Sixteenth Marcel Grossmann Meeting



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Explaining GRB prompt emission with photospheric emission model

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Although the observed GRB prompt emission spectrum is well constrained, the underlying radiation mechanism is not very well understood. We have explored photospheric emission in GRB jets by modelling the Comptonization of fast cooled synchrotron photons whilst the electrons and protons are accelerated to highly relativistic energies by repeated energy dissipation events as well as Coulomb collisions. In contrast to the previous simulations, we implemented realistic photon-to-particle number ratios of ~100,000 or higher, that are consistent with the observed radiation efficiency of relativistic jets. Using our Monte Carlo radiation transfer code, we can successfully model the prompt emission spectrum when electrons are momentarily accelerated to highly relativistic energies (LF~50-100) powered by ~40-50 episodic dissipation events, for baryonic outflows originating from moderate optical depth ~20-30. We have shown that the resultant shape of the photon spectrum is independent of the photon energy distribution and jet baryonic energy content.

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