

The 10th Anniversary Celebration of KSTAR's First Plasma



The 10th anniversary celebration was held at the COEX Convention & Exhibition center in Seoul on February 20, 2019

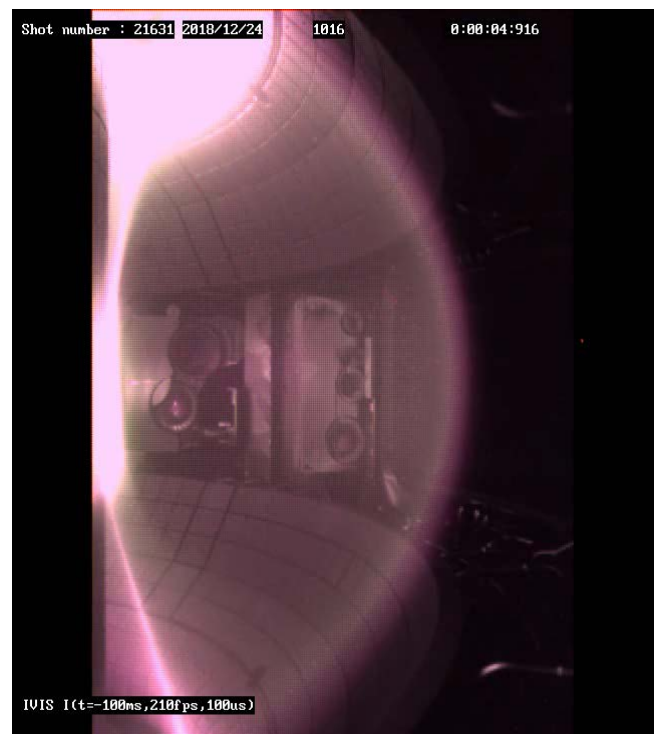
On February 20, 2019, the National Fusion Research Institute (NFRI) held the 10th anniversary celebration of KSTAR's first plasma at COEX, Seoul, sharing its research achievements that have been won as well as plans and visions for the future.

The event was attended by Mun Mi-Ock, the 1st vice minister of Science and ICT, Wohn Kwangyun, the chairperson of National Research Council of Science and Technology, members of the National Assembly including Kim Sung-Soo, Shin Yong-Hyeon, Kim Kyung-Jin, and more than 300 guests from industry, academia, and research institutes related to nuclear fusion research in Korea. Heads of international nuclear fusion agencies from the United States, Europe, Japan, and China were also present at the celebration.

Yoo Suk-Jae, the President of the NFRI, remarked in a welcoming address that KSTAR's globally recognized research achievements over the past decade have been the largest driving force in Korea's growth as a leader in the nuclear fusion arena.

In 2009, KSTAR drew international attention by maintaining a plasma current of 300kA for 2 seconds. In 2011, the KSTAR experiment succeeded in suppressing Edge-localized-modes (ELM), one of the biggest nuclear fusion challenges, and new observations were made through the Electron Cyclotron Emission Imaging(ECEI) system.

There were continuous breakthroughs. KSTAR achieved long sustainment of high-performance mode (H-mode) plasmas, 20 seconds in 2013 and 40 seconds (0.5 mA) with high efficiency in 2014. After the success of suppression of ELM for the world's longest time (34 seconds) in 2017, the superconducting tokamak maintained the plasma ion temperature of 100 million degrees which is regarded as the most critical operating condition of a nuclear fusion reactor for 1.5 seconds and sustained H-mode plasmas for 90 seconds in 2018.



KSTAR achieved a plasma core ion temperature of over 100 million degrees (December 24, 2018)

“KSTAR’s mission is to develop a technology to maintain high-temperature, high-density fusion plasmas for a long term. Given that raising an ion temperature is not easy since ions are heavier than electrons, maintaining 100 million degrees for 1.5 seconds, however short it may seem, is a great milestone. We will continue to work on these challenging research to sustain ultra-high temperature plasmas for 10 seconds within this year and 300 seconds by 2025”, says Vice president Lee Hyeon-Gon presenting a future plan for KSTAR in the event.

“The establishment of KSTAR was made possible through technological cooperation with the U.S., Europe, Japan, and Russia in the 1990s. I hope that Korean scientists will pass on KSTAR technologies to ITER and return to Korea with what they have learned to make a contribution to the development of domestic nuclear fusion research”, said Lee Gyung-Su, DDG & Chief Operating Officer at ITER Organization in his pep talk.

ITER Organization’s Director-General Bernard Bigot sent a congratulatory video message, praising that “KSTAR has contributed greatly to the accumulation of knowledge and experimental data of the research to be conducted at ITER and he expects continuous development of KSTAR since its success is closely related to ITER’s success.”

“KSTAR’s achievements hold significant meaning. The study on plasmas had been limited on a theoretical level until KSTAR turned theoretical studies into practical nuclear fusion experiments last year. In particular, as National Ignition Facility (NIF) of the U.S., a laser-based fusion research device, has been performing below expectations, tokamak fusion reactors (such as KSTAR) are regarded as the most promising for the moment”, said Steven Cowley, director general of the U.S. Department of Energy’s Princeton Plasma Physics Laboratory (PPPL), at a joint press conference held to share KSTAR’s research achievements and visions for nuclear fusion in the wake of KSTAR’s 10th anniversary celebration.



Joint press conference with great international scholars in celebration of the 10th-anniversary (Left to right) Deputy Director General Yutaka Kamada at Naka Fusion institute, Program Manager Tony Donn  at EUROfusion, Director General Steven Cowley at PPPL

Program manager Tony Donn  at EUROfusion, Europe’s leading fusion research consortium, gave a positive assessment of KSTAR, saying “If the 100 million-degree ion temperature can be sustained for a longer time than the present level of 1.5 seconds, it will create an environment where researchers can work on the studies necessary for commercializing nuclear fusion energy.”

“KSTAR is a device capable of achieving both high temperature and long sustainment. They are very important for plasma operation and KSTAR has already shown its potential last year”, said Yutaka Kamada, deputy director general of Naka Fusion Institute, National Institutes for Quantum and Radiological Science and Technology (QST). He is in charge of the JT-60SA project, the Japanese large superconducting tokamak fusion device. Kamada expressed his expectation, adding that ITER, KSTAR, and JT-60SA will play a significant role in joint research for fusion energy commercialization.opportunity to attend and promote themselves.

Prior to the 10th anniversary celebration, the NFRI held the 9th KSTAR Program Advisory Committee Meeting (PAC) from February 18 to 19, 2019. Nuclear fusion experts representing various countries gathered at this event to review KSTAR operation and its research outcomes before advising on the future direction of plasma experiments and long-term research plans.

“The development and verification of a predictive model for ELM suppression, which makes it possible to maintain plasma stability with external magnetic fields, have been highly praised,” said Yoon Si-Woo, the director of KSTAR Research Center, NFRI. He added that at the PAC, KSTAR’s achievements and plans were reviewed by nuclear fusion experts from home and abroad and every effort will be made for the KSTAR to continuously lead the way in solving challenges for nuclear fusion commercialization.

Meanwhile, the NFRI held the KSTAR Conference 2019 for three days from February 20 to 22 following the 10th anniversary celebration of KSTAR operation. In the conference, participants shared not only KSTAR’s research achievements but also the recent status and results of nuclear fusion programs conducted in countries around the world.



The KSTAR Conference 2019