Contribution ID: **160** Type: **contributed talk**

Weibel Mediated Shocks Propagating into the Inhomogeneous Media

Wednesday, 10 July 2019 10:30 (15 minutes)

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 the 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 in interstellar or circumstellar medium. We performed two-dimensional particle-in-cell simulations of relativistic shocks propagating to the inhomogeneous electron-positron plasmas. We found that, for the no-uniform case, the downstream magnetic field keeps a higher amplitude and larger length-scale than that for the uniform case. Furthermore, there is a much larger temperature anisotropy in the far downstream region than that for the uniform case. The downstream temperature anisotropy results from the downstream sound waves excited by an interaction of incident waves with shock waves. The observed temperature anisotropy is sufficiently large to generate the magnetic field required by the GRB observations. We could expect that the upstream inhomogeneity is crucial role for the generation of magnetic field and particle acceleration in relativistic collisionless shocks.

Primary authors: TOMITA, Sara (Aoyama Gakuin University); Dr OHIRA, Yutaka (University of Tokyo)

Presenter: TOMITA, Sara (Aoyama Gakuin University)

Session Classification: Particle acceleration and Radiation processes

Track Classification: Particle acceleration and Radiation processes