

Abstract Submitted
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Electron acceleration in relativistic GRB shocks¹ MIKHAIL MEDVEDEV, University of Kansas — The shock model of gamma-ray bursts (GRBs) contains two equipartition parameters: the magnetic energy density and the kinetic energy density of the electrons relative to the total energy density of the shock, ϵ_B and ϵ_e , respectively. These are free parameters within the model. Whereas the Weibel shock theory and numerical simulations fix ϵ_B at the level of $\sim \text{few} \times (10^{-3} \dots 10^{-4})$, no understanding of ϵ_e exists so far. Here we demonstrate that it inevitably follows from the Weibel shock theory that $\epsilon_e \simeq \sqrt{\epsilon_B}$. The GRB afterglow data fully agree with this theoretical prediction. Our result explains why the electrons are close to equipartition in GRBs. The $\epsilon_e - \epsilon_B$ relation can be used to reduce the number of free parameters in afterglow models.

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