KENT STATE UNIVERSITY

KENT STATE UNIVERSITY PHYSICS COLLOQUIUM

Thursday, April 28, 2016
1:30pm
Smith Hall 111

Refreshments @ 1:15 pm

Irina Sagert

Los Almos National Laboratory

Pasta Phases in Neutron Stars

Neutron stars are astrophysical laboratories for dense neutron-rich matter that enable the exploration of new physics and allow cross-checks with terrestrial experiments. Many neutron star observables such as their temperature, magnetic field, oscillations and rotation are coupled to the properties of the star's crust. Especially the presence of so-called nuclear pasta phases, exotic structures of nuclear matter created by an interplay of nuclear and Coulomb forces, have been shown to affect the electric and thermal conductivities in neutron stars. Furthermore, nuclear pasta phases can be produced during the death of massive stars in core-collapse supernovae and in the ejecta of binary neutron star mergers, which are both discussed as sites for nucleosynthesis. Due to their complex structure, pasta phases are usually studied numerically via Molecular Dynamics or quantum Hartree-Fock simulations. In this talk, I will give an introduction to neutron stars, neutron star crusts and different numerical methods to study pasta phases. I will then present first results from a quantum Hartree-Fock code for pasta phases that is based on the Multi-resolution Adaptive Numerical Environment for Scientific Simulations (MADNESS). MADNESS represents functions and operators via multi-wavelets for an efficient and accurate solution of multi-D integral and partial differential equation problems (such as Hartree-Fock) on modern supercomputers.

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