



China's First Superconducting Tokamak Retires

Next time you want to see HT-7 you will have to go see it in its new home, ASIPP's new energy center in Huainan (80 km west of Hefei). It will ultimately become a museum exhibit, showcasing an important period of history and bearing witness to the development of fusion research in China over the past two decades.

Recently the HT-7 Tokamak was officially endorsed for retirement by the Chinese Academy of Sciences and the Ministry of Environmental Protection after a three-month review of the feasibility of retirement and the retirement plan that included an assessment of scrap equipment and environmental impact. This is the first mega-science device that has ever been taken out of service in China.

HT-7, the world's fourth—and China's first—superconducting tokamak, entered service in 1995 and has fulfilled all of its scientific missions, running nearly 20 rounds of experiments, discharging 11,800 plasma shots, nurturing three generations of Chinese fusion scientists and achieving a 400-second record in long plasma discharges.

Its story dates back to early 1990 when Prof. B. B.

Kadomtsev, a distinguished plasma physicist and former director of the Nuclear Fusion Institute of RRC “Kurchatov Institute” in Moscow, expressed his Institute's willingness to transfer the T-7 Tokamak to ASIPP as a gift in his letter to Hefei.

After discussing logistical, management and technical considerations with his colleagues, as well as the engineering and physics challenges, then ASIPP director Prof. HUO Yuping made a prompt and bold decision to accept the offer.



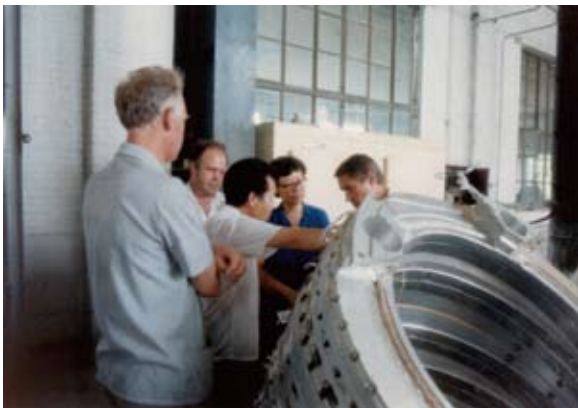
Prof. B. B. Kadomtsev in Hefei in October 1993.

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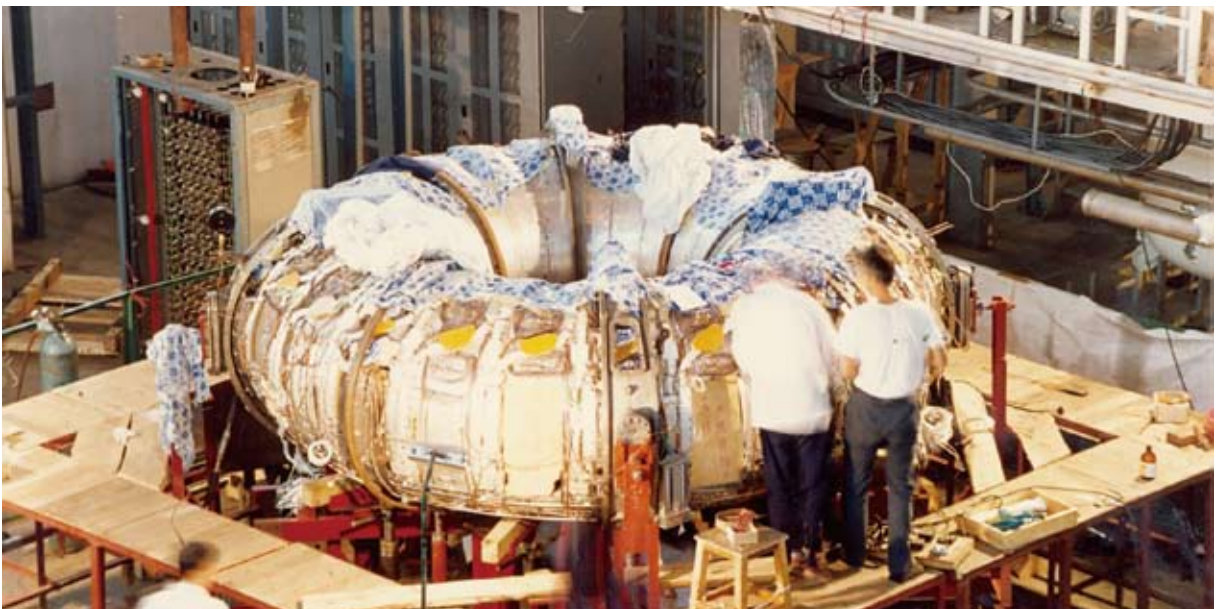


Prof. HUO Yuping (right) of ASIPP and Prof. Evgeny P. Velikhov, then Vice-President of the Soviet Academy of Sciences, in February 1995.



Russian and Chinese scientists working together on the reconstruction of HT-7 in October 1993.

HT-7 vacuum vessel under construction.



The decision received strong support from the Chinese Academy of Sciences and government authorities.

From 1991 to 1994, T-7, together with its subsystems, was transported to Hefei. Despite economic hardship at that time, ASIPP pooled its human and financial resources to rebuild the T-7 Tokamak, which was renamed “HT-7” with an additional “H” standing for the city of Hefei.

After commissioning in March 1995, HT-7 was put into operation the same year, a milestone achievement which made China the fourth country in the world after Russia, France and Japan to have a superconducting tokamak.

In order to conduct long-pulse, high-performance plasma operation and related physics research on HT-7, ASIPP developed dozens of systems and technologies such as the radio frequency wall conditioning technology, the water-cooled graphite limiter, the 1.5 MW/20-110 MHz radio frequency heating system, the real-time multi-variable feedback plasma control system and the 2.45 GHz/1.2 MW lower hybrid current drive technology.

In total, HT-7 has discharged up to 11,800 shots in nearly 20 experiment campaigns, which explored graphite limiter operation mode, high parameter plasma characteristics with wave heating and drive, and long-pulse high-performance operation modes. On March 21, 2008, it achieved a 400-second plasma record with central electron temperature of 12 million degrees and central plasma density of $0.5 \times 10^{19} \text{ m}^{-3}$.

Thanks to the construction and operation of HT-7, ASIPP has greatly enhanced its R&D capabilities and cultivated a team of engineers and scientists willing to brave hardship and challenges, a trustworthy “team of accomplishments”. Meanwhile, via HT-7, ASIPP has greatly promoted



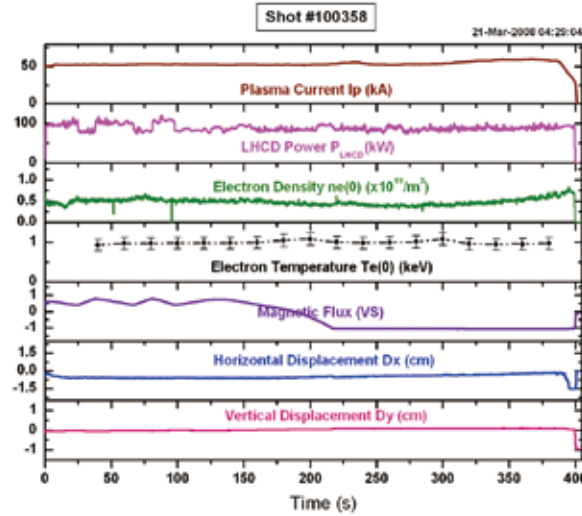
international cooperation with overseas colleagues.

The valuable experience and manpower training resulting from HT-7 exploitation paved the way for the successful construction and operation of EAST, and laid a solid foundation for China's contribution to ITER. More importantly, it is a great fortune for China's future fusion research and construction projects.

To those who have worked for and on HT-7, the tokamak represents a huge part of their lives, a legend of tears and laughter. The day of October 12, 2012 will always be a day to remember for ASIPP staff: three generations of ASIPP scientists gathered in the HT-7 tokamak control room to witness the last plasma discharge of their beloved machine and to say goodbye. HT-7 did not let them down. It put a beautiful full stop to its career by giving a mighty and last shot amid thunderous cheers and applause.

At last! Time to rest, old pal. (Article by Ms. DONG Shaohua from ASIPP. Photos by ASIPP)

Group photo: ASIPP scientists and their old pal.



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