Doctoral Seminar

Graduate Research Training Group (GRK)

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INSTITUT FÜR PHYSIK

Talks in WiSe 2021

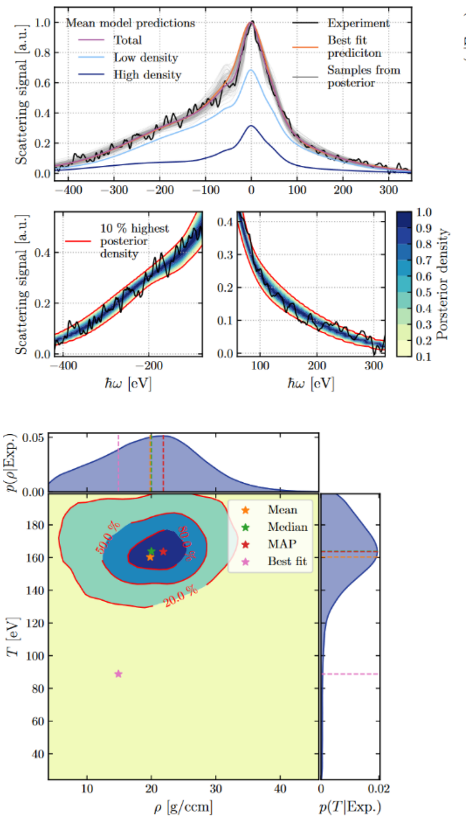
Traditio et Innovatio

Universität Rostock

14th October 2021, 15:00
Maximilian Schörner
Statistical Physics

An ab initio perspective on collective x-ray Thomson scattering at the National Ignition Facility

Red dwarf stars constitute about 76% of all main sequence stars in the solar neighbourhood and are considered to be potential hosts for habitable exoplanets. Understanding the evolution of these stars and predicting the composition in their later evolutionary stages is crucial for studying habitability in their surrounding. Hence, precise equation of state data and conductivities for red dwarf interior conditions, that are governed by several Gbar and hundreds of eV, are needed. For this purpose, we have performed inelastic scattering experiments at the NIF in forward scatter geometry in combination with ab initio simulations to determine the temperature for conditions deep inside red dwarfs via detailed balance and the electrical conductivity from the plasmon collisional damping. This was enabled by performing high-resolution x-ray scattering experiments using a spectrally narrow 9 keV x-ray probe on hohlraum-driven compressed targets. The scattering spectra were analyzed using Bayesian inference and a modified Chihara approach to x-ray Thomson scattering based on ab initio simulations that include scattering contributions of bound and free electrons and a self-consistent calculation of the ionization state. For the first time, electrical conductivities are inferred for the extreme conditions found in the deep interior of red dwarfs.



Talk: English
Slides: English
Location: Great Lecture Hall, Institute for Physics, Albert-Einstein Str. 24