

Theoretical Modeling of the Exceptional GRB 221009A

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The gamma-ray burst GRB 221009A stands out as an exceptional event for its intensity, spectral evolution, and duration. We investigate the early afterglow emission of this burst, especially focusing on the unique set of simultaneous GeV-TeV spectral and intensity data obtained by AGILE and LHAASO.

We present the results of a relativistic fireball model with a set of physical parameters that satisfactorily explains the first phases of the afterglow up to 10^4 seconds.

Interestingly, an extension of the model to late times (up to 10^6 - 10^7 seconds) describes the late X-ray and optical spectral and intensity data in a consistent picture. Our results are important in constraining the physics of particle acceleration and evolution in GRB 221009A and can be extended to the analysis of other powerful GRBs.

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