Generation of non-thermal particles in reconnection of e+ - e- plasmas

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Magnetic reconnection in the magnetotail has long been studied and we are studying its application in astronomical electron-positron plasmas.

We have carried out simulations of relativistic magnetic reconnection in e+ - e- plasmas, and found that significantly large amount of high-energy particles are generated through "relativistic-modified" Speiser-like orbit, affected by the strong electric field.

In this talk, we will introduce our simulation results and a new acceleration process.

Magnetic reconnection is the most important acceleration process in the Earth magnetotail. It may also be found in astronomical locations, such as the Crab pulsar's electron-positron magnetosphere.

We have carried out simulations of relativistic magnetic reconnection in e+ - e- plasmas, and found significantly large amount of non-thermal, high-energy particles. These particles are accelerated very effectively near the X-type region, where the electric field is stronger than the magnetic field.

In this region, accelerated particles become heavier by relativistic effect, so that their Larmor radii become longer and longer. In other words, particles are driven in Y the direction by the strong electric field and they are trapped around the X-type region. As a result, particles travel through "relativistic-modified" Speiser-like orbit, and gain a lot of energy by the electric field.

In this talk, we will introduce our simulation results and this new acceleration process. Since this process works very effectively, it may partly account for the origins of non-thermal particles in the universe.