

Bell's instability in the laboratory: pre-experiment simulation study

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The difusive shock acceleration is considered as a process to generate high energy cosmic ray particles. For efficient acceleration, magnetic field fluctuations stronger than the background interstellar field are indispensable in the upstream region of the shock. Bell's instability, a parallel electromagnetic instability driven by streaming cosmic rays, is a candidate for providing the required magnetic turbulence [1]. The properties of Bell's instability had been investigated with MHD studies and PIC simulations [1,2]. We attempt to develop an experiment for testing the saturation level and mechanism of Bell's instability in the laboratory. Here we would present the pre-experiment numerical investigations, based mainly on fully kinetic Particle-In-Cell simulations, that study physical conditions for the Bell's instability to occur in our laboratory experiment and its expected properties.

References

- [1] Bell, A. R. 2004, MNRAS, 353, 550
- [2] Niemiec, J., Pohl, M., Bret, A., & Stroman, T. 2010, ApJ, 709, 1148