DIESE WOCHE

PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik
der Johann Wolfgang Goethe-Universität Frankfurt

Mittwoch, den 05.06.2013, 16 Uhr c.t.
Großer Hörsaal, Raum _0.111,
Max-von-Laue-Str. 1

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The University of Warwick

„Warm Dense Matter – States with Complex Physics between Solids and Plasmas "

The term Warm Dense Matter (WDM) describes states with roughly solid densities and temperatures of a few electronvolts. To understand the complex physics of WDM, it might be more informative to define WDM by its characteristics: WDM is (at least) partially ionised, its thermal excitation is comparable to the Fermi energy and the interaction between the particles are strong but not dominant. These comparable energy scales make the usual techniques developed for gas-like plasmas as well as for cold solids inapplicable. Indeed, WDM can often be modelled best as a fluid of charged (quantum) particles. It is the combination of partially ionisation, partially degenerate electrons and strong forces in a liquid that gives WDM its exotic properties.

One motivation to investigate WDM is the wish to model planetary and stellar evolution as WDM dominates the interior of giant planets and the envelopes of stars such as white and brown dwarfs. In such objects, the high pressure of WDM is stabilised by gravity whilst the long evolution allows for sufficient cooling. WDM also occurs in technical applications that require the fast deposition of energy in matter such as inertial confinement fusion or material processing by laser ablation. Here, WDM is created as a transient state and its behaviour depends mostly on its nonequilibrium response to the excitation.

The talk will first give examples of WDM important for astrophysics and fusion research. Then the basic properties and the progress in modelling WDM states will be discussed. One important property is the microscopic ion structure as this quantity allows for a close connection to experimental investigations applying x-ray scattering techniques. Examples for the successful combinations of scattering experiments, quantum simulations and theory will be presented in the main part. A discussion how the recent progress in understanding WDM benefits astrophysics and fusion research will conclude the talk.

Die Dozenten der Physik

Kolloquium

http://www.uni-frankfurt.de/fb/fb13/Termine/index.html