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Upper limits on the VHE γ -ray flux from the ULIRG Arp 220 and other galaxies with VERITAS

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The cores of Ultra-Luminous InfraRed Galaxies (ULIRGs) are very dense environments, with a high rate of star formation and hence supernova explosions. They are thought to be sites of cosmic-ray acceleration, and are predicted to emit γ -rays in the GeV to TeV range. So far, no ULIRG has been detected in γ -rays. Arp 220, the closest ULIRG to Earth, has been well studied, and detailed models of γ -ray production inside this galaxy have been derived. They predict a rather hard γ -ray spectrum up to several TeV. Due to its large rate of star formation, high gas density, and its close proximity to Earth, Arp 220 is thought to be a very good candidate for observations in very-high-energy (VHE, above 100 GeV) γ -rays. Arp 220 was observed by the VERITAS telescopes for more than 30 hours with no significant excess over the cosmic-ray background. The upper limits on the VHE γ -ray flux of Arp 220 derived from these observations are the most sensitive limits presented so far and are starting to constrain theoretical models. The observations of Arp 220 are compared to the VERITAS flux limits derived for other galaxies.

Collaboration

VERITAS

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