

Upper limits on the cosmic-ray luminosity of supernovae in nearby galaxies

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Interactions between cosmic rays and also between cosmic rays and particles of the Cosmic Microwave Background and the Extragalactic Background Light produce charged and neutral pions. The mechanisms that can produce gamma-ray fluxes associated with cosmic rays are the decay of neutral pions, bremsstrahlung, and inverse Compton scattering from pions. These cascading processes show a correlation between the upper limit on the integral GeV-TeV gamma-ray flux and the upper limit on the UHECR luminosity, motivating the study of the multi-messengers to calculate luminosities of UHECRs for specific point sources. We examine the possible sites of ultra-high energy cosmic-ray acceleration in supernovae in nearby galaxies, which were measured by the High Energy Stereoscopic System (H.E.S.S.). The upper limits on the UHECR cosmic-ray luminosity of these sources are calculated with a particular focus on the sources that produce a mixed composition.

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UHECR, Gamma-Ray, Luminosity.

Collaboration

Auger

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Theoretical Results

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