# X-RAY BURSTING ACTIVITY IN THE BL LACERTAE OBJECT PKS 2155-304

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## 1. INTRODUCTION

The bright BL Lac object PKS 2155-304 ($m_V$=13; z=0.117) was observed with EXOSAT at five epochs (1983 Oct. 31, Nov. 30, 1984 Nov. 6, 7 and 11), for a total of about 30 hours of exposure time. Here we present data and results obtained with the Low Energy (LE) telescopes, in the band 0.05 - 2. keV, and with the Medium Energy (ME) argon proportional counters in the range 1. - 6. keV.

## 2. OBSERVATIONS

The band chosen for the ME data is the one in which the source to background ratio is higher; the LE data were obtained with the Channel Multiplier Array in conjunction with the Lexan filter. In both experiments the source exhibited different intensity levels at various epochs: the lowest intensity on 1983 October 31, the maximum at peak intensity

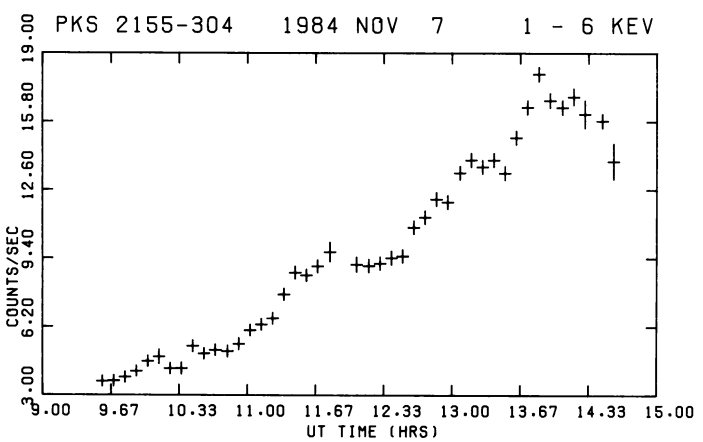


Fig. 1: Argon counters ME might curve recorded on 1984 Nov. 7.



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on 1984 November 7. This is the highest dynamic range of intentsity variation recorded for this source with a single instrument. From the light curves it is apparent that variability over time scales of months and days is common for this source, superposed on short-term variability, particularly in the observations of 1984 November 6 and 7, in which the 1-6 keV flux varied by a factor 2.5 in 5 hours and by a factor 5 in 4.5 hours respectively. In Fig. 1 the ME light curve for November 7 is shown: a variation time scale ($\tau = F(\Delta F/\Delta t)^{-1}$) as short as 1 hour (the minimum observed) is apparent around 13:30 UT. The overall behaviour of the LE count rate mimics the ME one, but with smaller dynamic range. During periods of activity there are indications of hardening of the spectrum (see Fig. 2).

The energy spectrum between 1 - 6 keV is well fitted by a power law with a low-energy cutoff due to photoelectric absorption. The photon spectral index ranges between $2.51 \pm 0.27$ and $2.92 \pm 0.12$. The values for the absorbing column density derived for the combined LE+ME fits are lower than those given by by the ME data alone: this, together with the different range of variability in the two energy bands, suggests either the presence of an additional soft spectral component with a distinct temporal behaviour, or the hypothesis that absorption present above 1 keV does not affect lower energies (warm absorber).

## 3. DISCUSSION

The maximum luminosity, recordered on 1984 Nov. 7 (assuming isotropic emission and $H_o = 100$ Km $s^{-1}$ $Mpc^{-1}$) is $L = 10^{46}$ erg $s^{-1}$ in the range 0.1 - 6 keV, comparable with the UV luminosity ($L = 3 \times 10^{45}$ erg $s^{-1}$) and greatly exceeding that in other bands. The maximum luminosity variation observed in the 1 - 6 keV range yields $(dL/dt) = 10^{42}$ erg $s^{-2}$. This observed values of L and dL/dt imply severe constraints on the source structure. Under the hypothesis of Eddington limit, the luminosity yields a lower value of the mass $M > 10^8$ $M_\odot$, which corresponds to a gravitational radius $R_g = 3 \times 10^{13}$ cm. The observed minimum time scale of variability, therefore, corresponds to an emission region of only $3R_g$, a rather restrictive value.

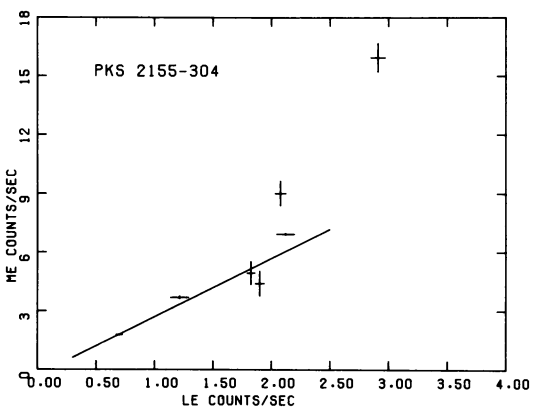


Fig.2: ME counts versus LE counts for all observations. (The peak intensity of 1984 Nov. 6 and 7 are not included in the linear regression shown).

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