SPACE AND COSMIC RAY PHYSICS SEMINAR

University of Maryland
Computer & Space Sciences Building, Rm 2400
4:30 PM Monday, September 8, 2003
Tea & cookies 4:00-4:30 PM

Vladimir Ptuskin

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Supernova Remnants as Cosmic Ray Accelerators

The acceleration of galactic cosmic rays in supernova remnants will be discussed in a general context of the problem of cosmic-ray origin. A brief description of the diffusive shock acceleration mechanism and the attendant plasma processes is presented. The instability in the cosmic-ray precursor of a supernova shock moving in the interstellar medium determines the level of turbulence and the rate of cosmic ray acceleration. The maximum energy of accelerated particles strongly depends on the age of a supernova remnant. It can be as high as $10^{17}Z$ eV in young remnants and falls down to about $10^{10}Z$ eV at the end of the Sedov stage (Z is the particle charge). The strong temporary evolution of cosmic ray spectrum is very essential for the interpretation of observations of gamma-ray emission from these objects. The average energy spectrum of cosmic rays injected in the interstellar medium has approximately universal shape and weakly depends on the form of instantaneous spectrum at the shock in the case of high efficiency of acceleration. The scenario of cosmic ray acceleration can be verified from measurements of the elemental abundances of nuclei at energies > 1 TeV/nucleon where the reacceleration of interstellar energetic particles by strong supernova shocks could lead to abnormally high ratio of secondary to primary nuclei.

Sponsored by: Department of Physics, University of Maryland, and the Institute for Physical Science and Technology, University of Maryland

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