**Plenary Talk** PV I Mon 9:45 Audimax

**The first wall in fusion experiments - an interface under extreme operational conditions** — •Rudolf Neu — MPI for Plasma Physics — Technical University Munich

With the largest fusion device, ITER, being built through an international collaboration in the south of France, the test for the viability of nuclear fusion for energy production gets within reach. The hot fusion plasma is confined by a strong magnetic field which conducts the edge plasma into the so-called divertor. It extracts the heat and helium ash produced by the fusion reaction, minimizing plasma contamination through the plasma-facing material. In order to deal with the parallel heat flux from the plasma being in the range of $GW/m^2$, a large fraction of the power must be dissipated in the edge plasma by radiation. A further reduction of the power density is achieved by inclining the plasma-facing components (PFCs), leading to power loads in the range of 10 $MW/m^2$. These loads are still larger than those in jet engines by about one order of magnitude and pose huge challenges to the PFCs. For ITER, the adopted solutions are actively cooled PFCs consisting of tungsten armour and heat sinks made of copper alloys. In a future fusion reactor, the demands to the PFCs will be further increased mainly through the considerably larger neutron fluence and lifetime requirements. In order to tackle this, novel metal-metal composites as well as new PFC designs are being developed as risk mitigating alternatives. The presentation introduces the challenges of power exhaust and gives an overview of the state-of-the-art solutions for ITER as well as of novel PFCs for a future fusion power plant.

**Plenary Talk** PV II Tue 9:00 Audimax

**Advances in laser plasma accelerators and their future prospect** — •Wim Leemans — DESY Hamburg, Deutschland

Laser-powered, plasma-based accelerators make electrons surf on waves and can reach multi-GeV energy levels in a few 10*s of cm that, if one relies on conventional methods, would require machines multiple football fields long. Although many challenges remain, this new technology is at the brink of offering a profoundly different way in which we may build particle accelerators. An overview of the latest progress and the next steps in the R&D needed to advance this technology will be presented. Applications such as generation of intense radiation, injection into storage rings, future colliders or medical therapy will be discussed.

**Plenary Talk** PV III Tue 9:45 Audimax

**Precision physics with low energy electron scattering: The physics program at MESA** — •Harald Merkel for the MAGIX-Collaboration — Johannes Gutenberg University, Mainz, Germany

An increasing number of experimental results with clear tension to the predictions of the Standard Model of particle physics suggests a path to access new physics. While the high energy frontier beyond the Higgs particle does not provide an obvious energy range to look for new phenomena, the precision frontier (also in high energy physics!) has promising candidate experiments for the search for new physics.

In Mainz, the electron accelerator MESA (Mainz Energy-recovering Superconducting Accelerator) is under construction. The key to precision physics at MESA is the operating principle of an energy-recovering linac (ERL). An ERL can provide very high luminosities with nearly massless targets, which increases the possible resolution of low energy electron scattering experiments by orders of magnitude.

In this talk, the physics program of MESA will be presented. Two major experimental setups will be installed: the P2 experiment will focus on the determination of the weak mixing angle as a key parameter of the Standard Model via parity violating electron scattering. The MAGIX setup, a multi-purpose experiment with high-resolution spectrometers, will be able to make a significant contribution, e.g. to astrophysical S-factor measurements of the Oxygen nucleo-synthesis, few body physics, proton radius measurements, or the search for messenger particles of the dark matter sector.