Contribution ID: **287** Type: **Contributed talk in mini symposium**

Acceleration of plasma ions driven by high-energy lepton flows via the Weibel instability

Friday, December 15, 2023 12:16 PM (12 minutes)

The interaction of high energy lepton flows with background electron-proton plasma has been investigated with particle-in-cell simulation, focusing on the acceleration processes of background protons due to development of electromagnetic turbulence. Such interaction may be found when plasma jets propagate in the interstellar medium. When an electron-positron beam is injected into the background plasma, the Weibel instability is excited, which soon leads to the development of plasma turbulence. The turbulent electric and magnetic fields accelerate plasma particles via Fermi II type acceleration, where power-law energy spectra are found both for electrons and protons. The accelerated protons provide a dissipative mechanism for the formation of collisionless electrostatic shock waves at later time. Some pre-accelerated protons are further accelerated when passing through the shock wave front. Dependence of proton acceleration on the beam-plasma density ratio and beam energy is investigated. For homogeneous plasma, both acceleration mechanisms are found to be significant; In the case of inhomogeneous plasma, the proton acceleration in the turbulent fields is dominant. The final proton energy increases with the kinetic energy and density of the lepton flow.

Primary author: SHENG, Zhengming (Shanghai Jiao Tong University)

Presenter: SHENG, Zhengming (Shanghai Jiao Tong University)

Session Classification: Plasma Astrophysics