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# Energy-dependent Light Curve Modeling of the Vela Pulsar

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The ground-based discovery of pulsed $\gamma$-ray emission from four pulsars has marked the beginning of a new era in pulsar science. Recent kinetic simulations sparked a debate regarding the emission mechanism responsible for pulsed $\gamma$-ray emission from pulsars. Detection of the Vela pulsar up to $\sim$˜100 GeV by H.E.S.S.\ and Fermi Large Area Telescope (LAT) provides evidence for a curved spectrum. We interpret this to be the result of curvature radiation due to primary particles in the pulsar magnetosphere and current sheet. We present predictions of energy-dependent light curves and spectra using a slot gap and current sheet model in a force-free magnetosphere, invoking a step function for the accelerating electric field as motivated by kinetic simulations. We include a refined calculation of the curvature radius of particle trajectories, which has a significant impact on the transport, predicted light curves, and spectra. Upon obtaining reasonable fits for the energy-dependent light curves and spectra, we isolate the distribution of Lorentz factors and curvature radii of trajectories associated with the first and second $\gamma$-ray light curve peaks. The median values of these quantities are slightly larger for the second peak, leading to larger cutoffs and explaining the decrease in ratio of first to second peak intensity as energy increases. However, an unknown azimuthal dependence of the electric field as well as uncertainty in the precise spatial origin of the emission preclude a simplistic discrimination of emission mechanisms.

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