

Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Cosmic ray effect on magnetization of a relativistic foreshock in an unmagnetized and weakly magnetized plasmas¹ MIKHAIL MEDVEDEV, University of Kansas — Cosmic Rays (CRs) accelerated by a shock form a streaming distribution of outgoing particles in the foreshock region. If the ambient fields are small enough, compared to the shock and CR energetics, the magnetic fields are to be generated in the shock upstream via the Weibel instability. Here we demonstrate self-similar nature of the foreshock region and calculate its structure, e.g., the magnetic field strength, its correlation scale, etc., as a function of the distance from the shock. This result indicates that the entire foreshock region of thickness comparable to the shock radius may be populated with magnetic fields much stronger than the typical interstellar medium magnetic fields. The presence of such fields in the foreshock region can help to explain both the efficient particle acceleration and large radiative efficiency of a gamma-ray burst afterglow shock.

¹This work is supported by grants DE-FG02-07ER54940 (DOE), AST-0708213 (NSF), NNX07AJ50G (NASA), NNX08AL39G (NASA).

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Date submitted: 18 Jul 2008

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