

ROSAT OBSERVATIONS OF BRIGHT BL LACERTAE OBJECTS

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Abstract. We have compiled a sample of 23 X-ray and radio selected BL Lacertae objects which have been observed with the Position Sensitive Proportional Counter (PSPC) on board of the ROSAT Satellite. The sample consists of three parts:

In Table I results from 4 objects observed for their known rapid X-ray variability are presented. 5 objects are the BL Lac subset of a complete sample of flat spectrum radio sources with 5 GHz flux densities $> 1 \text{ Jy}$. Detailed results from this sample will be published in Brunner *et al.* 1993. The data of the 14 remaining objects were collected from the ROSAT data archive to supplement the sample. The whole sample contains 7 X-ray selected objects (XBLs, $\alpha_{OX} < 1.2$) and 16 radio selected objects (RBLs).

The X-ray spectra of the sources are well described by single power laws with galactic absorption. The X-ray energy indices α_X are widely dispersed around a mean of 1.34. Significant X-ray flux variability and correlated spectral variability was detected on timescales down to hours. The object H 1218+304 was found to be rapidly variable within each of three observations. Its spectral hardness is correlated with the flux level (see Table I).

We calculated the intrinsic distributions of the spectral indices α_X for the XBL and RBL samples and of the differences between ROSAT and EXOSAT ME spectral indices $\alpha_{PSPC} - \alpha_{ME}$ (only XBL sample) using a maximum likelihood fit. There is no significant difference in the mean spectral indices between the X-ray and radio selected subsamples. The mean values $\langle \alpha_X \rangle$ are 1.34 for XBLs and 1.33 for RBLs. The spectra of the X-ray selected objects slightly steeper at higher X-ray energies ($\langle \alpha_{PSPC} - \alpha_{ME} \rangle = -0.11$). This supports the view that the X-ray emission of XBLs is supplied by synchrotron radiation. The steepening of the X-ray spectrum is then due to a cutoff in the energy distribution of the electrons.

TABLE I

Object	date	N_H gal. ¹	N_H ²	F_{1keV} [μJy]	α 0.1-2.4 keV	variab. ampl. (Δt)
0548-322	92/3/6	2.94	$2.76 \pm .14$	$9.59 \pm .12$	$0.95 \pm .05$	-
1218+304	91/6/15-16		$2.61 \pm .09$	$12.72 \pm .12$	$1.19 \pm .03$	15%(1 d)
1218+304	92/6/18-22	1.78	$2.51 \pm .10$	$10.05 \pm .11$	$1.22 \pm .03$	50%(6 mon)
1218+304	92/12/8-10		$2.85 \pm .25$	$5.11 \pm .14$	$1.47 \pm .07$	
3C 371	92/4/9	4.61	$3.43 \pm .81$	$0.32 \pm .02$	$0.87 \pm .25$	-
2005-489	92/4/27-29	5.44	$4.09 \pm .17$	$5.19 \pm .07$	$1.92 \pm .04$	50%(6 mon)
2005-489	92/10/28-11/1	5.44	$3.58 \pm .21$	$2.81 \pm .06$	$1.91 \pm .05$	-

¹ [10^{20} cm^{-2}], Elvis *et al.* 1989, Stark *et al.* 1992. ² [10^{20} cm^{-2}]

References

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 Stark, A. A., Gammie, C. F., Wilson, R. W., *et al.*, 1992, *ApJS*, **79**, 77