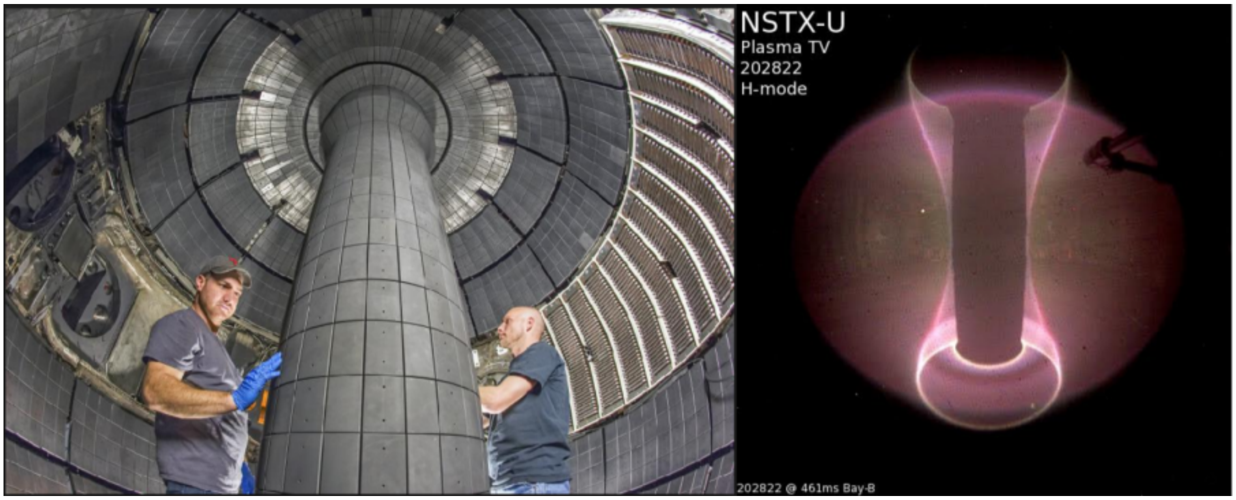
First results of NSTX-U research operations presented

October 25 2016



The new NSTX-U center stack central magnet that doubles the magnetic field and plasma current, left, and an image of NSTX-U H-mode plasma. Credit: Elle Starkman/PPPL Office of Communications. Right: NSTX-U Team.

First results of NSTX-U research operations presented at the International Atomic Energy Agency Conference in Kyoto, Japan

Researchers from the U.S. Department of Energy's (DOE) Princeton Plasma Physics Laboratories (PPPL) and collaborating institutions presented results from research on the National Spherical Torus Experiment Upgrade (NSTX-U) during October at the 26th International Atomic Energy Agency Conference (IAEA) in Kyoto, Japan. The fouryear upgrade doubled the magnetic field strength, plasma current and heating power capability of the predecessor facility and made the NSTX-U the most powerful fusion facility of its kind. Here are first results of the upgrade and related IAEA research presentations.

Physics results of the first 10-weeks of NSTX-U operation

The NSTX-U delivered important physics and operational results during its first research campaign under the run coordination leadership of Program Director Jon Menard and Head of Experimental Research Operations Stefan Gerhardt. Principal results and achievements included:

- Quickly surpassing the maximum magnetic field strength and pulse duration of its predecessor prior to the upgrade.
- Achieving high plasma confinement, or H-mode, on just the eighth day of the 10 weeks of experiments. H-mode is a superior regime for fusion performance.
- Reducing plasma instabilities with beams from a second neutral beam injector that was installed to increase the heating of the plasma. This device fired beams at different angles than the first injector which generated the initial instabilities.
- Changing the propagation direction of other instabilities using the second neutral beam injector. This result is consistent with the new beam significantly modifying the distribution of energetic ions. Providing increased flexibility in the distribution of energetic ions was a major scientific motivation for the new beam.
- Advancing development of methods to prevent plasma disruptions and to ramp down plasma when disruptions can no longer be avoided. Such methods will be critical for ITER, the

international fusion experiment under construction in France, and for all future tokamaks.
- Identifying and learning to correct conditions called error fields that are common to tokamaks and can hinder the performance of fusion plasmas.

Citation: First results of NSTX-U research operations presented (2016, October 25) retrieved 28 April 2024 from https://phys.org/news/2016-10-results-nstx-u.html