stellarator news

An international journal of news from the stellarator community

Editor: James A. Rome Issue 191 July 2026

E-Mail: James.Rome@ stelnews.info Phone: +1 (865) 566-7991

On the Web at https://stelnews.info

Completion of LHD experiments and future progress beyond the LHD era

On 25 December 2025, the National Institute for Fusion Science (Toki, Japan) completed its plasma experiment using the Large Helical Device (LHD), which features the world's first large-scale superconducting magnet system. LHD has operated since its first plasma was created on 31 March 1998. We sincerely appreciate the contributions of all our collaborators throughout the years.

LHD has been promoting research with the primary goal of achieving a comprehensive understanding of toroidal plasmas and exploring the possibility of realizing a steady-state reactor. Over the past 27 years of operation, LHD has provided research opportunities by conducting 200,252 plasma shots using a steady-state magnetic field generated by the superconducting magnets, high-power heating devices, and, above all, a variety of high-preci-

In this issue . . .

Members of the LHD team gathered to celebrate the end of a successful experiment.

sion diagnostics. We have opened a new frontier in plasma science using LHD.

The plasma parameters achieved include a high-temperature plasma of 10 keV, a high-beta plasma of 5.1%, a high-density plasma of 1.2×10^{21} m^{-3} with a core pressure exceeding atmospheric pressure. The plasma was maintained in a steady state for approximately 3,000 s at temperatures above 2 keV. By investigating the internal structure and behavior of plasmas with various high-resolution diagnostics, we have made significant discoveries that offer a scientific basis for assessing the confinement characteristics of fusion plasmas in the future. These discoveries include insights into isotopic effects, abrupt instability, non-local transport, and collisionless energy transport. We have made all plasma experimental data public, totaling 2 PB of data obtained over 27 years of LHD experiments. This data undoubtedly holds many more potential discoveries. We look forward to continued collaboration and future research using LHD data on demand.

Furthermore, LHD is proud to have made significant advancements not only in plasma physics but also in the core technologies essential for fusion reactors. These include the long-term stable operation of superconducting magnets and cryogenic systems that supported experimental campaigns, as well as the world-leading development and operation of negative-ion source neutral beam injection (NBI) systems, which are essential for the operation of large-scale fusion devices such as ITER.

Our past research achievements and the strong human connections cultivated through fruitful collaboration form a solid foundation for our future progress beyond the LHD project. In 2026, the National Institute for Fusion Science initiated a new project called the "Micro-Collective Phenomena of Ultra-high Temperature Plasmas, and Fusion Science" (MCPoP Project). We would like to ask for your continued active involvement and participation in this collaboration.

We are pleased to announce that the International LHD Workshop will be held at the Nagoya Noh Theater (https://www.nagoya-info.jp/en/spot/detail/36/) from 15 to 19 February 2027. The workshop will include a mix of invited lectures, contributed talks, and poster presentations. For more information, please visit the Workshop website (https://lhdws2027.nifs.ac.jp/). We look forward to seeing you there.

The LHD Team