Radiation Emission and Absorption by Astrophysical Jets from XRBs

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High-energy particles and radiation such as protons, pions, muons, neutrinos and gamma-ray photons are known to emit from collimated outflows of magnetized astrophysical plasma known as jets [1-4]. They are being ejected by Active Galactic Nuclei or X-ray binary systems (i.e., quasars, microquasars) [5] consisting of a companion star accreting mass onto a black hole or a neutron star. Thus, forming an overheated accretion disc of charged matter and gas. Jet particles (i.e., protons and electrons) are being accelerated through shock-waves and collide with cold protons of the jet or stellar-winds producing pions [1, 2]. The pions, then, decay into muons, neutrinos and gamma-ray photons that can reach even the Earth and be detected by undersea and under-ice detectors such as Ice-Cube, KM3Net etc. [6, 7]

Our work focuses on the calculation of the produced particle energy distributions and mainly on the intensities of gamma-rays and neutrinos emitted [8-10]. Various cooling and emission mechanisms (i.e., synchrotron emission, collisions) are taken into account in the transfer equation to be solved [1, 8]. We apply this model on prominent examples of Black Hole XRBs such as Cygnus X-1, SS 433, GRS 1915+105, etc. [9, 10]. We also study and work on calculating the absorption of emitted gamma-rays by soft and hard X-ray radiation fields originating from the system's accretion disc, corona and companion star that could strongly affect the jet's gamma-ray intensity that finally reaches the Earth [11].

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