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Analyzing Galactic PeVatrons: LHAASO J1825-1326 and LHAASO J1839-0545

Cosmic rays are charged particles that travel through the universe and reach Earth with varying energies and compositions. The search to understand the origins of these particles is in progress, and one possible origin for galactic cosmic rays is PeVatrons, which can accelerate these particles to energies of 10^{15} eV. This energy interval is known as the “knee” in the cosmic ray spectrum, where a change in the spectral index occurs. To analyze PeVatrons, it is important to study the relationship between gamma rays in the energy range from GeV to TeV and cosmic rays up to PeV. The LHAASO observatory has identified a population of PeVatrons close to the galactic center, with photons reaching up to 1.4 PeV. In this study, two PeVatrons cataloged by LHAASO will be discussed: LHAASO J1825-1326, which has the pulsars PSR J1826-1334 and PSR J1826-1256 in its neighborhood, and LHAASO J1839-0545, associated with the pulsars PSR J1837-0604 and PSR J1838-0537. We performed simulations of the propagation and interaction of cosmic rays in the galaxy using the spin-down model with the GALPROP software for the four identified pulsars. The results of these simulations will be presented and compared with data from several observatories. Furthermore, we will show the spectral energy distribution of the analyzed pulsars based on CTA simulations performed with the Gammapy software. These results highlight the contribution of gamma rays from these sources to the data observed at different energies and indicate possible future observations in these regions by the CTA observatory.

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