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Multi-wavelength studies of Cosmic Ray accelerators

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The study of cosmic-ray accelerators is done with a multi-wavelength approach which provides a more complete view of the physical phenomena that involve the acceleration of charged particles. Cosmic-ray accelerators are both galactic, for example Supernova Remnants, and extragalactic, for example Active Galactic Nuclei and Gamma-Ray Bursts. To get a larger sample of Galactic cosmic-rays, researchers are studying them using telescopes in the southern hemisphere.

In this study we focus on the TeV energy band through simulations of two Supernova Remnants, RCW86 and Vela Junior, with the Middle-Sized Telescopes (MSTs) of the southern array of the Cherenkov Telescope Array (CTA) to be installed at Paranal, Chile. These simulations allow us to investigate which MST configuration results in the best performance for studying gamma-ray emission from new Galactic sources and for a better understanding of the mechanisms at the basis of the acceleration of Galactic cosmic rays.

In particular, we compared the performance of a configuration composed of single-mirror MSTs and dual-mirror MSTs, the latter called Schwarzschild-Couder Telescopes (SCTs). Thanks to their better sensitivity and angular resolution, SCTs would be the preferred option to investigate in detail the morphology of extended sources. Indeed, we find that the mixed configuration performs better than the one composed of only single-mirror MSTs. We compared different spatial models in order to distinguish between different sources, such as a Supernova Remnant and a Pulsar Wind Nebula with the different telescope configurations.

These studies are complementary to MeV-GeV energy band analysis, which are being investigating with Fermi-LAT datasets.

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