Contribution ID: **14** Type: **not specified**

Pair-balance model for relativistic shocks and its application to astrophysical sources

Tuesday, 13 June 2023 16:00 (30 minutes)

Among astrophysical objects whose emission originates from relativistic shocks are active galactic nuclei, gamma-ray bursts, and pulsar winds. Their exceptionally broad spectra are due to synchrotron and inverse Compton emission of accelerated leptons. Although these radiation processes are common in space, the relativistic shocks and shear flows possess an efficient feedback mechanism that sets them apart from other particle acceleration sites.

The feedback operates through inelastic collisions of high-energy inverse Compton photons with low-energy synchrotron photons, that create electron-positron pairs in a region where the flow's velocity is relativistic with respect to the photons' source. The pairs gain energy from the difference in flow's velocity. This constitutes the converter acceleration mechanism.

Whenever it is efficient, the converter acceleration reaches nonlinear saturation regime, where momentum transfer by high-energy photons keeps flow's velocity gradient at minimum necessary for converter acceleration to operate. The balance occurs when photons from the inverse Compton peak in the spectrum have barely enough energy to produce pairs with photons from the synchrotron peak. This balance condition predicts the positions of both synchrotron and inverse Compton peaks, and the ratio of their heights. The predictions are in line with recent observations of TeV emission from gamma-ray burst afterglows.

Primary author: DERISHEV, Evgeny (Institute of Applied Physics, Nizhny Novgorod, Russia)

Presenter: DERISHEV, Evgeny (Institute of Applied Physics, Nizhny Novgorod, Russia)

Session Classification: Tuesday afternoon session