Service d'Astrophysique
SÉMINAIRE

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Lundi 21 avril 11h00

CEA Saclay, Orme des Merisiers Bât 709, p 220

PHOTON BREEDING AS A NOVEL PARTICLE ACCELERATION MECHANISM AND THE HIGH-ENERGY EMISSION FROM RELATIVISTIC JETS

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High-energy photons propagating in the magnetised medium with large velocity gradients can mediate energy and momentum exchange. Conversion of these photons into electron-positron pairs in the field of soft photons with the consequent isotropization and emission of new high-energy photons by Compton scattering can lead to the avalanche of the high-energy photons and pairs fed by the bulk energy of the flow. This is the essence of the photon breeding mechanism.

In this talk, I will discuss the way photon breeding accelerates high-energy leptons that are responsible for the radiation we see from relativistic jets in blazars. I will demonstrate how the action of this mechanism causes dramatic deceleration of the jet converting a significant fraction of its total power into radiation.

I will then compare the prediction of the model to the data on blazars and Fanaroff-Riley I galaxies. The model reproduces basic spectral features observed in blazars including the blazar sequence (shift of spectral peaks towards lower energies at higher luminosities). The significant deceleration of the jet at sub parsec scales reconciles the discrepancy between the high Doppler factors determined by the fits to the spectra of TeV blazars and low apparent velocities observed in these objects at VLBI scales. The mechanism produces significantly broader angular distribution of radiation than that predicted by simple models assuming an isotropic emission in the jet frame. This helps to reconcile the observed statistics of FR I and BL Lac objects with the large Lorentz factors of the jets.

I will also discuss possible sites of operation of the photon breeding mechanism and demonstrate that the accretion disc radiation at the scale of about 100 Schwarzschild radii, the emission from the broad-emission line region, the dust at a parsec scale, the stellar infrared radiation at kpc scale and the cosmic microwave radiation at 100 kpc scale all can serve as targets for photon breeding.

Le cafe sera servi 10 minutes avant
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