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Conceptual Design of Experimental Helium Cooling Loop for Indian TBM R&D Experiments

Authors : B. K. Yadav, A. Gandhi, A. K. Verma, T. S. Rao, A. Saraswat, E. R. Kumar, M. Sarkar, K. N. Vyas

Abstract : This paper deals with the conceptual design of Experimental Helium Cooling Loop (EHCL) for Indian Test Blanket Module (TBM) and its related thermal hydraulic experiments. Indian TBM team is developing Lead Lithium cooled Ceramic Breeder (IN-LLCB) TBM to be tested in ITER. The TBM box structure is cooled by high pressure (8 MPa) and high temperature (300-500C) helium gas. The first wall of TBM made of complex channel geometry having several parallel channels carrying helium gas for efficient heat extraction. Several mock-ups of these channels need to be tested before finalizing the TBM first wall design and fabrication. Besides the individual testing of such mock-ups of breeding blanket, the testing of Pb-Li to helium heat exchanger, the operational experience of helium loop and understanding of the behaviour of high pressure and high temperature system components are very essential for final development of Helium Cooling System for LLCB TBM in ITER. The main requirements and characteristics of the EHCL and its conceptual design are presented in this paper.

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