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| KSTAR - The Korean Superconducting Tokamak Advanced Research device achieved its first transition to H-mode. |

□ The National Fusion Research Institute (president Gyung-Su Lee), announced at a briefing on Wednesday November 24th that the superconducting device KSTAR**1)** achieved for the first time an advanced plasma condition called H-mode2) which is called as a higher confinement mode.

**1)** **KSTAR (Korean Superconducting Tokamak Advanced Research)**

The superconducting fusion device was developed using domestic techniques for the development of fusion energy, a future green energy source. The device was built with superconductive material that will also be used in ITER. After the main device construction from 1995 to 2007, it has now entered into an operational phase after demonstrating its ability in 2008 with the production of its first plasma.

**2) H-mode (High Confinement Mode)**

: The H-mode is a status when the energy and particle confinement times significantly increase in tokamak devices. This was first discovered in 1982, in the ASDEX Tokamak device in Germany and is an indication of greatly improved performance from KSTAR. KSTAR is the first all-superconducting device to achieve H-mode, and the first ever to achieve H-mode in a superconducting fusion device. ITER is set to operate in H-mode as well.

○ ITER3) is planning to operate in H-mode and KSTAR is the first all-superconducting device to achieve H-mode. The early achievement of H-mode operation in KSTAR shows the superior design of the device and because it shares a similar design to ITER. This represents a major step forward in the goal to achieve fusion energy.

**3) The ITER (International Thermonuclear Experimental Reactor) Project**

: The ITER Project is an international collaborative research and development project in which Korea and six other technologically advanced partners (European Union, Japan, USA, Russia, China, and India) have joined to construct and operate the ITER fusion research reactor.

□ The NFRI also said that the KSTAR experiment has progressed with both domestic and foreign joint research participants which began in September for approximately 2 months which achieved results above target goals. Both H-mode and D-shaped4) plasma has been made by applying advanced plasma control technology.

**4) D-shaped plasma**

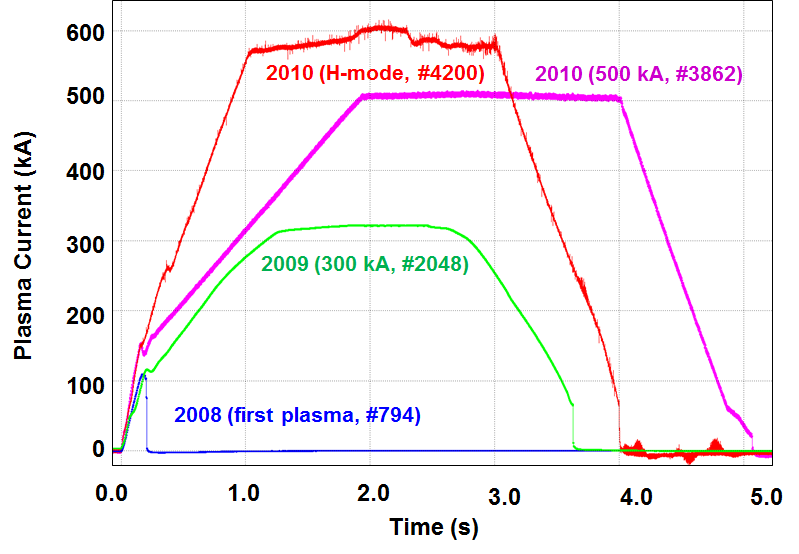
: The cross-section of the plasma is controlled to the shape of D. In this state the plasma surface boundary could be detached from the wall surface and impurities could be expelled through the up and bottom divertor so it could be called as “Divertor plasma” also. This shape is needed for H-mode operation.

○ KSTAR achieved a plasma current up to 700 kA and plasma duration up to 6.7 seconds in this campaign. Those values have been achieved in the year 2009 after having achieved a current up to 300 kA for more than 3 seconds.

○ The D-shaped plasma was achieved also by accurate magnetic field control using the superconducting coil with combining the fast feedback control using the newly installed fast vertical control coils inside the vacuum vessel.

○ Neutral Beam Injection (NBI) is a plasma heating technique developed by a domestically built source. It was used in its first operation to raise the ion temperature was measured to be about 2 keV (about 20 million oC) in H-mode when the neural beam injected up to 1.4 MW. As a result, high energy neutrons from the fusion reaction were detected also.

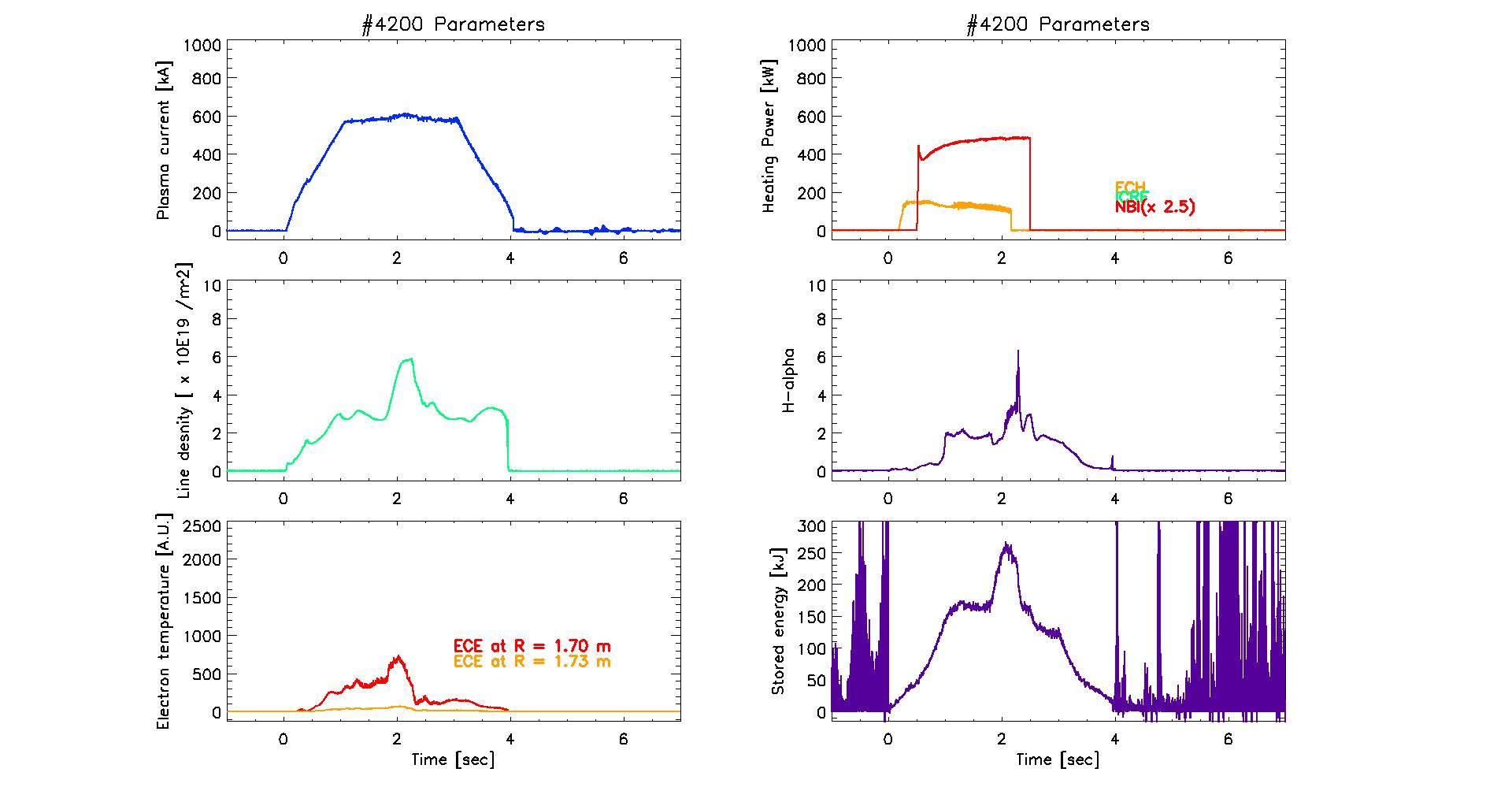
**Attach #1. Plasma current progress from the 2008 to 2010 operation campaign**



**Attach #2.** **Achievement of D-shaped Plasma control**

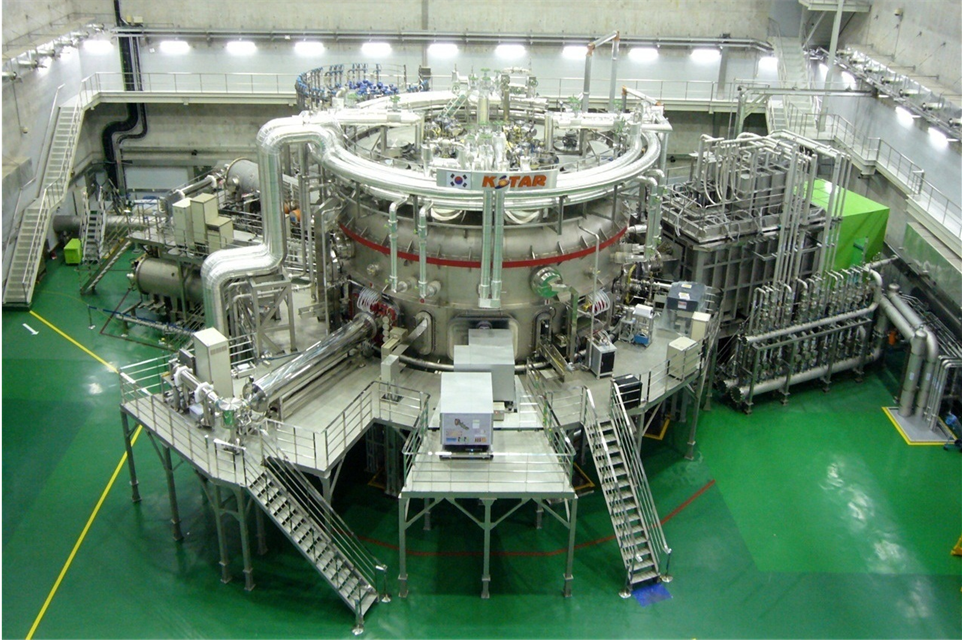
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| Bird-eye view of vacuum vessel and internal components | D-shaped plasma in vacuum vessel |

**Attach #3. Plasma parameter variation at the first H-mode transition events**



Bo = 2.0 T, Heating = 1.5 MW (NBI : 1.3 MW, ECH : 0.2 MW)

After Boronization on 2010. 11. 07

**Attach #4. Photo of KSTAR device**