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Thu-Af-Po.11-05: Operation results of JT-60SA cryogenic system in pulsed heat mitigation control for plasma operation

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JT-60SA is a superconducting tokamak for plasma fusion experiment developed in Japan. This is a joint international research and development project under the Broader Approach Agreement between Japan and Europe. The mass of the superconducting magnet system for JT-60SA is 750 tons. To cool down the magnets, the Helium Refrigeration System, which has an equivalent refrigeration capacity at 4.5 K of 9 kW, has been installed in 2016, and the assembly of JT-60SA was completed in March 2020. The first commissioning phase was conducted from October 2020 to March 2021, and the second commissioning phase and first plasma operation was conducted from May to December 2023.

The refrigeration system supplies a forced flow of supercritical helium to the magnets by using 2 cold circulators. The nominal heat load coming from magnets during TF magnet operation is 3 kW, but transitional pulsed heat loads are applied on magnets and magnet structures during plasma operation or magnet discharge event. A major feature of the refrigeration system is its 7 m^3 liquid helium buffer tank to mitigate pulsed heat load to optimize system requirements. This method of using a buffer tank to conduct heat load mitigation control is also adopted in ITER. However, the control logic has not been tested yet in a large-scale refrigeration system such as JT-60SA.

In this presentation, the operational result of the JT-60SA refrigeration system and the result of the pulsed heat mitigation control will be described.

JT-60SA was jointly constructed and is jointly funded and exploited under the Broader Approach Agreement between Japan and EURATOM.

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