INTERNATIONAL SPACE SCIENCE INSTITUTE
Hallerstrasse 6 ● CH-3012 Bern ● Switzerland

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

25 October 2011

Microphysics of cosmic plasmas

Convenors:

André Balogh (Imperial College London, UK)
Andrei Bykov (Ioffe Physical-Technical Institute, St. Petersburg, Russia),
Peter Cargill (University of St Andrews and Imperial College London, UK),
Richard Dendy (Euratom/UKAEA Fusion Association, UK)
Thierry Dudok de Wit (CNRS/LPC2E, France)
John C. Raymond (Harvard-Smithsonian Center for Astrophysics, USA)

Local organisation: Jennifer Zaugg, ISSI, jennifer.zaugg@issibern.ch
Phone: +41 31 631 48 96, Fax: +41 31 631 48 97

Date: 16 - 20 April 2012

Context: The International Space Science Institute (ISSI) is holding a series of 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 in cosmic plasmas*" was the first to be held on 16 to 20 May 2011. The second Workshop of the series, to be held in ISSI on 16 to 20 April 2012, will cover the "*Microphysics of cosmic plasmas*". The third Workshop, on "*Multi-scale structure formation and dynamics in cosmic plasmas*" is expected to be held in the first half of 2013.

Objectives of the Workshop:

The workshop will address the physical processes that underlie the observed large-scale properties, structures and dynamics of cosmic plasmas, the matter that fills interplanetary, interstellar and intergalactic space, as well as the solar atmosphere and the Earth's magnetosphere. The Workshop will review the status of understanding of microscale processes in all astrophysical collisionless plasmas. In addition, the Workshop will also consider the lessons that can be learned from the extensive existing knowledge of laboratory plasmas.

The Workshop will cover the following main themes:

- Turbulence as a phenomenological description of the properties of plasmas on all scales
    - General description of turbulence phenomena in space plasmas: the turbulent cascade, driving and dissipation processes
    - Plasma turbulence in the solar wind
    - Experimental and theoretical studies of the dissipation in solar system plasmas
    - Turbulence in the solar photosphere, chromosphere and corona
    - Astrophysical turbulence on all scales (Supernovae remnants, interstellar medium, intergalactic medium, accretion processes)

- A review and assessment of microprocesses in plasmas
    - Hierarchies of plasma instabilities
    - Non-local, non-diffusive transport processes in space plasmas, on astrophysical scales and laboratory plasmas
    - Ionisation and radiation processes

- Magnetic reconnection
    - Collisionless reconnection - conceptual problems and solutions
    - Magnetohydrodynamic reconnection
    - Experimental magnetic reconnection in laboratory plasmas
    - Reconnection in solar system plasmas including magnetospheres
    - The role of magnetic reconnection in astrophysical plasmas

- Shock waves in cosmic plasmas
    - Plasma kinetics of shocks
    - 3D structures and shock reformation
    - Interaction of turbulence with non-linear structures and shocks
    - Electron and ion heating at shocks
    - Relativistic shocks

- Techniques of plasma description
    - The study of in situ space plasma distributions
    - Remote sensing of astrophysical plasmas
    - Lessons from laser and laboratory plasmas

- Summaries
    - A number of summaries will be presented on the topics of the Workshop, to synthesise the achievements and identify and formulate remaining or new 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 on talks presented at the Workshop and will reflect the discussions that are encouraged to be held among the participants 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.
Young scientists: Under its special programme of supporting young scientists, ISSI will invite (in addition) 4 to 6 early career scientists, within 2 years of their PhD, to take a full part in the Workshop.

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

Schedule:

Invitations and First Circular:	25 October 2011
Registration deadline:	30 November 2011
Second Circular and final program:	1 March 2012
Workshop:	16 – 20 April 2012