Energetic Particle Acceleration in Space and Laboratory (SYPA)

gemeinsam veranstaltet von den Fachverbänden
Extraterrestrische Physik (EP) und
Plasmaphysik (P)

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Übersicht der Hauptvorträge und Fachsitzungen

(Zahnklinik)

Hauptvorträge

SYPA 1.1	Mi	17:00–17:30	Zahnklinik	**Particle acceleration in astroparticle physics** — •Reinhard Schlickeiser
SYPA 1.2	Mi	17:30–18:00	Zahnklinik	**Recent results on electron acceleration in solar flares obtained from hard X-ray diagnostics** — •Alexander Warmuth, Gottfried Mann
SYPA 1.3	Mi	18:00–18:30	Zahnklinik	**On runaway electrons** — •Per Helander

Fachsitzungen

SYPA 1.1–1.5	Mi	17:00–19:00	Zahnklinik	**Particle Acceleration**

SYPA 1: Particle Acceleration

Zeit: Mittwoch 17:00–19:00 Raum: Zahnklinik

Hauptvortrag SYPA 1.1 Mi 17:00 Zahnklinik
Particle acceleration in astroparticle physics — •Reinhard Schlickeiser — Institut für Theoretische Physik, Ruhr-Universität Bochum, Bochum

Observations of the photon radiation at TeV energies from cosmic particle accelerators by the H.E.S.S. and MAGIC air Cherenkov telescopes require extreme conditions on the efficiency and quickness of cosmic particle acceleration mechanisms. The main types of electromagnetic acceleration mechanisms are reviewed with special emphasis on their individual strengths and weaknesses.

Hauptvortrag SYPA 1.2 Mi 17:30 Zahnklinik
Recent results on electron acceleration in solar flares obtained from hard X-ray diagnostics — •Alexander Warmuth and Gottfried Mann — Astrophysikalisches Institut Potsdam, Germany

The acceleration of electrons to high energies in solar flares is one of the main unsolved questions in solar physics. A key diagnostic tool for studying this process is the hard X-ray emission generated by the interaction of energetic electrons with the solar atmosphere. In recent years, the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) has significantly advanced our knowledge in this spectral domain, primarily due to its high spectral resolution and simultaneous imaging capability. We will review the most important results of this mission concerning the characteristics of the energetic electrons, and we will discuss what this can tell us about the acceleration mechanism.

Hauptvortrag SYPA 1.3 Mi 18:00 Zahnklinik
On runaway electrons — •Per Helander — Max Planck Instiut für Plasmaphysik, Greifswald

This talk will give a broad overview of the physics of runaway electron acceleration in fusion research, in the Earth's atmosphere and in solar flares. As is well known, the collisional friction that an electron experiences in a plasma decreases with energy. As a result, a steady electric field can lead to virtually unlimited acceleration of electrons above a certain energy threshold. In so-called tokamak "disruptions", this mechanism can convert several mega-amperes of plasma current into a beam of multi-MeV electrons, which can seriously damage the wall on impact. At the same time, it accidentally converts the tokamak into a laboratory for relativistic electron physics, where phenomena such as synchrotron radiation damping and electron-positron pair production take place. The situation is exacerbated by several mechanisms that provide the "seed" of fast electrons from which the runaway avalance can grow. Large-angle collisions, which are not accounted for by the usual Fokker-Planck equation, provide the most efficient mechanism for runaway electron generation in large tokamaks, and are also thought to be responsible for triggering lightning in thunderstorms.

SYPA 1.4 Mi 18:30 Zahnklinik
Hot tail runaway electron mechanism — •Hakan Smith — Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, Deutschland

Hot tail runaway electron generation is caused by incomplete thermalization of the electron velocity distribution during rapid plasma cooling. It is an important runaway electron mechanism in tokamak disruptions when the thermal quench phase is sufficiently fast. Analytical estimates of the density of produced runaway electrons will be presented for cases of exponential-like temperature decay. Numerical simulations, aided by the analytical results, will be used to compare the strength of the hot tail runaway generation with the Dreicer mechanism for different disruption parameters. It is seen that the hot tail runaway production is going to be the dominant of these two primary runaway mechanisms in ITER.

SYPA 1.5 Mi 18:45 Zahnklinik
The acceleration of the Anomalous component of Cosmic Rays revisited — •Reinald Kallenbach[1,2], Martin Hilchenbach[1], and Karin Bamert[2] — [1]Max-Planck-Institut für Sonnensystemforschung, Max-Planck-Str.2,37191,Katlenburg-Lindau,Germany — [2]Physikalisches Institut, University of Bern, CH-3012 Bern, Switzerland

In the years 2004 and 2007, the instruments onboard the Voyager 1&2 spacecraft delivered unprecedented data on the solar wind plasma flow near its termination shock. This shock has been assumed to be responsible for the acceleration of the Anomalous component of Cosmic Rays from a pick-up ion seed population derived from the interstellar neutral gas penetrating the heliosphere. In expectation of the Voyager observations, detailed models have been developed on the acceleration mechanisms for the Anomalous Cosmic Rays. We summarize the different theoretical approaches on injection mechanisms into first-order Fermi acceleration, on stochastic acceleration in the supersonic and subsonic solar wind, and on the mediation and reformation of the termination shock. Comparing the results of these models to the Voyager observations, but also to energetic neutral atom data of SOHO/CELIAS/HSTOF, we try to compose an updated picture of the heliosheath plasma flow and of the structure of the solar wind termination shock.