

Recent observations of 1ES2344+514 and PSR 0355+54 with TACTIC Imaging Element

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Abstract. The TACTIC Imaging Element has observed the active galaxy 1ES 2344+514 and the pulsar PSR 0355+54 during Oct-Nov, 2001. Analysis of the recorded events, collected for a period of 70 hours on both these sources reveals absence of any steady emission from these sources.

Keywords : VHE γ -rays, TACTIC Telescope, 1ES 2344+514, PSR 0355+54

1. Introduction

The Imaging Element (IE) of the 4-element TACTIC array of atmospheric Cerenkov telescopes is in operation at Mt. Abu (24.6° N, 72.7° E, 1400 m asl). After equipping it with its full 349-pixel camera, it has successfully detected the TeV gamma-ray standard candle, the Crab Nebula, and the BL-Lac object Mkn-421 during the observation period Jan–March, 2001 (Bhatt et al. 2002). The system operates presently at a sensitivity level of $\sim 6.3 \sigma$ in 40 h for the Crab Nebula, at a gamma-ray threshold energy of ~ 1 TeV. Here we present results on our observations on 1ES 2344+514 (X-ray BL-Lac object at $z=0.044$) and PSR 0355+54 (156.38 ms pulsar) taken during the period Oct-Nov, 2001. The details of the IE system hardware, observational methodology, system calibration and data analysis have been discussed in Bhatt et al.(2002). Using the IE, observations were carried out in the on-source tracking mode on 1ES 2344+514 (for 43h) and the PSR 0355 +54 (for 27h) between Oct 13–Nov 13 2001.

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2. Results and Discussion

Various image parameters, viz., Length, Width, Distance and Alpha (α) were calculated for all the cleaned images. After applying the same γ -domain cuts (Bhatt et al. 2002), the selected events yield an α -distribution and daily γ -ray rate curves as shown in Fig.1 and Fig.2. An examination of these figures clearly reveals that no γ -ray emission at energies ≥ 1 TeV is seen from these sources. The number of excess events observed in the γ -ray

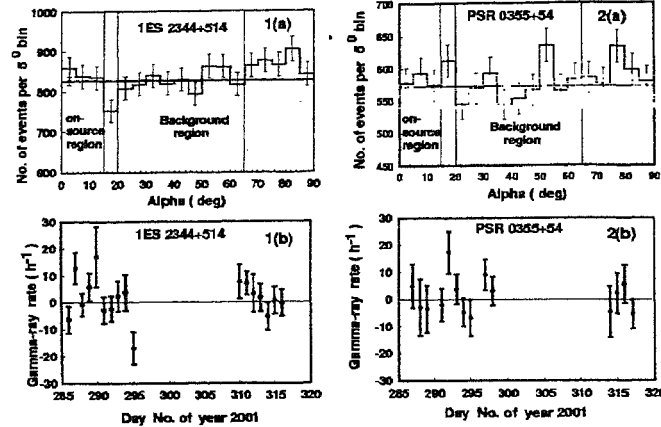


Fig.1 Alpha plot (a) and daily rate (b) for 1ES2344+514

Fig.2 Alpha plot (a) and daily rate (b) for PSR 0355+54

domain of $\alpha \leq 15^\circ$ turns out to be $\sim 48 \pm 58$ (for 1ES2344+514) and $\sim 26 \pm 48$ (for PSR 0355+54). The corresponding 3σ flux upper limits for two sources are estimated to be 4.3×10^{-12} and 5.7×10^{-12} photons $\text{cm}^{-2}\text{s}^{-1}$, respectively, at $E_\gamma \geq 1$ TeV. Although a TeV γ -ray signal from 1ES 2344+514 was claimed by the Whipple group (Catanese et al. 1998), subsequent monitoring could not confirm the detection (Badran et al. 2001; Konopelko et al. 1999), possibly because, like Mkn421 and Mkn501, this source is also episodic in nature and was in a prolonged quiet state. Pachmarhi group (Bhat et al. 1990) reported the first detection of a pulsed TeV γ -ray signal from PSR0355+54. Our non detection of a steady signal, consistent with the Whipple results (Reynolds et al. 1993), can be attributed to the possibility that either the source is not emitting γ -rays at all or that the flux level emitted is below the detection sensitivity of our instrument.

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