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Two-Frequency VLA Monitoring of LSI+61°303 during a Full Radio Period

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Abstract. We report observations of the radio periodic Be X-ray binary LSI+61°303, obtained with the VLA at 3.6 and 2.0 cm during a full 26.5 d cycle. These observations were carried out in coordination with CGRO monitoring of its possible γ-ray counterpart 2CG 135+1.

1. Introduction

The massive X-ray binary LSI+61°303 is well known for its periodic radio outbursts every orbital period of 26.5 d (Taylor & Gregory 1984), reaching centimetric peak flux densities of typically $\sim$ 100 mJy. Recently, evidence of X-ray periodicity in LSI+61°303 with the same 26.5 d radio period has also been discovered (Paredes et al. 1997). This system lies well within the $\sim 10'$ error box of 2CG 135+1 as determined by EGRET (von Montigny et al. 1993, Kniffen et al. 1996). In the present paper, we report the results of our recent radio monitoring of LSI+61°303 during the latest CGRO observations of 2CG 135+1. The main goal of our coordinated radio and γ-ray campaign was aimed to provide more insight into the suspected identity of LSI+61°303 and 2CG 135+1. The high energy data will be presented elsewhere, while the present work is mainly devoted to look into some interesting aspects of the radio results.

2. Observations and Results

Radio monitoring of LSI+61°303 was carried out using the VLA interferometer of NRAO. The radio observations covered more than one orbital period of the system, from 1996 September 6 to 1996 October 3. We observed at the wavelengths of 3.6 and 2.0 cm. In Figure 1 we present the observed light curves at the two wavelengths, as well as the corresponding spectral index ($S_\nu \propto \nu^\alpha$) for each session. The horizontal axis is labeled in terms of radio phase (top) and date of the year (bottom). The origin of radio phase is set at JD 2443366.775 and a period value of 24.496 d has been used (Taylor & Gregory 1984).

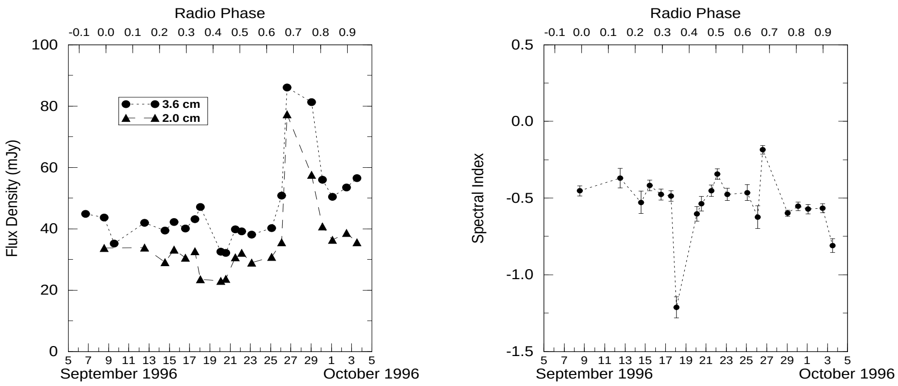

Figure 1. **Left:** Observed light curves at 3.6 cm and 2.0 cm. Error bars are smaller than the symbols. **Right:** Spectral index ($S_\nu \propto \nu^\alpha$). 3σ error bars have been plotted.

Our observed radio light curves in Figure 1 indicate that the main radio outburst of LSI+61°303 peaked at radio phase ~ 0.7, with a peak flux density higher than about 80 mJy at both frequencies. There seems to be a minor flaring event at phase ~ 0.35. The average value of the spectral index is -0.5, typical of synchrotron non-thermal radiation. However, occasional changes of α towards lower and higher values are certainly detected. Two of these variations are particularly evident: a) At radio phase ~ 0.35 there is a clear event of radio spectrum steepening. This event is similar to those observed by Paredes et al. (1996a), thus confirming our first reports of this phenomenon that can be possibly interpreted in terms of relativistic electrons undergoing heavy energy losses, mainly of synchrotron and inverse Compton origin (Paredes et al. 1996b). There is also some indication of steepening during the decay of the main radio outburst (phase ~ 0.95). However, our monitoring did not last long enough to follow it in detail. b) At radio phase ~ 0.65, an excursion of α towards the nearly flat value of ~ -0.2 took place, when the source flux density was rising steeply. This fact can be possibly interpreted as an opacity increase effect prior to the main radio outburst.

Further analysis of these observations will be presented in a future paper.

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