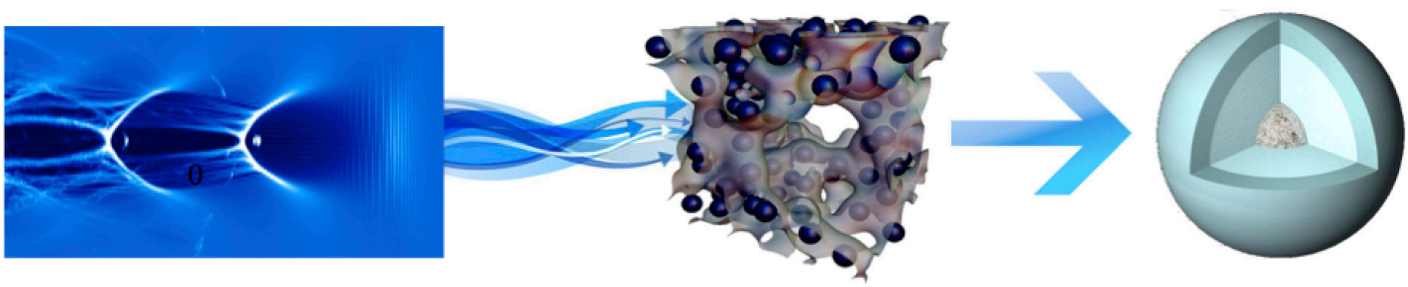
PHYSICS COLLOQUIUM.



Study of structure and Transport Properties of Warm Dense Matter using Ultra-Fast X-rayMethods

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DESY | Zeuthen | Platanenallee 6 | SR 3

This talk will introduce experimental concepts used to study the equation of state and transport properties of Warm Dense Matter (WDM), a type of plasma regime at moderately high temperatures of 0.1 – 100 eV and solid densities common in astrophysical objects such as interiors of planets or crusts of old stars. WDM is also common in dynamic processes such as asteroid impacts. In WDM, the electrons are fully or partially degenerate and the ions strongly coupled, which makes the theoretical description of this state very challenging. WDM can be created in laboratory with the use of powerful lasers and its properties can be studied with novel x-ray methods, which will be described in this talk. With the dawn of ultra-fast ultra-intense laser facilities such as the world-class DRACO facility at HZDR, the pre-equilibrium electron dynamics that are responsible for transport properties such as diffusion, head conductivity or particle stopping powers in WDM, can be accessed for the first time. These transport properties then influence the structure of planets and stars or determine the dynamics of supernova explosions. Applications of this research stem beyond Astrophysics, in particular to inertial confinement fusion (ICF) that could eventually lead to clean energy production.

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