

EMBARGOED FOR RELEASE UNTIL
7:00 a.m. PT on Monday, November 5, 2018
MEDIA CONTACTS

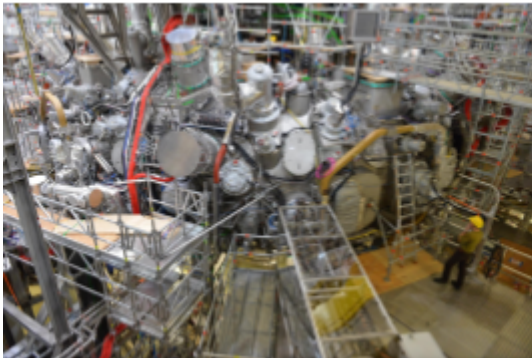
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Peak Performance: New Stellarator Experiments Show Promising Results

Wendelstein 7-X superconducting stellarator successfully completes first operational phase.

PORTLAND, Ore.—Imagine building a machine so advanced and precise you need a supercomputer to help design it. That’s exactly what scientists and engineers in Germany did when building the Wendelstein 7-X experiment. The device, funded by the German federal and state governments and the European Union, is a type of fusion device called a stellarator. The new experiment’s goal is to contain a super-heated gas, called plasma, in a donut-shaped vessel using magnets that twist their way around the donut.

The team completed construction of Wendelstein 7-X, the world’s most advanced superconducting stellarator, in 2015 and, since then, scientists have been busy studying its performance (Figure 1).



*Figure SEQ Figure * ARABIC 1:(Left) Wendelstein 7-X viewed from the outside. Visible is a section of the donut shaped vessel which houses the superconducting magnetic field coils. (Right) Wide angle view of the interior of the Wendelstein 7-X plasma vessel, showing the different armour materials designed to take up the heat from the plasma (Image credit – Glen Wurden, Max Planck Institute of Plasma Physics). The surface contour of the wall follows the shape of the plasma. On average, the radius of the plasma is 55 cm. (Image credit - Bernhard Ludewig, Max Planck Institute of Plasma Physics)*

“The advantage of stellarators over other types of fusion machines is that the plasmas produced are extremely stable and very high densities are possible”, said Dr. Novimir Pablant, a U.S. physicist from the Princeton Plasma Physics Laboratory, who works alongside a multinational team of scientists and engineers from Europe, Australia, Japan, and the United States (the U.S. collaboration is funded by the Department of Energy).

Using a tool called an X-ray spectrometer, Pablant studied the light given off by the plasma to answer an important question: Did the design of Wendelstein 7-X's twisted magnetic field work? His results indicate that, indeed, the plasma temperatures and electric fields are already in the range required for peak performance (Figure 2). He will present his work at the American Physical Society Division of Plasma Physics conference in Portland, Ore.

If the scientists working on Wendelstein 7-X are successful in optimizing the machine performance, the plasma contained in the donut will become even hotter than the sun. Atoms making up the plasma will fuse together, yielding safe, clean energy to be used for power. This achievement is a major milestone as it shows that it is possible to achieve temperatures of more than 10 million degrees in high-density plasmas using only microwaves to heat the electrons in the plasma. This achievement takes us one step closer to making fusion power a reality.

For additional information see also: [1] www.ipp.mpg.de/4413312/04_18

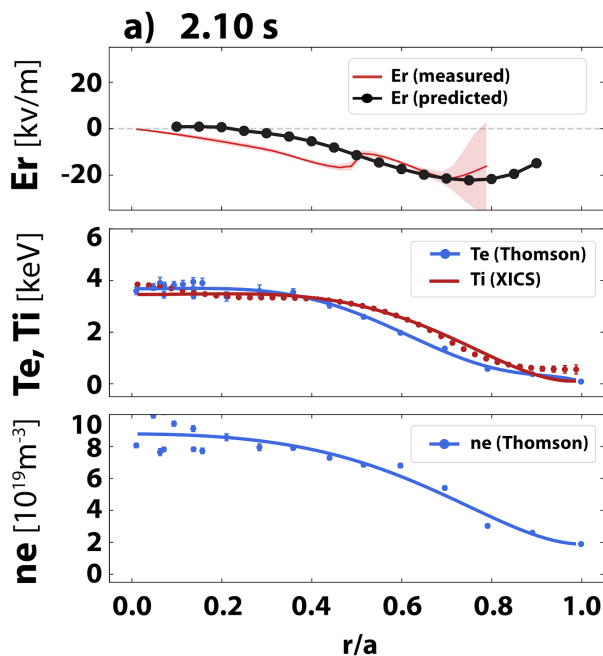


Figure SEQ Figure * ARABIC 2: Profiles of electric field, ion and electron temperature, and electron density closely match the predicted range for peak reactor performance. A radius of $r/a = 1.0$ corresponds to 55 cm. Electron density and temperature are measured by scattering the light of a high-energy laser on the plasma electrons (Thomson scattering). Electric field and ion temperature are derived from high resolution X-ray spectra. The electric field is an indicator that the transport regime for investigating the optimized confinement has already been achieved. The temperatures correspond to an impressive 40 million degrees.

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Abstracts

[FR1.00001](#)

[Performance of the Wendelstein 7-X stellarator during the first divertor operation phase](#)

Session

[FR1: Review: Performance of Wendelstein 7-X Stellarator Plasmas During the First Divertor Operation Phase](#)

8:00 AM–8:00 AM, Tuesday, November 6, 2018

[YP11.00045](#)

Session

Room: OCC Oregon Ballroom 201-203

[Heat transport and core turbulence measurements on the optimized stellarator Wendelstein 7-X](#)

[YP11: Poster Session IX: The crossover between](#)

[high-energy-density plasmas and ultracold neutral plasmas ;](#)

[Supplemental; Post-Deadline Abstracts](#)

Room: OCC Exhibit Hall A1&A