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Internal shock model for Prompt GRBs

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Internal shocks are one of the prominent dissipation mechanisms for the prompt gamma-ray emission. In internal shocks, each collision between two shells forms a pair of forward and reverse shocks, which dissipate part of their kinetic energy. This dissipation is governed by the hydrodynamics. However, most studies in the literature treat this as a plastic collision of two infinitely thin shells without any reference to hydrodynamics. In our study we start with basic properties of the central engine and derive the physical properties of the shells before and after their collision. Consequently, we estimate the internal energy dissipation rates at both shock fronts. We find that under generic physical conditions, the shock strengths and the dissipation rates associated with both shock fronts are typically significantly different. In particular, the reverse shock tends to be stronger than the forward shock. This can have interesting observable consequences such as different luminosities, peak times and peak photon energies from these two shocked regions.

Presenter: RAHAMAN, Sk. Minhajur

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