

X-RAY SELECTED BL LAC OBJECTS: TIME VARIABILITY AND X-RAY SPECTRUM

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The *Einstein* Observatory Medium Sensitivity Survey contains four sources identified with BL Lac objects. The radio and optical properties of these objects have been described in Stocke *et al.* (1985).

The X-ray properties of these X-ray selected BL Lac objects have been probed by means of repeated observations with the *EXOSAT* Observatory. The X-ray spectrum has been measured only for two BL Lacs, namely 1E 1402.3+0416 when its intensity was highest and 1E 0317.0+1835. In both cases the *EXOSAT* Medium Energy experiment data were fitted with a power law in the 2 to 6 keV energy range: the amount of absorption due to the galactic hydrogen column densities and energy slopes respectively of 1.6 (+0.3, -0.1) and 1.5 (+0.6, -0.5) were obtained. Within the *EXOSAT* observations, only 1E 1402.3+0416 has shown fast time variability (a factor 2 decrease in about 6 hours; see Giommi *et al.* 1986). Long term variability can be checked by comparing *Einstein* and *EXOSAT* fluxes. The comparison however is strongly dependent on the spectral slope and on the amount of absorption. In order to compare the *Einstein* and *EXOSAT* fluxes of our sources, we either used the measured spectral parameters or we assumed a spectral slope of 1.5 with an uncertainty of ± 0.5 . Long term variability is present only in 1E 1402.3+0416 (Giommi *et al.* 1986) and possibly in 1E 1235.4+6315, provided its spectral slope is steeper than 1. It is remarkable that in the case of 1E 1207.9+3945, for which we have the best monitoring (10 observations spread over 15 months with *EXOSAT*, plus 2 *Einstein* observations; see Figure 1), no variability has been detected.

Many models (e.g., Bonometto and Rees 1971) predict that spectral slopes greater than 1, as we observed in two objects and as it seems to be common for many BL Lacs, are most easily obtained for compactness parameters of the sources $> 10^{30}$ ergs $\text{cm}^{-1} \text{s}^{-1}$. Since these X-ray selected BL Lacs have luminosities of the order of 10^{45} ergs s^{-1} , the corresponding radial dimensions are 10^{15} cm and therefore their typical variability time scale should be 10^4 seconds. Our observations have not shown this type of variability but in the case of 1E 1402.3+0416. This

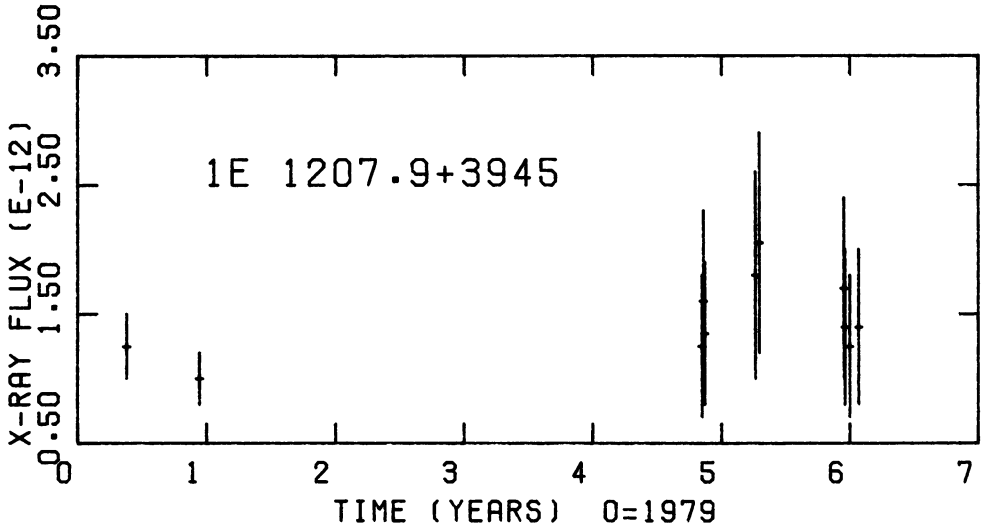


Figure 1: The X-ray light curve of 1E 1207.9+3945. The X-ray flux is in the 0.5–3.5 keV energy range and EXOSAT fluxes have been converted assuming a spectral index of 1.5 ± 0.5 .

could hint to emission mechanisms where pair production is not important and the resulting X-ray spectrum simply reflects the electron injection spectrum.

References

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