

A Fundamental Plane of Gamma-Ray Pulsars: Observations and Kinetic PIC Models

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The Fermi data imply that the gamma-ray observables, i.e., the gamma-ray luminosity, spectral cut-off energy, stellar surface magnetic field, and spin-down power obey a relation that represents a 3D plane in the 4D log-space. This observed fundamental plane (FP) is remarkably close to the theoretical relation that is obtained, assuming that the pulsar gamma-ray emission is due to curvature radiation. We present advanced kinetic particle-in-cell (PIC) models that reproduce both the shapes of the gamma-ray light curves and the FP. Our modeling predicts also that the cutoff energies decrease toward low spin-down powers for both young and millisecond pulsars implying that the observed death line of gamma-ray pulsars is due to cutoff energies dropping below the Fermi band.

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