PROCEEDINGS OF SCIENCE

Blazar Variability from Plasmoids in Relativistic Reconnection

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The gamma-ray, short timescale variability in blazars ($\sim$ minutes to hours), which has been recently detected in GeV gamma-rays by Fermi-LAT, challenges existing blazar emission models. An excellent candidate for describing such events is the relativistic magnetic reconnection model, in which energy is transferred to compact regions, denoted as plasmoids, characterized by high Doppler-boosting and fast motions within the blazar jet. Recent 2D particle-in-cell (PIC) simulations have been able to fully capture the evolution and dynamics of these plasmoids that contain high-energy particles and magnetic fields in rough energy equipartition. By coupling PIC results with our radiative transfer model, we may track the temporal evolution of both the electron and photon distributions within each plasmoid, while taking into account the variable Doppler boosting due to the accelerated motion of the plasmoids. Here, I will present the cumulative light curves from a chain of plasmoids formed in the reconnection layer of a blazar jet. I will also present the resulting power-spectral densities and discuss their dependence upon various model parameters and plasmoid sizes while making a direct comparison to blazar observations.

7th Fermi Symposium 2017
15-20 October 2017
Garmisch-Partenkirchen, Germany

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PoS(IFS2017)040