CENTER FOR NANOHYBRID FUNCTIONAL MATERIALS

MONDAY
DEC. 7, 2015
3:30 – 4:30 PM
W213B NEBRASKA HALL
UNL

Dr. Matthew L. Reinke

Oak Ridge National Laboratory

Making Measurements Above a Million Degrees: Diagnosing Plasmas for Fusion Energy Applications

Economically generating power from thermonuclear fusion is one of the National Academy of Engineering's Grand Challenges of the 21st century, and decades of experimental, computational and theoretical work have brought us closer than ever to making this a reality. The tokamak approach to magnetic confinement fusion energy is briefly reviewed, focusing on the plasma conditions and reactor design necessary to obtain significant energy gain. To demonstrate the physics and engineering basis for the tokamak, smaller-scale facilities are operated around the world where the plasma can be more easily investigated. Still, these devices create a challenging measurement environment, with core temperatures reaching nearly 100 million degrees Kelvin and heat exhausted to special armored surfaces exceeding 10 MW/m^2. The tools and techniques used to diagnose the core and boundary of fusion-grade plasmas are discussed in detail, demonstrating how instruments are used to further our understanding. The important role played by advances in sensor technology is highlighted as well.

Dr. Matthew L. Reinke works for Oak Ridge National Laboratory as an R&D Staff Scientist in the Fusion and Materials for Nuclear Systems Division but is based at Princeton Plasma Physics Laboratory where he is developing diagnostics for the NSTX-U spherical tokamak. Prior to joining ORNL in May 2015, he served as a Lecturer in the Physics Department at the University of York in the UK where he collaborated on the JET and ASDEX-Upgrade tokamaks. Dr. Reinke received his PhD in Nuclear Science and Engineering from MIT in 2011, using the Alcator C-Mod tokamak to demonstrate models of how trace impurities equilibrate in high temperature plasmas. He graduated from University of Wisconsin in 2004 with a BS in Physics and a BS in Engineering Mechanics where he got his start in plasma physics by designing x-ray spectroscopy and visible imaging diagnostics for the Pegasus Toroidal Experiment.

Seminar hosted by Dr. Ming Han, UNL Department of Electrical and Computer Engineering

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