# Particle-in-Cell simulation of the Weibel Mediated Shocks Propagating into the Inhomogeneous Media

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The Weibel instability occurs in collisionless plasma with the temperature anisotropy. It is thought to be important for particle acceleration and generation of magnetic fields in relativistic shocks. Observations of afterglows of gamma ray bursts (GRBs) suggest that magnetic fields are amplified in the large downstream regions of relativistic shocks. However the magnetic field produced by the Weibel Instability decays rapidly, which cannot explain observed properties of afterglows of GRBs. The nonlinear evolution of the Weibel instability has been studied in uniform plasmas so far. In reality, there must be density fluctuations. We proposed a new model for the magnetic field generation in the far downstream region of relativistic shocks. Relativistic shocks propagating to inhomogeneous media make an anisotropic density structure in the downstream region. Then, an anisotropic velocity distribution is generated, so that the magnetic field is generated by the Weibel instability in the far downstream region (S. Tomita & Y. Ohira, ApJ, 2016). We performed two-dimensional particle-in-cell(PIC) simulations of relativistic shocks propagating to the inhomogeneous electron-positron plasmas. We found that there is a larger temperature anisotropy in the far downstream region compared with a uniform case. The observed temperature anisotropy is sufficiently large to generate the required magnetic field. Furthermore, sonic waves propagating to the downstream direction are generated in the downstream regions. In order to investigate whether or not the temperature anisotropy and the sonic wave are also generated in three-dimensional space, we plan to address three-dimensional simulations or laser experiments in future work.