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Modeling Very-High-Energy Emission from Pulsars

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Ground-based Air-Cherenkov telescopes have detected pulsations at energies above 50 GeV from a growing number of Fermi pulsars. These include the Crab, Vela, PSR B1706-44 and Geminga, with the first two having pulsed detections above 1 TeV. There appears to be VHE emission that is an extension of the Fermi spectra to high energies as well as additional higher-energy components that require a separate emission mechanism. We will present results of broad-band spectral modeling using global magnetosphere fields and multiple emission mechanisms that include synchro-curvature, synchrotron self-Compton (SSC) and inverse Compton (IC) radiation from both accelerated particles and lower-energy pairs. Our models predict two VHE components: SSC from pairs that can extend to several TeV and IC from particles accelerated in the current sheet, scattering pair synchrotron radiation, that appears beyond 10 TeV. Model spectra show a wide range of VHE flux, with detectable SSC and IC components expected for Crab-like pulsars and some millisecond pulsars but only a primary IC component for Vela. We argue that the IC component peaking above 10 TeV from Vela has been seen by H.E.S.S. Detection of this emission component from the Crab and other pulsars is possible with HAWC and CTA, and directly measures the maximum particle energy in pulsars.

Keywords

Pulsars; particle acceleration; VHE emission

Collaboration

other Collaboration

Subcategory

Theoretical Results

Primary authors: HARDING, Alice (Los Alamos National Laboratory); Dr VENTER, Christo (North-West University); Dr KALAPOTHARAKOS, Constantinos (University of Maryland, College Park)

Presenter: HARDING, Alice (Los Alamos National Laboratory)

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