

First Circular – Workshop of the International Space Science Institute (ISSI)

8 October 2010

Particle acceleration in cosmic plasmas

Convenors:

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Context: The International Space Science Institute (ISSI) is planning to hold three Workshops on physical processes in cosmic plasmas. The initiative is based on discussions held in an ISSI Forum in March 2009 on the future of magnetospheric research and also subsequently. The objective of the workshops is to broaden the review of space plasma physics to all scales in the Universe. The Workshop on particle acceleration is the first to be implemented. The two subsequent Workshops are expected to cover the “Microphysics of governing processes in cosmic plasmas” and “Multi-scale structure formation and dynamics in cosmic plasmas”.

Objectives of the Workshop:

Critical assessment of acceleration mechanisms and observations on a range of scales from suprathermal particles in the heliosphere to high energy cosmic rays [10^3 eV to 10^{20} eV] and a constructive comparison of acceleration processes across the scales.

The Workshop will cover the following main themes:

- Review of observations of accelerated particles on all scales: *in situ* and remotely from space, and also ground-based, from the magnetosphere to extragalactic scales
- A detailed assessment of the physical processes underlying particle acceleration in the different physical environments: the aurorae, the Earth’s radiation belts, bow shock- and interplanetary shock associated particles, flare-accelerated and generally solar energetic particles, acceleration at and beyond the heliospheric

termination shock, particles accelerated by supernova remnants, jets, pulsars, gamma ray bursts. Competing processes in different physical contexts will be critically evaluated.

- Acceleration mechanisms in general:
 - Shocks and diffusive shock acceleration, magnetic field amplification,
 - Stochastic acceleration (2nd order Fermi): its mechanisms in the different environments, and its possible role on largest scales for accelerating highest energy cosmic rays
 - Turbulent acceleration: the description of mechanism and applicability across the cosmic scales
 - Acceleration in current sheets; acceleration by parallel electric fields; their applicability in different physical contexts
 - Nature of acceleration process and its possible scale-dependence that gives a distribution function with a power law in particle speed, with a spectral index of -5.
 - The contribution of different simulation and modelling studies to the understanding of the particle acceleration processes
- The status of particle acceleration research and future perspectives: identification of shortcomings in the theory, gaps in the observations and the improvements needed to remedy those problems.

Product: Following the Workshop, its output will be published as a volume in the Space Science Series of ISSI by Springer, in parallel with the publication of the papers in Space Science Reviews. It is expected that a total of about 15 to 20 review style and quality papers, submitted to the usual refereeing process will be published in the book. Papers will be based talks presented at the Workshop and will be moderated by the discussions during the Workshop.

Location: The Workshop will be held at the International Space Science Institute, Hallerstrasse 6, 3012 Bern, Switzerland.

Attendance: by invitation only, ~ 40 participants maximum.

Funding: ISSI will provide the subsistence costs (hotel and meals) to all participants, but not the travel costs. There will be no registration charge for the Workshop.

Schedule:

Invitations and First Circular:	8 October 2010
Registration deadline:	30 November 2010
Second Circular and final program:	1 March 2011
Workshop:	16 – 20 May 2011