BOSTON UNIVERSITY

Astrophysics Seminar
Monday, February 29, 2016

The Journey of High-Energy Photons in Blazar Jets

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3:15 pm
Refreshments
CAS Room 500

3:30 pm
Seminar
CAS Room 502

Abstract:

We investigate the origin and the fate of high-energy photons in blazar jets, by means of analytical theory and first-principles particle-in-cell (PIC) kinetic simulations. In magnetically-dominated jets, magnetic reconnection is often invoked as a mechanism to transfer the jet magnetic energy to the emitting particles, thus powering the observed non-thermal emission. With 2D and 3D PIC simulations, we show that magnetic reconnection in blazar jets satisfies all the basic conditions for the emission: extended non-thermal particle distributions (with power-law slope between -2 and -1), efficient dissipation and rough equipartition between particles and magnetic field in the emitting region.

TeV photons emitted by the highest energy electrons accelerated by reconnection will interact in the intergalactic medium (IGM) with the extragalactic background light, producing a dilute beam of ultra-relativistic pairs. It is a matter of recent debate whether the energy of the pair beam is lost due to inverse Compton scattering off the CMB -- resulting in ~10-100 GeV photons -- or heats the IGM via collective plasma instabilities. The astrophysical stakes are very high because of the large amount of energy and extensive cosmic volume involved in this process. We study the relaxation of blazar-induced beams in the IGM, by means of 2D and 3D PIC simulations. We find that at most 10% of the beam energy is deposited into the IGM plasma, so that at least 90% of the beam energy will be ultimately re-processed in the multi-GeV band.

Next Week

- Spring Recess 3/7
- *3/14—Ian Stephens BU IAR*

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