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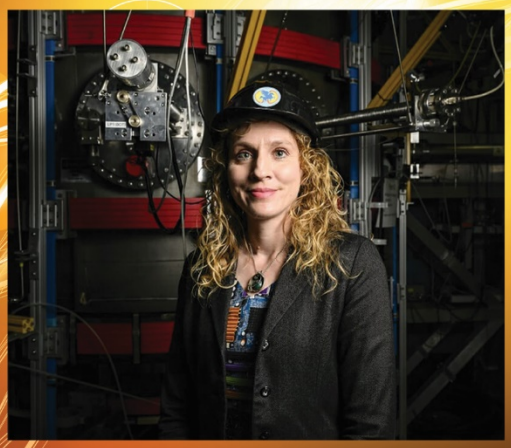
Michigan Institute for Plasma Science and Engineering



Wednesday
December 2, 2020
3:30 pm

Prof. Stephanie Diem

University of Wisconsin – Madison

Exploring Transformative Startup Solutions for Magnetically Confined Fusion Plasmas

The potential to use fusion as a carbon-free, fuel-abundant energy source to meet the world's growing energy demands has motivated significant US and international research. One research path to realize fusion energy involves tokamaks that magnetically confine hot plasmas in the shape of a torus. Almost every tokamak fusion reactor in the world relies on magnetic induction from a central solenoid to drive the current necessary to create a fusion grade plasma. Minimizing or eliminating the need for a central solenoid in a tokamak would greatly simplify the construction and reduce the cost of these devices, increasing their viability for commercial energy production. Solenoid-free startup techniques such as helicity injection (HI) and radiofrequency (RF) wave injection offer the potential of reducing the technical requirements of, or possibly the need for, a central solenoid. A major upgrade is underway for the spherical tokamak, Pegasus-III at the U of Wisconsin. The new facility will be a dedicated US platform to study innovations in plasma startup techniques, allowing for studies of both HI and RF during plasma initiation, ramp-up and sustainment. Experimental plans for RF heating and current drive in the microwave regime will be presented. The new capabilities of Pegasus-III will provide a bold test of the viability of a non-solenoidal compact tokamak using reactor relevant techniques.

About the Speaker: Prof. Diem's research interests are in experimental plasma physics for fusion energy development with emphasis on validating numerical models with experimental data. She focuses on utilizing radio frequency (RF) waves to heat and drive current in magnetically confined plasmas. Prof. Diem's current research is focused on electron Bernstein wave and electron cyclotron heating and current drive experiments on Pegasus-III at UW-Madison as well as collaborations domestically and internationally on RF injection in magnetically confined fusion plasmas. Prof. Diem received her PhD in Plasma Physics from Princeton U. where she developed diagnostics to study electron Bernstein wave emission and mode conversion on the National Spherical Tokamak at the Princeton Plasma Physics Lab. She received a BS in Nuclear Engr. & Engr. Physics from UW-Madison. Prior to joining the faculty at UW-Madison, Prof. Diem was a Research and Development Staff Scientist in the Fusion Energy Division at Oak Ridge National Lab. and was on long-term assignment at the DIII-D National Fusion Facility at General Atomics in San Diego, CA.