

A New Insights for Early Afterglows –“Magnetic Bullet”

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We study the effects of magnetic acceleration on GRB afterglows by our implemented 1D special relativistic MHD simulation code with adaptive mesh refinement. Our simulation can treat magnetization more than 1, which is an efficient condition for magnetic acceleration. We simulate the interaction between a strongly magnetized thin/thick shell jet and an ambient medium. The Lorentz factor evolution is estimated for a wide range of magnetization of jets. Based on our simulation results, we make a semi-analytic model of the dynamics of magnetized jets called “Magnetic Bullet”. Our proposed model expects an optical gradual flux increase and an X-ray plateau emission. Besides, the model suggests a gamma-ray very steep flux evolution in the magnetic acceleration phase of early afterglows, which might explain the TeV light curve of GRB221009A. We hope the Cherenkov Telescope Array will detect a lot of TeV afterglows in the next decade, a part of which may have a clear detection of the steep rise in TeV bands.

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