HIGH-ENERGY GAMMA AND RADIO VARIABILITY OF BLAZARS IN THE MODEL OF NON-STATIONARY JETS

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A model has been developed for impulsive VLBI jet formation and gamma ray outbursts of Blazars. Propagation of newly expelled matter in the old channel of a jet is calculated supposing that the main driving force is the electromagnetic field. The new outflowing matter overtakes the old matter and forms double, fast or slow magnetosonic shock fronts. In the region of the fronts, the number of particles and their energy increase continuously with propagation time from the central object (Romanova and Lovelace, 1995). Accelerated electrons and positrons in the front interact with a diffuse field of UV photons (inverse Compton scattering), with the magnetic field (synchrotron radiation), and with synchrotron photons (SSC processes), thus creating radiation in a very wide range of bands. The self-consistent relativistic equations for the number of particles, the momentum, energy, and magnetic flux in the front are derived and solved numerically (Lovelace and Romanova, 1995). The time-dependent apparent luminosities in the radio to gamma ray bands are calculated taking into account the Doppler boost of the photons. The model predicts a short outburst of radiation in gamma rays (weeks or so) connected with Compton processes, a sharp (less than a day) outburst in the X-rays with a smooth decrease of the luminosity connected with SSC processes, and synchrotron radiation changing from infrared to radio bands (Fig. 1A). The lepton distribution function was taken as $f_l = K_1/\gamma^2$ in the main energy containing range, $\gamma_1 \leq \gamma \leq \gamma_2$, steeper distribution $f_l = K_2/\gamma^3$ for $\gamma_2 \leq \gamma \leq \gamma_3$, and even steeper for $\gamma \geq \gamma_3$. For $\gamma < \gamma_1$, f_l is assumed negligible as a result of

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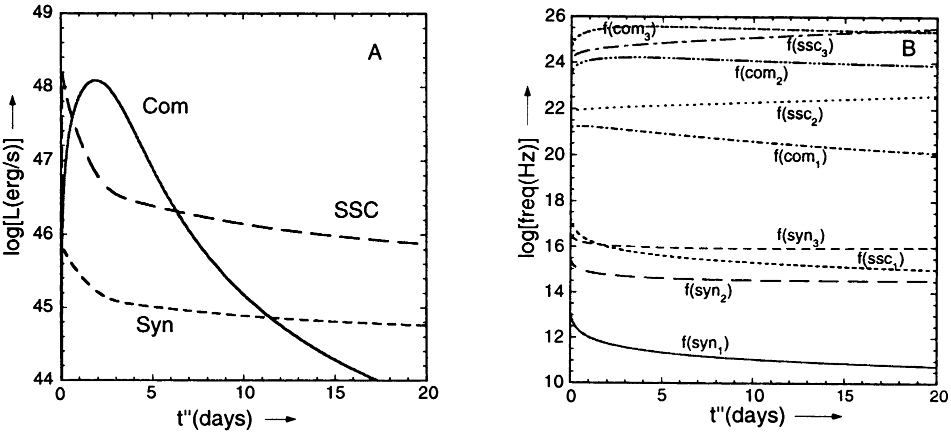

Figure 1. **A.** Apparent luminosities for an observer at an angle $\theta_{obs} = 11.5^o$ to the $z-$axis. **B.** Apparent frequencies of photons radiated by electrons with Lorentz factors γ_1, γ_2, and γ_3 due to different processes

synchrotron self-absorption. The lowest frequency $f(syn_1)$, determined by self-absorption, corresponds initially to the infrared band, and later - to the radio band. From Fig.1B, one can see that radio at 3 mm may start to appear after 2 weeks after outburst. But its maximum may correspond to much later times (months), because $f(syn_1)$ decreases slowly with time. The appearance of the new VLBI component in QSO 0528+134, which approximately coincides with the strong gamma-ray flash and with the beginning of the strong mm radio outburst (Krichbaum, et al. 1995; Pohl, et al. 1995), supports the proposed model.

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