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Brightness temperature for radio sources

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Abstract. In this work, using the database of the university of Michigan Radio Astronomy Observatory (UMRAO), we determined the brightness temperatures, T_B for a sample of 167 radio sources. The value of T_B is in a range of log T_B(K) = 10.46 to 20.08, which suggested that the boosting factors are in a range of $\delta = 0.41$ to 41.26.

Keywords. galaxies: active, methods: data analysis, galaxies: jets

1. Introduction

Blazars form an extreme subclass of Active Galactic Nuclei (AGNs), showing extremely observational properties(e.g. Aller *et al.* 2003; Cellone *et al.* 2007; Efimov *et al.* 2002; Fan, 2005). These extremely observational properties are associated with the beaming effect. Up to now, boosting factors are only available for large samples in the papers by Ghisellini *et al.* (1993)-(G93) and Lahteenmark & Valtaoja, (1999)-(LV99). Therefore, we used the UMRAO database for the determination of boosting factor for a larger sample.

2. Brightness Temperature and Boosting Factor

From the work(Wagner & Witzel, 1995), the brightness temperature can be calculated by $T_B = (4.5 \times 10^{10}\mathrm{K})F[\frac{\lambda d}{t_{obs}(1+z)}]^2$, here F is the flux density in Jy, λ the wavelength in cm, d the distance in Mpc, and t_{obs} the time scale in days. From the UMRAO database, we calculated the brightness temperature T_B for 167 sources. The obtained temperatures are in the range of log T_B = 10.46 to 20.08. If the brightness temperature is explained as the boosting effect as argued by Qian *et al.* (1991) and Romero *et al.* (1994), we can estimate the boosting factors are in the range of $\delta = 0.41 \sim 41.26$. This results are consistent with the range of δ by G93 and LV99.

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Table. Brightness temperature and Boosting factor of radio sources

Name	$\log T_B$	δ	Name	$\log T_B$	δ	Name	$\log T_B$	δ
0003-066	16.57	8.21	0818-128	17.63	13.35	1606+106	18.06	16.31
0007+106	17.01	10.04	0829+046	16.67	8.59	1609+660	16.70	8.72
0016+731	17.35	11.75	0831+557	12.53	1.28	1611+343	18.00	15.86
0022+638	15.91	6.05	0836+710	18.65	21.42	1624+416	18.24	17.73
0040+517	15.11	4.18	0838+133	17.94	15.40	1633+382	17.73	14.00
0048-097	17.38	11.90	0850+581	16.27	7.15	1634+628	17.05	10.25
0059+581	17.32	11.58	0851+202	16.82	9.19	1637+574	17.54	12.81
0106+013	18.23	17.60	0859+470	16.53	8.07	1641+399	17.36	11.83
0108+388	16.84	9.30	0906+430	17.38	11.90	1642+690	18.10	16.59
0109+224	17.54	12.84	0912+297	16.29	7.22	1652+398	15.33	4.63
0127+233	16.98	9.90	0917+458	15.21	4.38	1717+178	16.79	9.07
0133+476	17.74	14.09	0917+624	18.13	16.82	1721+343	15.68	5.44
0134+329	16.18	6.85	0923+392	16.91	9.59	1727+502	16.07	6.53
0153+744	16.84	9.28	0951+699	10.47	0.49	1730-130	17.48	12.45
0202+149	17.19	10.90	0954+556	17.41	12.05	1741-038	18.21	17.43
0212+735	17.37	11.87	0954+658	17.63	13.34	1749+096	17.52	12.71
0215+015	17.80	14.43	0957+227	16.97	9.85	1749+701	18.58	20.74
0218+357	17.45	12.32	1003+351	15.55	5.13	1803+784	18.03	16.07
0219+428	16.83	9.25	1031+567	16.70	8.71	1807+698	15.01	4.00
0220+427	13.48	1.98	1034-293	16.84	9.29	1823+568	17.61	13.26
0234+285	17.73	14.00	1038+528	18.71	22.00	1828+487	17.81	14.50
0235+164	18.39	18.95	1040+123	17.87	14.89	1842+455	14.58	3.27
0300+470	16.37	7.48	1055+018	18.25	17.75	1845+797	15.04	4.05
0306+102	17.35	11.75	1100+772	16.32	7.30	1901+319	17.17	10.79
0315+416	13.65	2.14	1101+384	15.41	4.80	1921-293	17.67	13.64
0316+413	10.41	0.48	1127-145	17.71	13.89	1928+738	17.32	11.57
0323+022	17.06	10.27	1133+704	15.71	5.52	1939+605	16.14	6.72
0333+321	17.78	14.34	1137+660	16.12	6.66	1951+498	18.72	22.11
0336-019	17.94	15.39	1147+245	16.62	8.38	1954+513	17.78	14.32
0355+508	19.27	28.40	1148-001	16.05	6.46	2005+403	18.09	16.50
0404+768	16.24	7.05	1156+295	17.97	15.61	2007+777	11.02	11.07
0420-014	18.29	18.10	1157+732	15.95	6.17	2014+370	16.44	7.74
0422+004	17.79	14.40	1215+303	16.87	9.40	2020+614	15.69	5.47
0430+052	14.86	3.73	1217+023	15.54	5.11	2032+107	17.60	13.21
0440-003	17.51	12.64	1219+285	16.59	8.27	2121+053	18.27	17.93
0454-234	17.15	10.72	1222+216	17.57	13.01	2131-021	17.33	11.65
0456-020	18.25	17.81	1225+206	18.46	19.62	2134+004	17.87	14.92
0518+165	18.09	16.51	1226+023	13.32	1.84	2136+141	17.21	11.00
0521-365	14.98	3.95	1253-055	16.32	7.30	2145+067	17.89	15.05
0528+134	18.11	16.64	1254+476	16.63	8.44	2153+377	17.20	10.97
0528-250	18.88	23.82	1307+121	17.56	12.97	2155-152	17.62	13.32
0538+498	16.58	8.25	1308+326	17.71	13.88	2155-304	16.99	9.96
0552+398	17.40	12.00	1328+307	17.08	10.38	2200+420	17.17	10.81
0605+480	15.57	5.18	1335-127	17.48	12.46	2202+315	17.62	13.29
0605-085	17.64	13.43	1354-152	18.00	15.86	2223-052	17.99	15.75
0607-157	17.24	11.19	1358+624	17.08	10.35	2229+391	14.60	3.32
0710+439	16.60	8.32	1400+162	16.95	9.78	2230+114	17.36	11.78
0711+356	18.30	18.19	1409+524	15.17	4.31	2243+394	16.27	7.15
0716+714	20.08	41.26	1413+135	16.88	9.45	2251+158	17.56	12.94
0723+679	17.84	14.71	1418+546	15.66	5.40	2254+074	16.06	6.48
0735+178	19.38	29.90	1458+718	16.08	6.55	2311+612	16.49	7.92
0754+100	16.87	9.42	1504-166	16.32	7.31	2335+031	16.86	9.38
0804+499	18.46	19.59	1510-089	16.96	9.80	2345-167	17.50	12.59
0808+019	17.49	12.52	1514+197	18.32	18.38	2351+456	18.39	19.01
0809+483	19.12	26.49	1538+149	17.06	10.28	2352+495	15.91	6.07
0814+425	16.95	9.78	1543+005	17.57	13.00			

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