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Constraining Jet Dynamics of PKS 2155-304 Through Time-Dependent SED Analysis

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Blazars are a unique subclass of active galactic nuclei (AGN) characterised by their relativistic jets oriented towards Earth. This study focuses on the blazar PKS 2155-304, a high synchrotron-peaked BL Lac object located at a redshift of z=0.116. We utilised multiwavelength observations, ranging from optical to gamma-ray, primarily from the Fermi Large Area Telescope (LAT) and the Swift Observatory. The objective was to study the spectral energy distributions (SEDs) at various flux states, specifically selecting periods of varying gamma-ray and/or X-ray flux, including quiescent, flaring, and intermediate states. The SEDs were modelled using a one-zone leptonic framework with a broken power-law electron distribution within the JetSeT framework, an open-source tool for simulating radiative processes in relativistic jets. This tool was employed to fit the numerical model to the observed data. Upon completion of the epoch modelling, we obtained distributions for several important parameters, including the jet magnetic field, particle injection, and maximum energy of the relativistic particles. This analysis aims to uncover the underlying physical processes driving the observed variability in PKS 2155-304, contributing to our understanding of blazar behaviour and their emission mechanisms.

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