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MULTI-WAVELENGTH (RADIO, X-RAY AND γ-RAY) OBSERVATIONS OF THE γ-RAY BINARY LS I +61 303 [1]

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ABSTRACT

We present the results of the first multiwavelength observing campaign on the high-mass X-ray binary LS I +61 303 comprising observations at the TeV regime with the MAGIC telescope, along with X-ray observations taken with *Chandra*, and radio interferometric observations taken with the MERLIN, e-EVN and VLBA arrays, in October and November 2006. From our MERLIN observations, we can exclude the existence of large scale (~ 100 mas) persistent radio-jets. Moreover, our 5.0 GHz VLBA observations display morphological similarities to previous 8.4 GHz VLBA observations carried out at the same orbital phase, suggesting a high level of periodicity and stability of the processes behind the radio emission. This disfavors the possibility that the radio emission is produced by the interaction of an outflow with wind clumps. Further, if the radio emission is produced by a milliarcsecond scale jet, it should also show a stable, periodic behavior, which is difficult to reconcile with the absence of a large scale ($\sim$100 mas), relativistic jet. In addition, we find a possible hint of temporal correlation between the X-ray and TeV emissions and evidence for radio/TeV non-correlation, which points to the existence of one population of particles producing the radio emission and a different one producing the X-ray and TeV emissions. Finally, we present a quasi-simultaneous energy spectrum including radio, X-ray and TeV bands.

Subject headings: gamma rays: observations, X-rays: binaries, X-rays: individual (LS I +61 303)

1. INTRODUCTION

LS I +61 303 is a high-mass X-ray binary consisting of a low-mass [$M \sim (1-4)\ M_\odot$] compact object orbiting around an early type B0 Ve star along an eccentric ($e = 0.7$) orbit (Casares et al. 2005, and references therein). The modulation of both radio (Gregory & Taylor 1978) and X-ray (Taylor et al. 1996; Paredes et al. 1997) emissions display a period of $P_{\rm R} = 26.496$ d, attributed to the orbital motion. LS I +61 303 is positionally coincident with an EGRET γ-ray source (Kniffen et al. 1997). Moreover, variable emission at TeV energies has been recently detected with the MAGIC telescope (Albert et al. 2006). These authors found that the peak flux at TeV energies occurs at orbital

[1] Based on observations made with the MAGIC telescope, the *Chandra* X-ray Observatory, and the MERLIN, e-EVN, and the NRAO VLBA arrays.

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