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## **Modeling very-high energy gamma-ray emission from HESS J1825-137 and neighboring regions**

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This work analyzes gamma-ray emission from relativistic electron and proton populations, focusing on the very-high-energy (VHE,  $E > 0.1$  TeV) gamma-ray region HESS J1825-137. Associated with pulsar PSR J1826-1334, HESS J1825-137 has been extensively studied by High Energy Stereoscopic System (H.E.S.S.), High-Altitude Water Cherenkov Gamma-Ray Observatory (HAWC), and Large High Altitude Air Shower Observatory (LHAASO), and is notable for its flux levels compared to the Crab Nebula. This study models new observational data using a single-zone approach with Naima and Markov Chain Monte Carlo (MCMC) methods. We also evaluate the capabilities of the upcoming Cherenkov Telescope Array Observatory (CTAO). Our findings indicate inverse Compton scattering as the primary gamma-ray production mechanism, with pion decay as a secondary contributor.

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