



Contribution ID: 823

Type: **Poster Presentation**

C2Po1G-02 [39]: The construction of 3.8K sub-cooling system for the KSTAR ancillary system

Tuesday, 23 July 2019 09:00 (2 hours)

The Korea Superconducting Tokamak Advanced Research (KSTAR) has been operated for the basic research of fusion energy and its 11th campaign was performed in 2018. It was necessary to construct new cryogenic facility in order to operate the KSTAR ancillary system for the advancement of KSTAR plasma performance. The KSTAR Upgraded Helium supply System (UHES) was constructed in 2016 which is composed of the helium liquefier with the capacity of 1kW@4.5K and the new distribution box which is called DB#3. The KSTAR UHES supplies liquid helium to the cryo-panel of new neutral beam injection system (NBI-2), KSTAR in-vessel cryo-pump (CPI) and hydrogen pellet fueling system since then. In order to achieve higher pumping performance of the NBI-2 cryo-panel, the feed temperature of liquid helium from the UHES should be lower to 3.8K.

The basic study of 3.8K liquid helium circulation loop was completed in 2016 and the requirement of 3.8K sub-cooling system was established which is consisting of a built-in liquid helium reservoir, helium sub-cooling system and a cold compressor with the specification of 20 g/s and pressure ratio 1.67. The cold compressor was manufactured by ATEKO a.s. in Czech Republic and its mechanical testing was completed at the ambient temperature 2018. The installation work is in progress and the commissioning will be performed in 2019. The UHES is expected to supply 3.8K cryogen to the KSTAR NBI-2, CPI and PIS from the 12th KSTAR campaign. This paper will present the basic study result of 3.8 K sub-cooling LHe circuit, cold compressor manufacturing and its testing result. Also, the latest progress of cold compressor commissioning will be described.

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Session Classification: C2Po1G - Sub-Atmospheric Refrigeration