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Michigan Institute for Plasma Science and Engineering

Joint Physics/MIPSE seminar

Monday
January 26, 2014
4:00 pm
335 West Hall
Central Campus

Dr. Damiano Caprioli

Princeton University

First-Principles Simulations of Particle Acceleration at Astrophysical Shocks

Particle-in-cell simulations are providing us unprecedented insights into the microphysics of collisionless shocks, also attesting to their ability to accelerate particles and generate magnetic fields. I present state-of-the-art 2D and 3D kinetic simulations of non-relativistic shocks, discussing under which conditions (shock strength and inclination) ions and electrons are injected and energized via diffusive shock acceleration. I also outline how the initial magnetic field is amplified by different plasma instabilities induced by energetic particles, which has both observational and theoretical implications. Finally, I discuss the relevance of these findings for cosmic ray acceleration in astrophysical sources, such as supernova remnants and galaxy clusters.

About the Speaker: Damiano Caprioli received the Laurea (BS) in Physics and Laurea Specialistica (MS) in Physical and Astrophysical Sciences from the University of Pisa, and the Diploma di Licenza (MS) and PhD in Physics from Scuola Normale Superiore di Pisa. He was then post-doctoral research associate at the NAF/Osservatorio Astrofisico di Arcetri (Florence) and the Dept. of Astrophysical Science at Princeton Univ. where he is now an Associate Research Scholar specializing on several aspects of theoretical and computational High-Energy Astrophysics. His research interests include origin and propagation of cosmic rays, particle acceleration at shocks, non-thermal phenomenology of supernova remnants, kinetic theory of astrophysical plasmas, and pulsar electrodynamics.