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Development of Experimental Helium Cooling Loop (EHCL) for testing nuclear fusion blanket components

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Institute for Plasma Research is developing an Experimental Helium Cooling Loop (EHCL) as a part of R&D activities in fusion blanket technologies. This helium cooling system is designed for testing various nuclear fusion components such as tritium breeding blanket, helium-cooled divertor, and any other components which can be operated within EHCL operating window. The cooling channels of breeding blanket and divertor comprise of complex channel geometry having several parallel channels carrying helium gas for efficient heat extraction. Several mock-ups of these systems need to be tested before finalizing the design and fabrication. In addition to the individual testing of mock-ups of breeding blanket and divertor, integrated operation of the loop as well as understanding the behaviour of high-pressure and high-temperature system components are very essential for the development of Helium Cooling System for a fusion reactor.

This paper discusses the preliminary process design, process & instrumentation details, and operating & design parameters of the EHCL system. It also describes the characteristics of the EHCL system and the mechanism used to control various loop parameters. It briefly discusses about the architecture of major subsystems and components of the loop. Performance test results of the circulator(s) with its associated loop are also presented in this paper.

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