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The flaring activities observed by LHAASO-WCDA from misaligned radio galaxies object NGC 1275

We report the detection of flaring activity in the high-energy gamma-ray emission from the Fanaroff-Riley I radio galaxy NGC 1275 using the LHAASO-WCDA detector, following an alert from the MAGIC Collaboration (ATel #15820). The observation were performed between 2022 November 28 and 2023 January 29, as part of a monitoring program. Two flares in the light curve of NGC 1275 have been identified using the Bayesian block algorithm, with a false alarm rate of 5%. The first flare occurred from December 20 to December 22, 2022, and the second flare occurred from January 6 to January 14, 2023. The γ – ray spectra of the two flaring intervals can be adequately described by a simple power-law spectrum, with photon indices α of 3.39 ± 0.52 and 3.39 ± 0.29 respectively. This suggests that the energy distribution of the radiation in these two bursts exhibits similar characteristics, which may indicate that the physical mechanisms of the burst events are similar or generated by similar acceleration mechanisms. To explain these observations, we propose that the gamma-ray flares are caused by the injection of high-energy electrons into the jet, while the X-ray emission is a result of the combined effects of various regions. To demonstrate the viability of these scenarios, we fit the spectral energy distribution data of the two flaring intervals using a one-zone synchrotron self-Compton (SSC) model.

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