

Plenary Talk

PV V Tue 9:00 e415

The first operation of the superconducting optimized stellarator fusion device Wendelstein 7-X — ●THOMAS KLINGER — Max-Planck-Institut für Plasmaphysik, Greifswald — Ernst-Moritz-Arndt Universität, Greifswald

The confinement of a high-temperature plasma by a suitable magnetic field is the most promising path to master nuclear fusion of Deuterium and Tritium on the scale of a reasonable power station. The two leading confinement concepts are the tokamak and the stellarator. Different from a tokamak, the stellarator does not require a strong current in the plasma but generates the magnetic field by external coils only. This has significant advantages, e.g. better stability properties and

inherent steady-state capability. But stellarators need optimization, since ad hoc chosen magnetic field geometries lead to insufficient confinement properties, unfavourable plasma equilibria, and loss of fast particles. Wendelstein 7-X is a large (plasma volume 30 m^3) stellarator device with shaped superconducting coils that were determined via pure physics optimization criteria. After 19 years of construction, Wendelstein 7-X has now started operation. This talk introduces into the stellarator concept as a candidate for a future fusion power plant, summarizes the optimization principles, and presents the first experimental results with Helium and Hydrogen high temperature plasmas. An outlook on the physics program and the main goals of the project is given, too.