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Particle Acceleration due to Radiation Pressure in Relativistic Shock Waves

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Abstract content

A particle acceleration mechanism in relativistic shock waves by an action of radiation pressure is discussed. So far many particle acceleration mechanisms such as diffusive shock acceleration and shock drift/surfatron acceleration have been studied as an important energy conversion mechanism, but our understanding how non-thermal particles are generated is still poor. In this presentation, we discuss a new type of acceleration mechanism due to the radiation pressure of electromagnetic waves in relativistic shock waves by using the particle-in-cell simulation. In a relativistic shock where the upstream bulk Lorentz factor is much larger than unity, it is known that the extraordinary electromagnetic waves (light wave/photon), which are excited by the synchrotron maser instability in the relativistic shock front, can propagate towards the shock upstream region. We discuss that the light wave can generate an intense electrostatic wakefield due to Raman scattering process, and the generated wakefield can quickly accelerate electrons/ions. We argue that the wave energy of the upstream propagating precursor waves can be quickly converted to non-thermal electrons/ions, and the maximum energy of electron can exceed the upstream ion kinetic energy.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 2 (OG part 1), pages 239-242

Primary author(s) : Prof. HOSHINO, Masahiro (University of Tokyo)

Presenter(s) : Prof. HOSHINO, Masahiro (University of Tokyo)

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