

R&D status of Indian Test Facility for ITER DNB characterization

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Indian Test Facility (INTF) is a R&D facility under development at Institute for Plasma research (IPR), Gandhinagar as a part of the neutral beam development from negative ion source (NNBI) program. The major advantage of the INTF besides developing the beams from large ion sources is to characterize and benchmark the ITER Diagnostic Neutral Beam (DNB) to the desired specifications over transport lengths of ~ 21m, a unique feature of this test bed. Such a study will enable establish the expected power to be delivered by DNB into the ITER plasma, an important parameter to estimate the S/N ratio expected from the He ash measurements by CXRS in ITER plasmas. The INTF beam line has a one to one correspondence with the DNB in ITER in terms of the components, their placement and the inter component distances. However, the 9 m long 4.5 m dia vacuum vessel with a top openable lid and with double O rings seals for the vacuum is different from the rectangular vessels envisaged at ITER. The other difference is the 12 number of modular cryopumps providing the same pumping surface as the single panel ITER cryopumps. In addition, the beam characterization at 21 m is planned with a second calorimeter housed in the vacuum vessel connected to the end of the duct. The Data acquisition and Control system is developed using ITER CODAC platform and integrates around 800 channels from all plant systems for enabling safe remote operations. Extensive physics and thermomechanical calculations for various types of operational heat loads and loads due to various accidental scenarios have been performed to finalise the component design. Adequate choice of materials, manufacturing and jointing processes compatible to ITER safety standards has been made in order to make the components adhere to the safety and quality classification thereby ensuring that the components survive the ITER life time while operating in harsh nuclear environments. The components are currently in various phases of manufacturing and the first operations INTF are anticipated in Q4 of 2019. The experiments on INTF are supported by single driver test bed, ROBIN, and the two driver TWIN source. The paper will describe the R&D status of different components and auxiliary systems of Indian Test Facility (INTF), the envisaged experimental program of operation and some results from operational test beds.

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