Woodruff School Nuclear & Radiological Engineering/Medical Physics Programs

Nuclear and Radiological Engineering Seminar

"Advances in Control and Understanding of Fusion Plasmas in DIII-D"

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General Atomics, - San Diego, CA

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(901 Atlantic Drive – located directly across from the Neely building)
11:00 AM

ABSTRACT

The mission of the DIII-D National Fusion Facility is to develop the physics basis for the optimization of the tokamak approach to fusion energy production. This optimization seeks to develop integrated physics solutions that simultaneously allow operation at high plasma energy content through avoidance of pressure-limiting instabilities, reduced thermal losses by minimizing turbulence-driven transport, and shielding of the chamber walls from plasma heat exhaust through innovative methods for heat dispersal. Recent DIII-D enhancements have led to advances in the ability to control and diagnose important features of the magnetically confined fusion plasma. Examples of these advances will be presented in this talk with particular emphasis given to recent breakthroughs in plasma control and basic plasma understanding. In plasma control, the most detrimental of large-scale instabilities have been suppressed through use of non- axisymmetric magnetic fields and localized current drive, allowing operation at the theoretically predicted pressure limits. In addition, methods for controlling key plasma profiles have been demonstrated and are regularly utilized for physics studies. Diagnostic instruments, capable of measuring small-scale (~2 mm) turbulent structures, have enabled researchers a first

glimpse into turbulence generation and its self-regulation through zonal flows. Separate measurements have revealed the complex structure of Alfvén instabilities caused by high-energy ions used for heating the plasma to high temperatures. These advances in the understanding and control of fusion plasmas are providing the basis for the successful demonstration of sustained fusion energy production in ITER — an international collaborative experiment aimed at sustaining 500 MW of fusion power for 400 s.

BIO

Dr. Mickey Wade received his PhD. in Nuclear Engineering from Georgia Tech in 1991 and began his research career studying helium transport and exhaust on a DoE Magnetic Fusion Energy Postdoctoral Fellowship at the DIII-D National Fusion Facility in San Diego. As a research staff member of the Oak Ridge National Laboratory for 15 years, Dr. Wade led a diverse set of research programs on DIII-D, including studies of impurity transport, impurity enrichment via induced flows in the edge, edge stability, and advanced scenario development.

This research led to several invited talks at prestigious fusion conferences and over 30 first-author journal publications covering a wide range of topics. Recently, a paper in which Dr. Wade was the primary co-author was awarded the inaugural Nuclear Fusion award recognizing the most outstanding paper in Nuclear Fusion in terms of scientific impact on the fusion community. Dr. Wade has also represented the U.S. on several international scientific committees. In 2006, Dr. Wade was named the Director of the Experimental Science

Division of the DIII-D program and is now responsible for the DIII-D scientific program, which has over 100 participating scientists from the U.S. and abroad.

REFRESHMENTS WILL BE SERVED