P 4: Invited Talks Melzer, Trottenberg

Time: Tuesday 11:40–12:40 Location: B 305

Invited Talk P 4.1 Tu 11:40 B 305

Experiments and Simulations of Dusty Plasmas — •Andre Melzer — Institut für Physik, Ernst-Moritz-Arndt-Universität Greifswald

Particle-containing (dusty) plasmas are ubiquitous in astrophysical situations and are of enormous relevance in various technological applications. For fundamental studies, dusty plasmas are ideal systems to study structural and dynamical properties on the kinetic level of individual particles since in experiments the size and time scales allow a detailed observation by video microscopy. On the other hand, the drastically different time scales of plasma and dust dynamics pose serious challenges for the simulations of dusty plasma systems.

Here, we present kinetic simulations of dusty plasma discharges that allow to reveal the fundamental properties of dust particle charging and the forces acting on the particles. Furthermore, experiments on finite 3D dust clouds, so called Yukawa balls, are presented. In these systems the particles are arranged in concentric spherical shells ("onion shells"). Recent progress in diagnostic techniques allows to determine the particle dynamics of such dust clusters.

Invited Talk P 4.2 Tu 12:10 B 305

Electrostatic microparticle propulsion for space flights — •Thomas Trottenberg, Viktor Schneider, and Holger Kersten — Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität Kiel, 24098 Kiel

Today electrostatic propulsion is still a synonym for ion thrusters, which extract and accelerate ions from a plasma. The resulting propulsive force (thrust) is typically small (< 1 N). The idea of using particles even heavier than heavy ions, i.e. molecules, clusters, and fine particles, suggests itself and is not new [1]. The expected advantage is an increased thrust. At first glance, charging of nano- and microparticles in a complex plasma for their subsequent acceleration could be suitable, but on closer examination this route implicates severe obstacles [2]. Currently investigated concepts for heavy particle thrusters are summarized [3,4], and a new technique developed in our group is presented. It is based on contact charging of solid conductive microparticles up to their limits. The principle known from simulations of micrometeorites [5,6] has to be improved with regard to a reliable and high particle charging and a high mass flow rate.

[1] R. G. Jahn, Physics of Electric Propulsion, McGraw-Hill, 1968
[2] Th. Trottenberg et al., New J. Phys. 10, 063012 (2008)
[3] K. Smith et al., 31st International Electric Propulsion Conference, IEPC-2009-189 (2009)
[4] Gilchrist et al., United States Patent 7,516,610 (2009)
[5] H. Shelton et al., J. Appl. Phys. 31, 1243 (1960)
[6] M. Stübig et al., Planet. Space Sci. 49, 853 (2001)