73	FSRQ	2.367	7.3	2.82	0.137		B97a	2.17	47.46	16.99	13.68
J0219.1−1725	J021905.8−17250	IBL	0.128	4.2	1.92	0.081		BZCAT	5.20	44.14	2.08	1.67
J0222.0−1615	PKS 0219−164	FSRQ	0.700	5.7	2.47	0.028		BZCAT	2.77	45.82	4.36	3.51
J0222.6+4302	3C 66A	IBL	0.444	256.0	1.85	1.560	$2.60^{+0.17}_{-0.17}$	D01	5.75	47.18	6.23	5.14
J0227.3+0203	J0227.2+0201	HBL	0.456	4.3	1.86	3.379	1.90	L99	5.67	45.43	8.34	6.57
J0237.1−6136	PKS 0235−618	FSRQ	0.467	28.4	2.33	0.081		BZCAT	3.16	46.10	3.91	3.15
J0237.5−3603	RBS 0334	HBL		3.6	1.56	0.257		BZCAT	9.07	46.01	8.26	6.66
J0237.8+2846	4C +28.07	FSRQ	1.206	37.7	2.16	0.060	$3.02^{+0.82}_{-1.66}$	B97a	3.80	47.32	7.30	6.15
J0238.6−3117	J023832.6−31165	HBL		10.0	1.85	0.572		BZCAT	5.75	46.33	8.60	6.92
J0238.7+1637	AO 0235+164	LBL	0.940	187.0	2.02	1.150	$2.59^{+0.86}_{-0.86}$	D01	4.53	47.77	9.85	8.12
J0245.9−4652	PKS 0244−470	FSRQ	1.385	45.4	2.43	0.047		BZCAT	2.87	47.53	8.71	7.02
J0250.6+1713	J025037+171209	FSRQ	1.100	9.6	1.84	0.735	$2.02^{+0.64}_{-0.49}$	B97b	5.84	46.70	12.99	10.33
J0257.9+2025	J025805+2029	IBL		6.8	2.19	0.079		BZCAT	3.67	46.05	5.80	4.67

Table 1 – *Continued*

Name (1)	Other Name (2)	Class (3)	z (4)	F_γ (5)	α_γ (6)	$F_{1\mathrm{keV}}$ (7)	α_X (8)	Ref (9)	$\langle E_\gamma \rangle$ (10)	$\log \nu L_\nu$ (11)	$\delta_\gamma^{6\mathrm{h}}$ (12)	$\delta_\gamma^{1\mathrm{d}}$ (13)
J0259.5+0740	PKS 0256+075	FSRQ	0.893	6.3	2.39	0.068	$1.11^{+1.08}_{-0}$	B97a	2.98	46.16	8.69	6.26
J0303.4−2407	PKS 0301−243	LBL	0.260	67.3	1.94	0.270	$2.68^{+0.31}_{-0.31}$	D01	5.05	46.02	3.46	2.87
J0303.5+4713	4C +47.08	LBL	0.475	18.5	2.24	0.040		BZCAT	3.47	45.95	3.60	2.90
J0303.5−6209	PKS 0302−623	FSRQ	1.351	11.2	2.48	0.059		BZCAT	2.75	46.89	8.75	7.05
J0304.5−2836	RBS 0385	HBL		3.7	1.62	0.341		BZCAT	8.23	45.99	8.48	6.83
J0309.1+1027	PKS 0306+102	FSRQ	0.863	15.2	2.26	0.004	$4.49^{+2.23}_{-3.85}$	B97a	3.39	46.52	3.76	3.32
J0310.0−6058	PKS 0308−611	FSRQ	1.479	10.9	2.56	0.032		BZCAT	2.58	47.00	8.60	6.92
J0315.8−2611	RBS 0405	HBL	0.443	6.4	1.87	0.339		BZCAT	5.59	45.57	5.25	4.22
J0319.6+1849	RBS 0413	HBL	0.190	10.6	1.55	2.050	$2.08^{+0.1}_{-0.1}$	D01	9.22	45.14	4.68	3.74
J0322.0+2336	J032201+2336	IBL		14.2	2.09	0.072		B97b	4.14	46.40	5.85	4.71
J0323.6−0108	BZB J0323−0108	HBL	0.392	5.2	1.49	0.077		BZCAT	10.20	45.56	4.29	3.45
J0323.6−0108	BZB J0323−0111	HBL	2.075	5.2	1.49	0.067		BZCAT	10.20	47.17	17.63	14.19
J0325.6−1650	RBS 0421	HBL	0.291	6.9	1.97	3.025		BZCAT	4.85	45.12	5.51	4.44
J0326.1+0224	1H 0323+022	HBL	0.147	12.9	2.06	3.210	$2.27^{+0.09}_{-0.09}$	D01	4.30	44.68	3.76	3.04
J0326.1+2226	TXS 0322+222	FSRQ	2.066	11.3	2.41	0.107		BZCAT	2.92	47.40	14.93	12.03
J0334.2−4008	PKS 0332−403	LBL	1.357	43.3	2.19	0.140	$1.60^{+0.12}_{-0.12}$	D01	3.67	47.50	12.94	9.91
J0334.3−3728	J0334−3725	LBL		34.2	1.99	0.010		BZCAT	4.72	46.81	4.40	3.55
J0337.0+3200	NRAO 140	FSRQ	1.259	10.9	2.59	0.096	$1.57^{+0.07}_{-0.07}$	D05	2.52	46.80	10.78	8.23
J0339.4−0144	PKS 0336−01	FSRQ	0.852	13.5	2.48	0.110		B97a	2.75	46.43	6.35	5.11
J0340.6−2113	PKS 0338−214	LBL	0.223	5.5	2.43	0.052		BZCAT	2.87	44.57	2.28	1.84
J0348.6−2750	PKS 0346−27	FSRQ	0.987	6.5	2.32	0.043	$3.10^{+1.68}_{-0.94}$	B97a	3.19	46.30	5.62	4.75
J0357.0−4950	PKS 0355−500	IBL	0.643	3.7	1.74	0.031		BZCAT	6.80	45.77	4.91	3.96
J0403.9−3604	PKS 0402−362	FSRQ	1.417	55.5	2.30	0.298	$1.75^{+0.17}_{-0.15}$	B97a	3.25	47.65	14.41	11.20
J0405.8−1309	PKS 0403−13	FSRQ	0.571	4.6	2.35	0.405	$1.60^{+0.06}_{-0.06}$	B97a	3.09	45.52	6.86	5.25
J0416.8+0105	1ES 0414+009	HBL	0.287	6.9	1.98	4.690	$2.63^{+0.08}_{-0.08}$	D01	4.78	45.11	5.35	4.42
J0422.1−0645	J0422−0643	FSRQ	0.242	6.9	2.39	0.039		BZCAT	2.98	44.77	2.29	1.85
J0423.2−0120	PKS 0420−01	FSRQ	0.916	66.5	2.30	0.280	$1.86^{+0.18}_{-0.18}$	D01	3.25	47.23	8.92	7.00
J0424.7+0034	PKS 0422+00	LBL	0.310	18.6	2.30	0.077		BZCAT	3.25	45.48	2.99	2.41
J0428.6−3756	PKS 0426−380	LBL	1.111	311.0	1.95	0.090	$3.20^{+1.25}_{-1.25}$	D01	4.98	48.19	7.51	6.37
J0430.4−2507	J0430−2507	LBL	0.516	3.9	2.20	0.010		BZCAT	3.63	45.38	3.10	2.50
J0433.5+2905	J043337+2905	IBL	0.970	43.1	2.04	0.077	$3.16^{+2.72}_{-2.02}$	B97b	4.41	47.16	6.43	5.44
J0442.7−0017	PKS 0440−00	FSRQ	0.844	59.2	2.44	0.189		BZCAT	2.85	47.06	6.90	5.56
J0448.5−1633	RBS 0589	HBL		9.3	1.91	0.358		BZCAT	5.27	46.27	7.86	6.33
J0448.6−2118	PKS 0446−212	FSRQ	1.971	4.3	2.33	0.021		BZCAT	3.16	46.92	11.20	9.02
J0449.4−4350	PKS 0447−439	HBL	0.205	114.0	1.86	0.903		BZCAT	5.67	46.06	3.87	3.12
J0453.1−2807	PKS 0451−28	FSRQ	2.560	19.3	2.66	0.036	$2.12^{+0.66}_{-0.72}$	B97a	2.40	47.94	15.70	12.57
J0456.1−4613	PKS 0454−46	FSRQ	0.858	14.0	2.62	0.130	$2.00^{+0.92}_{-1.42}$	B97a	2.46	46.44	6.77	5.37
J0456.5−3132	J0456−3135	FSRQ	0.865	4.8	2.42	0.033		BZCAT	2.90	46.00	5.39	4.34
J0505.4+0419	J050533+0415	HBL	0.027	7.6	2.15	0.735	$2.35^{+0.49}_{-0.49}$	B97b	3.84	42.86	1.54	1.25
J0505.5+0501	PKS 0502+049	FSRQ	0.954	13.0	2.35	0.060		BZCAT	3.09	46.56	6.51	5.24
J0506.5−0901	J0506.6−0857	IBL		5.7	2.24	0.029		BZCAT	3.47	45.96	4.91	3.95
J0507.5−6102	J0507−6104	FSRQ	1.089	13.0	2.36	0.052		BZCAT	3.06	46.71	7.16	5.76
J0508.0+6737	1ES 0502+675	HBL	0.416	24.2	1.49	8.510	$2.34^{+0.06}_{-0.06}$	D01	10.20	46.28	9.03	7.34
J0509.2+1013	PKS 0506+101	FSRQ	0.621	12.8	2.33	0.048		BZCAT	3.16	46.06	4.43	3.57
J0509.4+0542	TXS 0506+056	LBL		49.4	2.06	0.088	$2.89^{+2.2}_{-1.25}$	B97b	4.30	46.95	5.55	4.65
J0509.9+1802	PKS 0507+17	FSRQ	0.416	12.5	2.29	0.042		BZCAT	3.29	45.63	3.29	2.65
J0516.5−4601	PKS 0514−459	FSRQ	0.194	4.3	2.47	0.126		BZCAT	2.77	44.31	2.42	1.95
J0526.1−4829	PKS 0524−485	FSRQ	1.300	14.8	2.20	0.042		BZCAT	3.63	46.99	8.43	6.79
J0530.8+1333	PKS 0528+134	FSRQ	2.070	25.7	2.22	1.480	$1.58^{+0.05}_{-0.05}$	D01	3.54	47.76	32.75	25.03
J0533.0+4823	TXS 0529+483	FSRQ	1.162	28.8	2.31	0.018	$3.65^{+3.29}_{-1.17}$	B97b	3.22	47.14	5.54	4.77
J0536.2−3348	J053629.4−33430	HBL		20.8	2.39	0.538		BZCAT	2.98	46.49	7.53	6.06
J0538.8−4405	PKS 0537−441	LBL	0.892	371.0	2.01	0.597	$2.12^{+0.06}_{-0.06}$	B97a	4.59	48.01	9.67	7.75
J0539.3−2841	PKS 0537−286	FSRQ	3.104	6.1	2.83	0.183	$1.32^{+0.16}_{-0.16}$	B97a	2.16	47.75	40.54	30.07
J0540.4−5415	PKS 0539−543	FSRQ	1.186	7.9	2.57	0.022		BZCAT	2.56	46.59	6.55	5.28
J0543.9−5532	J054357.3−55320	HBL		19.4	1.74	1.005		BZCAT	6.80	46.66	9.69	7.80
J0558.2−3837	EXO 0556.4−3838	HBL	0.302	7.0	2.25	1.420	2.11	NED	3.43	45.05	4.78	3.83
J0601.1−7037	PKS 0601−70	FSRQ	2.409	36.1	2.12	0.012		BZCAT	3.99	48.07	13.31	10.72

Table 1 – *Continued*

Name (1)	Other Name (2)	Class (3)	z (4)	F_γ (5)	α_γ (6)	$F_{\rm 1keV}$ (7)	$\alpha_{\rm X}$ (8)	Ref (9)	$\langle E_\gamma \rangle$ (10)	$\log \nu L_\nu$ (11)	$\delta_\gamma^{\rm 6h}$ (12)	$\delta_\gamma^{\rm 1d}$ (13)
J0607.4+4739	TXS 0603+476	IBL		22.3	2.05	0.043		BZCAT	4.35	46.60	5.45	4.39
J0608.0−0836	PKS 0605−08	FSRQ	0.872	17.8	2.36	0.090		B97a	3.06	46.59	6.40	5.16
J0611.8−6059	PKS 0609−609	FSRQ	1.775	5.2	2.36	0.023		BZCAT	3.06	46.89	10.14	8.17
J0629.3−2001	PKS 0627−199	LBL		24.8	2.19	0.019		BZCAT	3.67	46.61	4.64	3.74
J0630.9−2406	TXS 0628−240	IBL	1.238	33.8	1.79	0.125		BZCAT	6.30	47.39	10.57	8.51
J0635.5−7516	PKS 0637−75	FSRQ	0.651	17.3	2.65	0.490	$1.64^{+0.07}_{-0.07}$	D01	2.41	46.20	7.60	5.84
J0650.7+2505	1ES 0647+250	HBL	0.203	17.8	1.59	6.010	$2.47^{+0.32}_{-0.32}$	D01	8.64	45.40	5.41	4.43
J0701.7−4630	PKS 0700−465	FSRQ	0.822	14.9	2.16	0.040		BZCAT	3.80	46.48	5.59	4.50
J0710.5+5908	1H 0658+595	HBL	0.125	8.1	1.53	1.830	$2.15^{+0.22}_{-0.22}$	D01	9.52	44.65	3.75	3.01
J0721.9+7120	S5 0716+71	IBL	0.300	183.0	2.01	0.990	$2.77^{+0.09}_{-0.09}$	D01	4.59	46.56	4.31	3.59
J0725.6+2159	TXS 0723+220	FSRQ	1.858	5.4	2.59	0.044		BZCAT	2.52	46.98	11.34	9.13
J0729.9+3304	J073026.0+33072	HBL	0.112	5.3	1.89	0.156		BZCAT	5.43	44.13	2.19	1.76
J0738.0+1742	PKS 0735+17	LBL	0.424	51.6	2.05	0.220	$2.34^{+0.51}_{-0.51}$	D01	4.35	46.35	4.46	3.62
J0739.2+0138	PKS 0736+01	FSRQ	0.189	25.4	2.23	0.640	$1.76^{+0.04}_{-0.04}$	D01	3.51	45.15	3.41	2.65
J0745.0+7436	MS 0737.9+7441	HBL	0.315	6.3	1.80	0.880	$2.53^{+0.25}_{-0.25}$	D01	6.20	45.25	4.80	3.94
J0746.6+2549	B2 0743+25	FSRQ	2.979	5.8	2.85	0.540	1.11	NED	2.13	47.68	59.95	43.16
J0747.7+4501	B3 0745+453	FSRQ	0.192	4.8	2.24	0.155		BZCAT	3.47	44.43	2.59	2.09
J0750.6+1230	OI 280	FSRQ	0.889	14.8	2.42	0.208	$2.10^{+0.62}_{-0.92}$	B97a	2.90	46.52	7.54	6.03
J0753.0+5352	4C +54.15	LBL	0.200	11.8	2.01	0.047		BZCAT	4.59	44.97	2.31	1.86
J0754.8+4824	GB1 0751+485	IBL	0.377	11.3	2.19	0.056		BZCAT	3.67	45.51	3.28	2.65
J0757.1+0957	PKS 0754+100	IBL	0.266	20.5	2.19	0.720	$2.11^{+0.65}_{-0.65}$	D01	3.67	45.41	4.02	3.22
J0805.3+7535	J0805.4+7534	HBL	0.121	14.5	1.68	0.407		BZCAT	7.48	44.77	2.79	2.25
J0809.8+5218	1ES 0806+524	HBL	0.137	24.5	1.94	4.910	$2.93^{+0.16}_{-0.16}$	D01	5.05	44.96	3.72	3.12
J0816.4−1311	J0816−1311	HBL		27.5	1.80	0.961		BZCAT	6.20	46.79	9.46	7.62
J0816.5+5739	SBS 0812+578	HBL		9.7	1.98	0.395		B97b	4.78	46.27	7.84	6.31
J0817.9+3238	J0817.9+3243	HBL		5.0	2.19	0.052		BZCAT	3.67	45.92	5.44	4.38
J0818.2+4223	S4 0814+42	LBL	0.530	72.1	2.14	0.050	$1.16^{+0.78}_{-0.78}$	D01	3.89	46.69	4.79	3.48
J0819.6−0803	J0819.2−0756	HBL		3.4	1.58	0.156		BZCAT	8.78	45.98	7.60	6.12
J0824.7+3914	4C +39.23	FSRQ	1.216	4.1	2.64	0.370	$1.78^{+0.58}_{-0.71}$	B97a	2.43	46.33	12.15	9.47
J0824.9+5552	OJ 535	FSRQ	1.418	8.3	2.68	0.071		BZCAT	2.36	46.83	9.18	7.39
J0825.9+0308	PKS 0823+033	IBL	0.506	6.7	1.97	0.175		BZCAT	4.85	45.68	5.05	4.07
J0825.9−2229	PKS 0823−223	IBL	0.910	45.4	2.08	0.147		BZCAT	4.19	47.10	7.60	6.12
J0830.5+2407	S3 0827+24	FSRQ	0.942	11.2	2.67	0.306	$1.98^{+0.28}_{-0.34}$	B97a	2.38	46.46	8.49	6.73
J0831.9+0429	PKS 0829+046	LBL	0.174	50.0	2.05	0.400		D01	4.35	45.44	2.98	2.40
J0834.3+4221	OJ 451	FSRQ	0.249	7.1	2.33	0.145	$2.32^{+0.98}_{-0.76}$	B97b	3.16	44.83	2.87	2.33
J0839.4+1802	TXS 0836+182	LBL	0.280	3.9	2.46	0.034		BZCAT	2.80	44.65	2.42	1.95
J0839.6+0059	PKS 0837+012	FSRQ	1.123	7.9	2.21	0.054		BZCAT	3.58	46.55	7.63	6.14
J0841.6+7052	4C +71.07	FSRQ	2.218	7.2	2.95	1.600	$1.42^{+0.04}_{-0.04}$	D01	2.03	47.41	38.61	29.00
J0847.2+1134	J0847.1+1133	HBL	0.198	5.3	1.48	1.980	$2.50^{+0.09}_{-0.09}$	D01	10.30	44.92	4.72	3.87
J0848.1−0703	TXS 0845−068	BL Lac		3.9	1.96	0.239		BZCAT	4.91	45.88	7.28	5.87
J0854.8+2005	OJ 287	LBL	0.306	35.5	2.23	0.930	$2.50^{+0.17}_{-0.17}$	D01	3.51	45.78	4.22	3.46
J0903.4+4651	S4 0859+47	FSRQ	1.466	4.3	2.27	0.037	$2.82^{+1.78}_{-0.98}$	B97a	3.36	46.58	8.15	6.80
J0909.1+0121	PKS 0906+01	FSRQ	1.026	32.1	2.58	0.054	$2.98^{+0.98}_{-0.85}$	B97a	2.54	47.02	5.72	4.81
J0909.2+2308	J0908.9+2311	IBL	0.223	8.5	1.71	0.040	$2.99^{+0.54}_{-0.57}$	B00	7.13	45.10	2.72	2.28
J0910.6+3329	Ton 1015	IBL	0.354	10.5	1.94	0.142		BZCAT	5.05	45.52	3.88	3.12
J0912.9−2102	MRC 0910−208	HBL	0.198	8.2	1.94	1.379		BZCAT	5.05	44.83	3.97	3.20
J0913.0+1553	BZB J0912+1555	HBL	0.212	4.3	2.25	0.396		BZCAT	3.43	44.48	3.15	2.54
J0915.8+2932	B2 0912+29	HBL		21.1	1.87	1.076	$2.18^{+0.12}_{-0.12}$	B00	5.59	46.64	9.49	7.63
J0917.0+3900	S4 0913+39	FSRQ	1.267	3.9	2.53	0.034		B00	2.64	46.36	7.51	6.05
J0920.9+4441	S4 0917+44	FSRQ	2.189	91.0	2.11	0.470	$1.39^{+0.1}_{-0.1}$	D01	4.03	48.37	31.95	23.90
J0927.9−2041	PKS 0925−203	FSRQ	0.348	6.0	2.53	0.359	$2.90^{+0.32}_{-0.4}$	B97a	2.64	45.05	3.54	2.96
J0929.5+5009	J0929+5013	LBL	0.370	7.2	1.98	0.121	$2.30^{+0.36}_{-0.42}$	B97b	4.78	45.38	3.82	3.10
J0930.4+8611	S5 0916+864	LBL		10.4	2.05	0.016		BZCAT	4.35	46.27	4.65	3.74
J0937.6+5009	J0937+5008	FSRQ	0.276	4.7	2.50	0.092		BZCAT	2.70	44.71	2.77	2.23
J0941.4+6148	J0940.3+6148	HBL	0.211	5.7	2.08	0.142		BZCAT	4.19	44.67	2.78	2.24
J0945.9+5751	J0945+5757	IBL	0.229	5.6	2.16	0.019		BZCAT	3.80	44.71	2.08	1.68
J0946.2+0104	J0946.2+0104	HBL	0.577	3.4	1.57	0.199		BZCAT	8.92	45.71	6.36	5.12

Table 1 – *Continued*

Name (1)	Other Name (2)	Class (3)	z (4)	F_γ (5)	α_γ (6)	$F_{1\mathrm{keV}}$ (7)	α_X (8)	Ref (9)	$\langle E_\gamma \rangle$ (10)	$\log \nu L_\nu$ (11)	$\delta_\gamma^{6\mathrm{h}}$ (12)	$\delta_\gamma^{1\mathrm{d}}$ (13)
J0948.8+0020	J0948+0022	FSRQ	0.585	21.7	2.26	0.071	$2.56^{+2.47}_{-1.18}$	B97b	3.39	46.24	4.36	3.59
J0948.8+4040	4C +40.24	FSRQ	1.249	4.2	2.56	0.069	$1.82^{+0.76}_{-0.86}$	B97a	2.58	46.37	9.18	7.18
J0950.1+4554	US 1015	IBL	0.399	4.5	1.68	0.013		BZCAT	7.48	45.40	3.12	2.51
J0953.1−0839	J0953−0840	BL Lac		23.1	1.78	0.205		BZCAT	6.40	46.72	7.47	6.02
J0956.9+2516	OK 290	FSRQ	0.708	12.6	2.39	0.086	$2.28^{+0.84}_{-0.98}$	B97a	2.98	46.19	5.25	4.25
J0957.6−1350	J0957−1350	FSRQ	1.323	7.2	2.46	0.024		BZCAT	2.80	46.68	7.50	6.04
J0957.7+4735	OK 492	FSRQ	1.882	3.3	2.54	0.051		BZCAT	2.62	46.77	11.83	9.52
J0957.7+5522	4C +55.17	FSRQ	0.899	112.0	1.83	0.190	$1.84^{+0.07}_{-0.08}$	B97a	5.93	47.56	9.01	7.06
J0958.6+6533	S4 0954+65	LBL	0.367	13.6	2.42	0.160	$1.24^{+0.25}_{-0.29}$	U96	2.90	45.49	4.41	3.24
J1001.0+2913	J1001+2911	LBL	0.558	10.5	2.22	0.024	$2.84^{+0.86}_{-1.52}$	B97b	3.54	45.89	3.61	3.01
J1003.0+2219	J100235.8+22160	HBL		4.3	2.24	0.049		BZCAT	3.47	45.84	5.33	4.29
J1007.7+0621	J100800+0621	LBL		10.1	2.29	0.053		BZCAT	3.29	46.20	5.35	4.30
J1009.7−3123	J101015.9−31190	HBL	0.143	8.4	2.24	1.134		BZCAT	3.47	44.39	3.06	2.47
J1012.1+0631	NRAO 350	LBL	0.727	7.0	2.14	0.036		BZCAT	3.89	46.03	4.98	4.01
J1012.5+4227	B3 1009+427	HBL	0.365	3.7	1.87	1.106	$1.84^{+0.09}_{-0.08}$	B00	5.59	45.13	5.95	4.66
J1014.1+2306	4C +23.24	FSRQ	0.566	4.6	2.54	0.079	$2.26^{+0.81}_{-0.84}$	B97a	2.62	45.48	4.27	3.45
J1015.1+4925	1H 1013+498	HBL	0.212	78.0	1.72	2.150	$2.49^{+0.08}_{-0.08}$	D01	7.02	46.00	4.55	3.73
J1017.0+3531	B2 1015+35B	FSRQ	1.228	2.3	2.89	0.066	$1.78^{+0.92}_{-1.08}$	B97a	2.09	46.11	8.81	6.87
J1019.0+5915	TXS 1015+594	LBL	2.025	3.4	2.18	0.011		BZCAT	3.71	46.85	10.74	8.65
J1023.1−0115	J1022.7−0112	HBL		6.9	1.88	0.599		BZCAT	5.51	46.16	8.59	6.92
J1023.6+2959	J1023.6+3001	HBL	0.433	3.2	1.28	0.113	$2.40^{+0.3}_{-0.3}$	B00	14.20	45.56	5.19	4.24
J1023.6+3947	4C +40.25	FSRQ	1.254	5.7	2.44	0.025	$1.82^{+0.5}_{-0.5}$	B97a	2.85	46.51	7.81	6.11
J1023.8−4335	J1023.9−4336	HBL		14.9	1.82	1.490		BZCAT	6.02	46.51	10.07	8.11
J1026.7−1749	J102658.5−17490	HBL	0.114	7.5	1.93	0.238		BZCAT	5.12	44.28	2.33	1.88
J1031.0+5053	1ES 1028+511	HBL	0.360	11.5	1.81	2.550	$2.44^{+0.05}_{-0.05}$	D01	6.11	45.64	6.10	4.99
J1037.6+5712	J1037+5711	IBL	0.830	28.8	1.91	0.213	$2.50^{+0.17}_{-0.21}$	B97b	5.27	46.86	7.38	6.05
J1040.7+0614	4C +06.41	FSRQ	1.264	10.9	2.52	0.175	$2.02^{+0.71}_{-0.93}$	B97a	2.66	46.80	10.24	8.14
J1042.6+8053	S5 1039+81	FSRQ	1.260	4.6	2.54	0.183	$2.09^{+0.13}_{-0.13}$	B97a	2.62	46.42	10.02	8.01
J1043.1+2404	B2 1040+24A	IBL	0.559	9.7	2.07	0.157	$2.05^{+0.41}_{-0.38}$	B00	4.24	45.91	5.34	4.25
J1051.3+3938	PB 00667	HBL	0.498	3.1	1.56	0.357		BZCAT	9.07	45.52	6.28	5.06
J1053.6+4928	J1053+4930	IBL	0.140	9.2	1.75	0.090	2.62	D01	6.70	44.67	2.38	1.96
J1057.0−8004	PKS 1057−79	LBL	0.581	27.5	2.05	0.048		BZCAT	4.35	46.41	4.47	3.60
J1058.6+5628	TXS 1055+567	LBL	0.143	47.9	1.93	2.190	$2.76^{+0.08}_{-0.08}$	D01	5.12	45.30	3.47	2.89
J1059.4+8113	S5 1053+81	FSRQ	0.706	8.3	2.58	0.029		BZCAT	2.54	45.98	4.35	3.50
J1100.9+4014	J1100.3+4019	HBL	0.225	5.7	1.60	0.644	$2.48^{+0.1}_{-0.11}$	B00	8.50	45.00	4.11	3.37
J1103.4−2330	1ES 1101−232	HBL	0.186	4.9	1.80	10.230	$2.03^{+0.05}_{-0.05}$	D01	6.20	44.63	5.66	4.51
J1104.4+3812	Mkn 421	HBL	0.031	297.0	1.77	58.370	$2.82^{+0.03}_{-0.03}$	D01	6.49	44.80	3.32	2.77
J1107.2−4448	PKS 1104−445	FSRQ	1.598	9.3	2.67	0.071	$3.26^{+1.32}_{-3.25}$	B97a	2.38	47.03	8.17	6.94
J1107.8+1505	J1107.8+1505	HBL	0.602	5.9	1.86	0.559	$2.20^{+0.14}_{-0.16}$	B97b	5.67	45.85	7.09	5.71
J1110.2+7134	J1110.2+7134	HBL		3.1	2.10	0.175	$2.16^{+0.3}_{-0.28}$	B97b	4.09	45.74	6.76	5.43
J1117.2+2013	RBS 0958	HBL	0.138	18.6	1.70	7.339	$1.90^{+0.04}_{-0.06}$	B97b	7.24	44.99	4.83	3.80
J1118.0+5354	J1117+5355	HBL		8.2	1.91	0.050		BZCAT	5.27	46.22	5.78	4.66
J1118.1−4629	PKS 1116−46	FSRQ	0.713	6.1	2.62	0.007	$4.60^{+1.04}_{-1.28}$	B97a	2.46	45.86	3.11	2.75
J1121.0+4211	RBS 0970	HBL	0.124	11.7	1.61	1.830	$2.62^{+0.07}_{-0.07}$	D01	8.36	44.75	3.60	2.97
J1121.5−0554	PKS 1118−05	FSRQ	1.297	38.9	2.30	0.039		BZCAT	3.25	47.39	8.14	6.55
J1125.2+4933	J1124+4933	BL Lac		2.8	1.88	0.108	$2.71^{+0.27}_{-0.31}$	B97b	5.51	45.76	6.17	5.12
J1126.0−0743	J112551.6−07421	HBL	0.279	3.5	1.67	0.277		BZCAT	7.60	44.95	4.03	3.24
J1126.6−1856	PKS 1124−186	FSRQ	1.048	34.0	2.36	0.594		BZCAT	3.06	47.08	10.10	8.14
J1130.3−1448	PKS 1127−14	FSRQ	1.184	18.0	2.70	0.396	$1.34^{+0.5}_{-0.62}$	B97a	2.33	46.95	15.14	11.26
J1130.9+5809	J1131+5809	IBL	0.360	4.1	2.19	0.020		BZCAT	3.67	45.02	2.72	2.19
J1132.9+0033	PKS B1130+008	LBL	1.223	18.3	2.18	0.022		BZCAT	3.71	47.01	7.23	5.82
J1136.3+6736	J1136.5+6737	HBL	0.134	6.1	1.68	3.230	$2.39^{+0.24}_{-0.24}$	D01	7.48	44.49	3.99	3.25
J1136.7+7009	Mkn 180	HBL	0.046	11.5	1.74	2.620	$2.51^{+0.1}_{-0.1}$	D01	6.80	43.75	2.51	2.06
J1137.0+2553	J1136.8+2551	HBL	0.156	2.6	1.44	0.089		B00	11.00	44.41	2.66	2.14
J1143.1+6119	114026.7+613850	IBL	0.475	7.5	2.07	0.018		BZCAT	4.24	45.62	3.30	2.66
J1146.8−3812	PKS 1144−379	FSRQ	1.048	15.9	2.31	0.410	$2.54^{+0.19}_{-0.19}$	D01	3.22	46.76	8.78	7.22
J1147.7−0724	PKS 1145−071	FSRQ	1.342	16.6	2.30	0.042	$2.20^{+0.48}_{-0.48}$	B97a	3.25	47.06	8.52	6.86

Table 1 – *Continued*

Name (1)	Other Name (2)	Class (3)	z (4)	F_γ (5)	α_γ (6)	$F_{1\mathrm{keV}}$ (7)	α_X (8)	Ref (9)	$\langle E_\gamma \rangle$ (10)	$\log \nu L_\nu$ (11)	$\delta_\gamma^{6\mathrm{h}}$ (12)	$\delta_\gamma^{1\mathrm{d}}$ (13)
J1150.1+2419	B2 1147+24	LBL	0.200	13.0	2.19	0.045	$1.86^{+0.22}_{-0.24}$	U96	3.67	44.93	2.19	1.72
J1150.5+4154	RBS 1040	HBL		22.3	1.76	0.094	$3.35^{+0.27}_{-0.38}$	B00	6.60	46.71	6.01	5.13
J1151.5+5857	TXS 1148+592	IBL		7.7	1.79	0.268	$1.62^{+0.22}_{-0.24}$	B97b	6.30	46.24	8.80	6.75
J1153.2+4935	OM 484	FSRQ	0.334	7.7	2.52	0.536	$1.99^{+0.03}_{-0.04}$	B97a	2.66	45.12	4.27	3.38
J1153.2+4935	BZQ J1152+4939	FSRQ	1.093	7.7	2.52	0.031		BZCAT	2.66	46.48	6.45	5.19
J1154.0−0010	J115404.9−00100	HBL	0.254	8.2	1.86	0.276		BZCAT	5.67	45.12	3.61	2.91
J1159.5+2914	Ton 599	FSRQ	0.725	60.4	2.29	0.185	$1.86^{+0.32}_{-0.3}$	B97a	3.29	46.92	6.76	5.30
J1203.2+6030	SBS 1200+608	IBL	0.065	7.8	1.99	0.161	$2.12^{+0.44}_{-0.44}$	B97b	4.72	43.75	1.70	1.36
J1204.2+1144	J120413.0+11454	HBL	0.296	7.5	2.06	0.131		BZCAT	4.30	45.14	3.33	2.68
J1204.3−0711	J120417.0−07095	IBL	0.184	7.6	2.13	0.111		BZCAT	3.94	44.64	2.47	1.99
J1206.0−2638	PKS 1203−26	FSRQ	0.786	7.7	2.67	0.101	$2.64^{+0.84}_{-1.93}$	B97a	2.38	46.07	5.22	4.32
J1209.6+4121	B3 1206+416	IBL	0.377	4.3	1.58	0.102	$2.39^{+0.29}_{-0.32}$	B00	8.78	45.38	4.24	3.46
J1213.2−2616	RBS 1080	HBL	0.278	5.5	2.41	0.423		BZCAT	2.92	44.81	3.59	2.89
J1214.6+1309	4C +13.46	FSRQ	1.139	4.8	2.57	0.022	$2.07^{+0.15}_{-0.16}$	B97a	2.56	46.32	6.48	5.17
J1214.8+1653	TXS 1212+171	FSRQ	1.132	5.4	2.18	0.113	$1.16^{+1.05}_{-0.52}$	B97b	3.71	46.40	12.43	9.02
J1217.8+3006	1ES 1215+303	HBL	0.130	54.9	2.02	3.466	$2.47^{+0.05}_{-0.05}$	B00	4.53	45.22	3.55	2.91
J1219.7+0201	PKS 1217+02	FSRQ	0.241	3.9	2.66	0.310		BZCAT	2.40	44.45	3.04	2.45
J1219.8−0310	J121946.0−03141	HBL	0.299	6.2	1.86	0.191		BZCAT	5.67	45.16	3.75	3.02
J1221.3+3010	PG 1218+304	HBL	0.184	28.1	1.71	10.050	$2.22^{+0.03}_{-0.03}$	D01	7.13	45.43	5.55	4.47
J1221.4+2814	W Comae	LBL	0.103	55.4	2.02	0.400	$2.24^{+0.16}_{-0.16}$	D01	4.53	45.00	2.36	1.91
J1222.4+0413	4C +04.42	FSRQ	0.966	13.1	2.77	0.347	$1.87^{+0.04}_{-0.04}$	B97a	2.23	46.56	9.15	7.19
J1223.9+8043	S5 1221+80	LBL		11.2	2.26	0.021		BZCAT	3.39	46.25	4.65	3.75
J1224.4+2436	MS 1221.8+2452	HBL	0.218	6.3	2.03	0.281	$2.22^{+0.18}_{-0.18}$	B00	4.47	44.77	3.18	2.57
J1224.9+2122	4C +21.35	FSRQ	0.434	354.0	2.12	0.404	$2.19^{+0.2}_{-0.2}$	B97a	3.99	47.18	5.00	4.02
J1228.6+4857	TXS 1226+492	FSRQ	1.722	7.5	2.39	0.020		BZCAT	2.98	47.01	9.55	7.69
J1229.1+0202	3C 273	FSRQ	0.158	151.0	2.45	10.921	$2.11^{+0.01}_{-0.01}$	B97a	2.82	45.66	4.51	3.61
J1230.2+2517	ON 246	IBL	0.135	8.8	2.27	0.399	$2.15^{+0.15}_{-0.14}$	B00	3.36	44.34	2.53	2.03
J1231.6+1417	J1231+1421	HBL	0.256	6.2	2.15	0.209		BZCAT	3.84	44.87	3.23	2.60
J1231.7+2848	B2 1229+29	IBL	0.236	35.4	1.87	0.212	$2.30^{+0.2}_{-0.22}$	B97b	5.59	45.68	3.31	2.68
J1239.5+0443	J123931+0443	FSRQ	1.761	44.7	2.32	0.031		BZCAT	3.19	47.81	10.60	8.54
J1241.6−1457	J1241.8−1455	HBL		4.7	1.98	0.931		BZCAT	4.78	45.95	8.96	7.22
J1243.1+3627	Ton 116	HBL	1.065	18.8	1.70	1.367	$2.52^{+0.07}_{-0.08}$	B00	7.24	47.01	12.65	10.39
J1245.1+5708	J124510.5+57102	IBL	1.545	4.8	2.11	0.037		BZCAT	4.03	46.71	9.96	8.02
J1246.7−2546	PKS 1244−255	FSRQ	0.633	87.4	2.10	0.268	$2.46^{+0.64}_{-0.82}$	B97a	4.09	46.98	5.89	4.82
J1248.2+5820	PG 1246+586	IBL	0.847	41.2	1.95	0.500	2.42	D01	4.98	47.02	8.51	6.95
J1249.9+3705	J1249.8+3708	HBL		6.8	1.58	0.029		BZCAT	8.78	46.28	5.84	4.70
J1253.1+5302	S4 1250+53	LBL		37.3	1.97	0.030		BZCAT	4.85	46.85	5.26	4.23
J1254.1+6237	J1253+6242	HBL		3.3	2.02	0.036		BZCAT	4.53	45.78	5.33	4.29
J1256.1−0547	3C 279	FSRQ	0.536	256.0	2.22	0.961	$1.84^{+0.01}_{-0.01}$	B97a	3.54	47.23	7.18	5.62
J1257.0+3650	125716.0+364713	IBL	0.531	8.1	2.01	0.017	$3.41^{+0.39}_{-0.65}$	B00	4.59	45.79	3.50	2.99
J1258.2+3231	ON 393	FSRQ	0.806	4.5	2.55	0.065	$1.36^{+0.94}_{-0.64}$	B97b	2.60	45.88	6.92	5.16
J1308.5+3547	5C 12.291	FSRQ	1.055	11.0	2.28	0.033	$2.12^{+0.93}_{-1.35}$	B97b	3.32	46.61	6.68	5.35
J1309.3+1154	4C +12.46	LBL		4.6	1.91	0.053		BZCAT	5.27	45.97	5.84	4.70
J1309.4+4304	B3 1307+433	IBL	0.691	17.8	1.84	0.044		BZCAT	5.84	46.48	5.34	4.30
J1310.9+0036	J1311.1+0035	HBL		3.6	1.52	0.105		BZCAT	9.68	46.03	7.27	5.85
J1313.0−0425	PKS B1310−041	FSRQ	0.825	4.3	2.37	0.036		BZCAT	3.03	45.91	5.27	4.25
J1314.6+2348	TXS 1312+240	IBL		14.5	2.08	0.087	$2.86^{+0.17}_{-0.2}$	B00	4.19	46.41	5.53	4.62
J1317.9+3426	S4 1315+34	FSRQ	1.055	3.3	2.38	0.051		B97a	3.01	46.08	6.91	5.56
J1326.8+2210	B2 1324+22	FSRQ	1.403	18.7	2.47	0.036		BZCAT	2.77	47.16	8.40	6.77
J1332.0−0508	PKS 1329−049	FSRQ	2.150	50.1	2.54	0.032		BZCAT	2.62	48.12	12.66	10.20
J1332.7+4725	B3 1330+476	FSRQ	0.668	3.1	2.54	0.057	$1.74^{+0.96}_{-0.82}$	B97b	2.62	45.50	5.09	3.95
J1337.7−1257	PKS 1335−127	FSRQ	0.539	17.7	2.44	0.418	$1.83^{+0.17}_{-0.17}$	B97a	2.85	46.02	6.05	4.73
J1340.5+4407	J1340.4+4410	HBL	0.546	3.8	1.80	0.256		BZCAT	6.20	45.59	5.93	4.78
J1341.3−2048	PKS B1339−206	FSRQ	1.582	5.1	2.63	0.052		BZCAT	2.45	46.75	9.82	7.90
J1345.4+4453	B3 1343+451	FSRQ	2.534	21.1	2.47	0.022		BZCAT	2.77	47.93	14.43	11.62
J1347.7−3752	J1347−3750	FSRQ	1.300	9.0	2.32	0.053		BZCAT	3.19	46.76	8.54	6.88
J1350.8+3035	B2 1348+30B	FSRQ	0.712	6.4	2.45	0.135	$2.06^{+0.38}_{-0.44}$	B97b	2.82	45.90	5.86	4.67

Table 1 – *Continued*

Name (1)	Other Name (2)	Class (3)	z (4)	F_γ (5)	α_γ (6)	$F_{\rm 1keV}$ (7)	$\alpha_{\rm X}$ (8)	Ref (9)	$\langle E_\gamma \rangle$ (10)	$\log \nu L_\nu$ (11)	$\delta_\gamma^{\rm 6h}$ (12)	$\delta_\gamma^{\rm 1d}$ (13)
J1351.4+1115	J1351.3+1115	HBL		4.2	1.46	0.231		B97b	10.70	46.12	8.39	6.75
J1352.6−4413	PKS 1349−439	IBL		6.4	2.13	0.267		BZCAT	3.94	46.04	7.11	5.73
J1354.7−1047	PKS 1352−104	FSRQ	0.332	12.6	2.57	0.400	$2.06^{+0.3}_{-0.34}$	B97a	2.56	45.32	3.96	3.16
J1358.0+0137	J1357.6+0128	IBL		5.0	2.28	0.173		BZCAT	3.32	45.89	6.44	5.18
J1405.1+0405	PKS 1402+044	FSRQ	3.215	5.1	1.90	0.031	$1.73^{+0.61}_{-0.61}$	B97a	5.35	47.53	25.86	20.06
J1405.1+0405	MS 1402.3+0416	HBL	0.344	5.1	1.90	0.256		BZCAT	5.35	45.20	4.22	3.40
J1410.3+2811	J1410+2820	HBL		3.3	1.52	0.114	$2.68^{+0.23}_{-0.27}$	B00	9.68	45.99	7.09	5.87
J1418.1+2539	J1417+2543	HBL	0.237	4.5	1.98	4.280	$2.37^{+0.05}_{-0.05}$	D01	4.78	44.73	5.00	4.07
J1419.4+3820	B3 1417+385	FSRQ	1.831	4.5	2.65	0.056	$1.36^{+0.49}_{-0.4}$	B00	2.41	46.89	16.14	12.03
J1420.2+5422	OQ 530	LBL	0.153	7.7	2.37	0.014	$1.92^{+0.29}_{-0.29}$	D05	3.03	44.36	1.51	1.19
J1425.1+3615	J1424+3615	IBL		9.2	2.14	0.023		BZCAT	3.89	46.19	4.85	3.90
J1426.1+3406	J1426+3404	IBL	1.553	4.9	1.83	0.102	$2.50^{+0.03}_{-0.03}$	NED	5.93	46.77	11.88	9.75
J1427.0+2347	PKS 1424+240	IBL		115.0	1.78	1.470	$2.78^{+0.04}_{-0.04}$	D01	6.40	47.42	8.96	7.46
J1428.0−4206	PKS B1424−418	FSRQ	1.522	147.0	1.96	0.209	$1.40^{+0.2}_{-0.2}$	G07	4.91	48.20	17.87	13.39
J1428.6+4240	H 1426+428	HBL	0.129	7.5	1.32	4.640	$1.92^{+0.04}_{-0.04}$	D01	13.40	44.78	4.75	3.75
J1437.1+5640	J1436+5639	HBL	0.150	4.7	1.53	0.300	2.22	D01	9.52	44.58	3.08	2.48
J1438.7+3712	J1439+3711	FSRQ	1.026	19.2	2.28	0.006		BZCAT	3.32	46.82	4.85	3.91
J1438.7+3712	B2 1436+37B	FSRQ	2.399	19.2	2.28	0.014		BZCAT	3.32	47.80	13.14	10.58
J1439.2+3932	PG 1437+398	HBL	0.349	4.1	1.69	1.583	$2.33^{+0.06}_{-0.07}$	B00	7.36	45.23	5.90	4.79
J1440.3+4948	J1439+4958	LBL		3.4	2.45	0.018		BZCAT	2.82	45.69	4.37	3.52
J1440.9+0611	J1440+0610	IBL		10.8	2.16	0.129	$1.52^{+1.08}_{-0.84}$	B97b	3.80	46.26	7.42	5.64
J1442.7+1159	1ES 1440+122	HBL	0.163	4.6	1.41	1.220	2.20	D01	11.60	44.72	4.14	3.33
J1443.9−3908	PKS 1440−389	HBL	0.065	32.5	1.77	0.730		BZCAT	6.49	44.50	2.30	1.85
J1444.1+2500	PKS 1441+25	FSRQ	0.939	9.2	2.03	0.112		BZCAT	4.47	46.46	7.59	6.11
J1448.0+3608	RBS 1432	HBL		12.0	1.89	0.456	$2.66^{+0.12}_{-0.13}$	B00	5.43	46.39	7.53	6.23
J1454.4+5123	TXS 1452+516	IBL	1.083	20.1	2.04	0.042		BZCAT	4.41	46.95	7.38	5.94
J1457.4−3540	PKS 1454−354	FSRQ	1.424	119.0	2.11	0.057		BZCAT	4.03	48.01	9.83	7.92
J1501.0+2238	MS 1458.8+2249	HBL	0.235	18.9	1.77	0.457	$2.74^{+0.16}_{-0.16}$	B00	6.49	45.46	3.73	3.10
J1503.7−1541	RBS 1457	HBL		9.5	1.80	0.955		BZCAT	6.20	46.33	9.45	7.61
J1504.3+1029	PKS 1502+106	FSRQ	1.839	401.0	2.15	0.042	$1.84^{+0.1}_{-0.1}$	B97a	3.84	48.82	13.27	10.39
J1506.6+0806	J1506+0814	HBL	0.376	6.0	1.96	0.169		BZCAT	4.91	45.33	4.12	3.32
J1508.5+2709	RBS 1467	HBL	0.270	4.1	1.97	1.011	$1.46^{+0.18}_{-0.18}$	B97b	4.85	44.82	5.11	3.86
J1508.9−4342	J1509−4340	FSRQ	0.776	5.3	2.65	0.024		BZCAT	2.41	45.90	4.53	3.65
J1509.7+5556	SBS 1508+561	IBL	2.025	3.9	1.76	0.047	$2.99^{+0.67}_{-1.21}$	B97b	6.60	46.96	13.17	11.07
J1512.8−0906	PKS 1510−08	FSRQ	0.360	406.0	2.29	0.723	$1.98^{+0.1}_{-0.12}$	B97a	3.29	46.98	4.89	3.87
J1514.6+4449	BZQ J1514+4450	FSRQ	0.570	7.6	2.29	0.018		BZCAT	3.29	45.75	3.59	2.89
J1517.7−2421	AP Librae	LBL	0.048	51.6	2.05	0.620	$2.36^{+1.95}_{-1.95}$	D01	4.35	44.26	1.87	1.52
J1518.0+6526	1H 1515+660	HBL	0.702	6.9	1.66	7.420	$2.29^{+0.1}_{-0.1}$	D01	7.72	46.17	12.35	10.00
J1522.0+4348	B3 1520+437	FSRQ	2.171	2.5	2.99	0.021		BZCAT	1.99	46.93	11.37	9.16
J1522.7−2731	PKS 1519−273	LBL	1.294	35.5	2.22	0.390	$2.03^{+0.43}_{-0.43}$	D01	3.54	47.36	12.51	9.96
J1535.4+3720	RGB J1534+372	IBL	0.143	4.5	2.15	0.027	$2.84^{+1}_{-1.96}$	B97b	3.84	44.16	1.81	1.51
J1538.1+8159	1ES 1544+820	HBL		4.1	1.48	0.097	$2.64^{+0.21}_{-0.1}$	D05	10.30	46.10	7.05	5.83
J1540.4+1438	4C +14.60	LBL	0.605	5.2	2.28	0.090	$1.66^{+0.26}_{-0.3}$	U96	3.32	45.66	5.36	4.13
J1542.9+6129	J1542+6129	IBL		63.7	1.97	0.120	$2.50^{+0.3}_{-0.32}$	B97b	4.85	47.09	6.24	5.12
J1546.1+0820	J154604.6+08191	HBL		3.4	1.57	0.110		BZCAT	8.92	45.98	7.22	5.81
J1548.8−2251	J1548−2251	HBL	0.192	12.2	1.93	0.691		BZCAT	5.12	44.98	3.52	2.83
J1549.5+0237	PKS 1546+027	FSRQ	0.414	18.2	2.46	0.840		D01	2.80	45.74	5.07	4.09
J1555.7+1111	PG 1553+113	HBL	0.360	140.0	1.67	13.420	$2.85^{+0.04}_{-0.04}$	D01	7.60	46.80	7.49	6.25
J1559.0+5627	TXS 1557+565	LBL	0.300	12.8	2.10	0.014		BZCAT	4.09	45.36	2.36	1.90
J1604.6+5710	J1604+5714	FSRQ	0.720	16.5	2.50	0.112	$1.90^{+0.72}_{-0.68}$	B97b	2.70	46.31	5.91	4.66
J1607.0+1552	4C +15.54	LBL	0.497	21.8	2.23	0.020		BZCAT	3.51	46.08	3.34	2.69
J1608.5+1029	4C +10.45	FSRQ	1.232	15.9	2.33	0.067		B97a	3.16	46.94	8.39	6.75
J1610.6−4002	J1610−3958	FSRQ	0.518	13.8	2.61	0.027		BZCAT	2.48	45.84	3.38	2.72
J1610.8−6650	J1610−6649	IBL		25.7	1.70	0.165		BZCAT	7.24	46.80	7.39	5.95
J1613.4+3409	OS 319	FSRQ	1.400	4.9	2.31	0.240	$1.76^{+0.06}_{-0.06}$	D01	3.22	46.58	13.61	10.59
J1618.2−7718	PKS 1610−77	FSRQ	1.710	21.0	2.50	0.061		BZCAT	2.70	47.45	11.08	8.92
J1630.4+5218	TXS 1629+524	IBL		9.5	2.03	0.037		BZCAT	4.47	46.24	5.34	4.30

Table 1 – *Continued*

Name (1)	Other Name (2)	Class (3)	z (4)	F_γ (5)	α_γ (6)	$F_{1\mathrm{keV}}$ (7)	α_X (8)	Ref (9)	$\langle E_\gamma \rangle$ (10)	$\log \nu L_\nu$ (11)	$\delta_\gamma^{6\mathrm{h}}$ (12)	$\delta_\gamma^{1\mathrm{d}}$ (13)
J1635.2+3810	4C +38.41	FSRQ	1.813	116.0	2.25	0.290	$1.62^{+0.05}_{-0.05}$	B97a	3.43	48.26	20.04	15.38
J1637.7+4714	4C +47.44	FSRQ	0.735	18.2	2.41	0.026		B97a	2.92	46.39	4.52	3.64
J1640.7+3945	NRAO 512	FSRQ	1.660	38.3	2.36	0.041	$1.84^{+0.13}_{-0.13}$	B97a	3.06	47.67	11.42	8.95
J1641.6−0614	TXS 1639−062	LBL	1.514	11.2	2.37	0.032		BZCAT	3.03	47.03	9.07	7.30
J1642.9+3949	3C 345	FSRQ	0.593	33.9	2.49	0.568	$1.81^{+0.02}_{-0.02}$	B97a	2.73	46.41	6.90	5.39
J1653.9+3945	Mkn 501	IBL	0.034	87.7	1.74	5.955	$2.36^{+0.03}_{-0.04}$	B00	6.80	44.36	2.54	2.06
J1656.5+6012	165604.4+601702	FSRQ	0.623	3.6	2.36	0.054	$2.26^{+0.6}_{-0.7}$	B97b	3.06	45.51	4.46	3.61
J1700.2+6831	TXS 1700+685	FSRQ	0.301	38.0	2.40	0.017		BZCAT	2.95	45.73	2.27	1.83
J1709.7+4319	B3 1708+433	FSRQ	1.027	22.2	2.31	0.011		BZCAT	3.22	46.88	5.38	4.33
J1714.8+6836	S4 1716+68	FSRQ	0.777	12.4	1.95	0.408	$1.76^{+0.13}_{-0.14}$	B97a	4.98	46.41	9.03	7.02
J1719.3+1744	PKS 1717+177	LBL	0.137	22.3	1.84	0.480	$2.54^{+2.1}_{-2.1}$	D01	5.84	44.97	2.88	2.37
J1722.7+1013	TXS 1720+102	FSRQ	0.732	22.9	2.23	0.058		BZCAT	3.51	46.52	5.30	4.27
J1725.0+1151	1H 1720+117	HBL	0.018	37.0	1.93	3.600	$2.65^{+0.25}_{-0.25}$	D01	5.12	43.31	1.85	1.53
J1727.1+4531	S4 1726+45	FSRQ	0.717	15.5	2.58	0.030		BZCAT	2.54	46.27	4.43	3.57
J1728.2+0429	PKS 1725+044	FSRQ	0.293	12.7	2.53	0.095	$2.40^{+0.23}_{-0.27}$	B97a	2.64	45.19	2.82	2.30
J1728.2+5015	I Zw 187	HBL	0.055	8.1	1.83	3.630	$2.39^{+0.08}_{-0.08}$	D01	5.93	43.70	2.72	2.22
J1733.1−1307	PKS 1730−13	FSRQ	0.902	31.3	2.24	0.969	$1.50^{+0.71}_{-0.89}$	B97a	3.47	46.89	13.00	9.85
J1734.3+3858	B2 1732+38A	FSRQ	0.975	35.5	2.24	0.050	$1.42^{+0.19}_{-0.21}$	B97a	3.47	47.04	7.95	5.97
J1736.6+0626	PKS 1734+063	FSRQ	1.207	7.3	2.66	0.047		BZCAT	2.40	46.58	7.39	5.95
J1739.5+4955	S4 1738+49	FSRQ	1.545	12.1	2.20	0.073	$2.26^{+0.84}_{-1.09}$	B97a	3.63	47.10	10.71	8.66
J1740.2+5212	4C +51.37	FSRQ	1.379	25.3	2.50	0.135	$2.08^{+0.47}_{-0.6}$	B97a	2.70	47.27	10.51	8.39
J1740.3+4738	S4 1738+47	FSRQ	0.954	5.7	2.09	0.016		BZCAT	4.14	46.25	5.57	4.48
J1742.1+5948	RGB 1742+597	IBL	0.400	5.3	2.23	0.030	2.96	D01	3.51	45.23	2.98	2.50
J1744.1+1934	S3 1741+19	IBL	0.083	6.3	1.62	1.610	$2.10^{+0.08}_{-0.08}$	D01	8.23	44.10	3.00	2.40
J1745.5−0751	TXS 1742−078	LBL		10.3	1.80	0.031		BZCAT	6.20	46.36	5.53	4.46
J1748.8+7006	S4 1749+70	IBL	0.770	21.4	2.04	0.150	$2.44^{+0.71}_{-0.71}$	D01	4.41	46.60	6.42	5.25
J1749.1+4323	B3 1747+433	LBL		13.0	2.22	0.050	$2.32^{+0.23}_{-0.23}$	D01	3.54	46.32	5.27	4.28
J1756.5+5523	J175615.5+55221	HBL		5.5	1.79	0.948	$2.64^{+0.17}_{-0.21}$	B97b	6.30	46.09	8.64	7.14
J1800.5+7829	S5 1803+784	LBL	0.680	44.5	2.23	0.240	$1.45^{+0.13}_{-0.13}$	D01	3.51	46.73	7.69	5.80
J1801.7+4405	S4 1800+44	FSRQ	0.663	4.4	2.66	0.171	$1.16^{+0.54}_{-1.08}$	B97a	2.40	45.63	7.71	5.60
J1806.7+6948	3C 371	LBL	0.051	38.3	2.19	0.520	$1.75^{+0.06}_{-0.06}$	D01	3.67	44.11	1.76	1.36
J1813.5+3143	B2 1811+31	IBL	0.117	17.9	2.11	0.066		BZCAT	4.03	44.58	1.84	1.48
J1824.0+5650	4C +56.27	LBL	0.664	26.3	2.43	0.270	$1.96^{+0.35}_{-0.35}$	D01	2.87	46.43	6.39	5.05
J1829.2+5402	J182925.7+54025	HBL		6.9	1.88	0.064	$3.31^{+0.31}_{-0.35}$	B97b	5.51	46.16	5.49	4.67
J1833.6−2104	PKS 1830−211	FSRQ	2.507	119.0	2.46	1.320	1.13	NED	2.80	48.67	58.26	42.07
J1838.7+4759	J1838+4802	HBL	0.300	12.0	1.72	0.100	3.10	D01	7.02	45.53	3.51	2.96
J1848.5+3216	B2 1846+32A	FSRQ	0.798	15.4	2.38	0.438	$1.34^{+0.93}_{-0.85}$	B97b	3.01	46.42	10.51	7.82
J1849.4+6706	S4 1849+67	FSRQ	0.657	73.6	2.09	0.069	$2.84^{+0.43}_{-0.52}$	B97a	4.14	46.95	4.80	4.01
J1903.3+5539	TXS 1902+556	IBL		34.7	1.94	0.045	$3.44^{+0.96}_{-0.94}$	B97b	5.05	46.83	5.11	4.37
J1911.1−2005	PKS B1908−201	FSRQ	1.119	56.7	2.21	0.197		BZCAT	3.58	47.40	9.30	7.49
J1917.6−1921	1H 1914−194	IBL	0.137	32.3	1.91	0.318		BZCAT	5.27	45.10	2.66	2.14
J1923.5−2105	TXS 1920−211	FSRQ	0.874	83.3	2.10	0.086		BZCAT	4.09	47.31	6.72	5.41
J1924.8−2912	PKS B1921−293	FSRQ	0.352	30.3	2.43	1.060	$1.89^{+0.05}_{-0.05}$	D01	2.87	45.79	5.15	4.05
J1927.5+6117	S4 1926+61	LBL		8.5	2.08	0.030		BZCAT	4.19	46.18	5.11	4.12
J1931.1+0938	J1931.1+0937	HBL		30.8	2.36	0.819		BZCAT	3.06	46.67	8.08	6.51
J1936.8−4721	J1936−4719	HBL	0.265	7.0	1.64	0.285		BZCAT	7.97	45.22	3.96	3.19
J2000.0+6509	1ES 1959+650	HBL	0.047	58.8	1.94	9.200	$2.68^{+0.05}_{-0.05}$	D01	5.05	44.36	2.81	2.33
J2000.8−1751	PKS 1958−179	FSRQ	0.652	24.7	2.38	0.390	$2.12^{+0.36}_{-0.46}$	B97a	3.01	46.39	6.46	5.17
J2001.1+4352	J2001+435	IBL		118.0	1.90	0.111		BZCAT	5.35	47.38	6.57	5.29
J2004.5+7754	S5 2007+77	LBL	0.342	10.8	2.22	0.170	$1.66^{+0.37}_{-0.4}$	U96	3.54	45.38	3.94	3.03
J2007.9−4430	PKS 2004−447	FSRQ	0.240	6.6	2.47	0.030		BZCAT	2.77	44.72	2.16	1.74
J2009.5−4850	PKS 2005−489	HBL	0.071	38.3	1.78	25.380	$2.32^{+0.04}_{-0.04}$	D01	6.40	44.64	4.08	3.31
J2012.1+4630	7C 2010+4619	IBL		25.6	1.97	0.427		BZCAT	4.85	46.69	7.96	6.41
J2035.4+1058	PKS 2032+107	FSRQ	0.601	15.4	2.55	1.220	$2.43^{+1.4}_{-1.4}$	D01	2.60	46.07	6.47	5.29
J2039.6+5218	1ES 2037+521	HBL	0.053	4.0	1.50	0.232	$2.80^{+0.79}_{-0.98}$	B97b	10.00	43.58	2.10	1.75
J2055.4−0023	J205528.2−00212	HBL		3.9	1.35	0.551		BZCAT	12.70	46.14	9.92	7.99

Table 1 – *Continued*

Name (1)	Other Name (2)	Class (3)	z (4)	F_γ (5)	α_γ (6)	$F_{\rm 1keV}$ (7)	$\alpha_{\rm X}$ (8)	Ref (9)	$\langle E_\gamma \rangle$ (10)	$\log \nu L_\nu$ (11)	$\delta_\gamma^{\rm 6h}$ (12)	$\delta_\gamma^{\rm 1d}$ (13)
J2056.2−4715	PKS 2052−47	FSRQ	1.489	86.3	2.23	0.262	$1.28^{+1.02}_{-1.02}$	B97a	3.51	47.91	19.06	14.07
J2115.3+2932	B2 2113+29	FSRQ	1.514	13.5	2.33	0.017		BZCAT	3.16	47.11	8.24	6.64
J2116.2+3339	B2 2114+33	IBL	0.350	28.2	1.80	0.191		B97b	6.20	46.01	4.19	3.38
J2121.0+1901	OX 131	FSRQ	2.180	23.5	2.20	0.010		BZCAT	3.63	47.78	11.38	9.16
J2131.6−0914	RBS 1752	HBL	0.449	7.7	2.09	0.812		BZCAT	4.14	45.56	5.74	4.62
J2133.8−0154	PKS 2131−021	LBL	1.284	9.5	2.32	0.050	$2.05^{+0.46}_{-0.46}$	D01	3.19	46.77	8.65	6.89
J2139.1−2054	RBS 1769	HBL	0.290	2.6	1.39	0.685		BZCAT	12.00	45.03	5.17	4.16
J2139.3−4236	MH 2136−428	IBL		55.7	2.10	0.120	$3.20^{+0.41}_{-0.41}$	D01	4.09	46.99	5.52	4.68
J2141.7−3739	PKS 2138−377	FSRQ	0.423	5.5	2.39	0.106	$1.36^{+0.72}_{-0.4}$	B97a	2.98	45.26	4.39	3.27
J2143.5+1743	OX 169	FSRQ	0.211	44.6	2.58	0.239	$2.44^{+0.22}_{-0.24}$	B97a	2.54	45.39	2.68	2.19
J2146.5−1530	PKS 2143−156	FSRQ	0.698	4.3	2.61	0.134	$1.87^{+0.63}_{-1.07}$	B97a	2.48	45.68	5.91	4.64
J2147.4−7534	PKS 2142−75	FSRQ	1.138	35.9	2.52	0.070		BZCAT	2.66	47.19	7.60	6.12
J2148.2+0659	4C +06.69	FSRQ	0.999	3.9	2.77	0.816	$1.82^{+0.18}_{-0.18}$	B97a	2.23	46.07	11.22	8.77
J2150.2−1412	TXS 2147−144	HBL	0.229	4.6	2.03	0.736	1.76	NED	4.47	44.68	4.04	3.14
J2150.8−2738	J2151−2742	FSRQ	1.485	4.7	2.38	0.140		BZCAT	3.01	46.63	11.18	9.00
J2151.5−3021	PKS 2149−306	FSRQ	2.345	6.4	3.00	1.206	$1.71^{+0.13}_{-0.13}$	B97a	1.98	47.45	31.00	24.01
J2152.4+1735	S3 2150+17	LBL	0.871	5.7	2.18	0.012		BZCAT	3.71	46.13	4.85	3.91
J2157.9−1501	PKS 2155−152	FSRQ	0.672	11.3	2.19	0.220	$2.17^{+0.1}_{-0.1}$	D01	3.67	46.13	6.19	4.97
J2158.8−3013	PKS 2155−304	HBL	0.116	235.0	1.84	44.900	$2.62^{+0.01}_{-0.01}$	D01	5.84	45.84	5.03	4.15
J2202.8+4216	BL Lacertae	LBL	0.069	105.0	2.11	2.200	$1.83^{+0.08}_{-0.08}$	D01	4.03	44.86	2.61	2.05
J2203.4+1726	PKS 2201+171	FSRQ	1.076	65.3	2.09	0.080	$1.41^{+0.8}_{-0.8}$	D01	4.14	47.44	9.87	7.41
J2208.1−5345	PKS 2204−54	FSRQ	1.206	11.5	2.42	0.058		BZCAT	2.90	46.77	7.91	6.37
J2217.1+2422	B2 2214+24B	LBL	0.505	9.1	2.24	0.083		B97b	3.47	45.71	4.22	3.40
J2221.6−5223	J2221−5224	HBL		6.8	2.06	0.604		BZCAT	4.30	46.09	8.21	6.61
J2225.6−0454	3C 446	FSRQ	1.404	22.3	2.44	0.292	$1.59^{+0.07}_{-0.07}$	B97a	2.85	47.24	15.08	11.54
J2232.4+1143	CTA 102	FSRQ	1.037	28.8	2.33	0.730	$1.51^{+0.04}_{-0.04}$	D01	3.16	47.00	13.90	10.54
J2234.9−4831	PKS 2232−488	FSRQ	0.510	5.9	2.55	0.209	$2.32^{+0.3}_{-0.28}$	B97a	2.60	45.46	4.54	3.69
J2236.4+2828	B2 2234+28A	LBL	0.795	50.8	2.05	0.068		BZCAT	4.35	47.01	6.05	4.87
J2236.5−1431	PKS 2233−148	LBL		38.6	2.24	0.047		BZCAT	3.47	46.79	5.29	4.26
J2237.2−3920	PKS 2234−396	FSRQ	0.297	4.8	2.07	0.092		BZCAT	4.24	44.94	3.15	2.54
J2243.2−2540	PKS 2240−260	LBL	0.774	16.2	2.30	0.070	$1.79^{+0.4}_{-0.4}$	D01	3.25	46.42	6.12	4.77
J2243.9+2021	RGB J2243+203	IBL		39.3	1.75	0.065	$2.68^{+1.18}_{-0.77}$	B97b	6.70	46.96	6.04	5.00
J2250.0+3825	B3 2247+381	HBL	0.119	10.9	1.84	0.600	$2.51^{+0.41}_{-0.43}$	B97b	5.84	44.53	2.80	2.30
J2253.9+1609	3C 454.3	FSRQ	0.859	965.0	2.23	1.370	$1.62^{+0.04}_{-0.04}$	D01	3.51	48.33	12.51	9.60
J2254.1+1401	J2253+1404	HBL	0.327	7.5	2.22	0.028		BZCAT	3.54	45.17	2.68	2.16
J2255.2+2408	J2255+2410	IBL		10.8	2.00	0.057		BZCAT	4.65	46.31	5.76	4.64
J2258.0−2759	PKS 2255−282	FSRQ	0.927	28.7	2.26	0.157	$1.70^{+0.3}_{-0.3}$	G07	3.39	46.88	8.63	6.67
J2258.8−5524	J2258−5526	HBL	0.479	3.6	1.81	0.327		BZCAT	6.11	45.42	5.60	4.51
J2304.7+3703	J230437.1+37050	HBL		4.5	1.66	0.636		BZCAT	7.72	46.06	9.24	7.44
J2311.0+3425	B2 2308+34	FSRQ	1.817	43.1	2.16	0.033		BZCAT	3.80	47.83	11.44	9.21
J2319.1−4208	PKS 2316−423	IBL	0.055	3.2	1.59	0.566	2.30	R00	8.64	43.45	2.21	1.79
J2321.0+2737	4C +27.50	FSRQ	1.253	7.1	2.31	0.054		BZCAT	3.22	46.61	8.29	6.67
J2322.2+3206	B2 2319+31	FSRQ	1.489	14.0	2.27	0.018		BZCAT	3.36	47.11	8.29	6.67
J2322.6+3435	TXS 2320+343	IBL	0.098	4.3	1.74	0.419	$1.80^{+0.82}_{-0.5}$	B97b	6.80	44.01	2.47	1.93
J2323.8+4212	1ES 2321+419	HBL	0.059	25.4	1.88	0.299		BZCAT	5.51	44.23	1.87	1.51
J2324.7−4042	1ES 2322−409	HBL	0.174	15.7	1.81	1.624		BZCAT	6.11	45.06	3.95	3.18
J2325.4−4758	PKS 2322−482	IBL	0.221	8.7	2.24	0.153		BZCAT	3.47	44.83	2.78	2.24
J2327.5+0940	PKS 2325+093	FSRQ	1.841	20.3	2.52	0.081		BZCAT	2.66	47.53	12.46	10.03
J2329.7−4744	PKS 2326−477	FSRQ	1.302	4.2	2.58	0.081	$2.52^{+1.08}_{-0.8}$	B97a	2.54	46.43	8.09	6.64
J2330.2+1107	4C +10.73	FSRQ	1.489	3.7	2.75	0.037		BZCAT	2.26	46.55	8.61	6.94
J2330.6−3723	PKS 2327−376	IBL	0.279	4.0	2.09	0.037		BZCAT	4.14	44.79	2.62	2.11
J2331.8−1607	PKS 2329−16	FSRQ	1.153	6.0	2.13	0.020		BZCAT	3.94	46.47	6.81	5.48
J2334.3+0734	TXS 2331+073	FSRQ	0.401	9.0	2.38	0.118		BZCAT	3.01	45.42	3.70	2.98
J2339.0+2125	J2338.8+2124	HBL	0.291	4.4	1.71	0.693	$2.30^{+0.2}_{-0.2}$	B97b	7.13	45.07	4.66	3.78
J2341.7+8016	J234051.4+80151	HBL	0.274	26.3	1.87	0.377		BZCAT	5.59	45.70	3.95	3.18
J2343.6+3437	BZB J2343+3439	HBL	0.366	2.5	1.47	0.604		BZCAT	10.50	45.18	5.70	4.59
J2347.0+5142	1ES 2344+514	HBL	0.044	15.5	1.72	5.260	$2.13^{+0.03}_{-0.03}$	D01	7.02	43.86	2.75	2.20

Table 1 – *Continued*

Name	Other Name	Class	z	F_γ	α_γ	$F_{\rm 1keV}$	$\alpha_{\rm X}$	Ref	$\langle E_\gamma \rangle$	$\log \nu L_\nu$	$\delta_\gamma^{\rm 6h}$	$\delta_\gamma^{\rm 1d}$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
J2347.9−1629	PKS 2345−16	FSRQ	0.576	15.6	2.36	0.108	$2.02^{+0.78}_{-0.78}$	B97a	3.06	46.06	4.88	3.88
J2353.5−3034	PKS 2351−309	LBL		5.3	2.11	0.024		BZCAT	4.03	45.96	4.92	3.96
J2359.0−3037	H 2356−309	HBL	0.165	6.1	1.89	0.057	$1.82^{+0.07}_{-0.07}$	G02	5.43	44.56	2.18	1.70

Notes: Col. (1) 2FGL name, Col. (2) other name, Col. (3) classification, Col. (4) redshift, Col. (5) flux (F_γ) in the bin 1–100 GeV in units of $10^{-9}\gamma\,{\rm cm}^{-2}\,{\rm s}^{-1}$ (from 2FGL), Col. (6) the γ-ray photon spectral index (from 2FGL), Col. (7) the X-ray flux density in units of μJy at 1 keV, Col. (8) the X-ray photon index, α_p, Col. (9) reference for Cols. (7) and (8), B97a: Brinkmann et al. (1997a), B97b: Brinkmann et al. (1997b), B00: Brinkmann et al. (2000), D01: Donato et al. (2001), D05: Donato et al. (2005), G02: Giommi et al. (2002), G07: Giommi et al. (2007), U96: Urry et al. (1996), NED: *http://ned.ipac.caltech.edu/forms/byname.html*, BZCAT: *http://www.asdc.asi.it/bzcat*, Col. (10) average γ-ray photon energy, $\langle E_\gamma \rangle$ in units of GeV, Col. (11) the integrated γ-ray luminosity $(1 - 100$ GeV) in erg ${\rm s}^{-1}$, Col. (12) the derived lower limit for the γ-ray Doppler factor ($\Delta T = 6$ h), $\delta_\gamma^{\rm 6h}$, Col. (13) the derived lower limit for the γ-ray Doppler factor ($\Delta T = 1$ d), $\delta_\gamma^{\rm 1d}$.