CURRENT STATUS OF THE ENGINEERING DESIGN OF THE TEST MODULE INTERFACE HEADS IN THE IFMIF TEST CELL

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As the heart of the International Fusion Material Irradiation Facility (IFMIF), the test cell is the convergent area of the primary IFMIF components and systems. During the current engineering validation and engineering design activities (EVEDA) phase of the IFMIF project, the development of an optimized design of the test cell is of major interest.

Based on the reference concept in the IFMIF Comprehensive Design Report [1] and other design proposals, a Modular Test Cell (MTC) concept has been introduced [2] and considered as an improved concept to be developed. The preliminary engineering design of the test cell based on the MTC concept has been started and is conducted by KIT. In this paper, a brief description of the MTC concept is addressed, and the current status of the test cell design is described with emphasis on the design of the test module interface heads (TMIHs) for the high flux test module and the middle flux test module.

In the current engineering design of the test cell, each test module is integrated with a corresponding TMIH, which holds the respective test module on the positioning system and houses the cable and pipe connections that connect the test modules to the test facility auxiliary systems. The TMIHs represent the first interface between the test modules and the IFMIF infrastructure. A high multiplicity of cooling gas pipes, electrical power and signal lines have to be conducted. The pipe and cable connections should enable a rapid exchange of the modules during the maintenance period, and withstand to the high radiation dose accumulated during the irradiation period for up to approximately one year in the fast neutron and gamma radiation field of the IFMIF source.

In this paper, the dimensions of the TMIHs and the piping/wiring between the test modules and the TMIHs are preliminary defined, and the cable and pipe connectors at the top of the TMIHs are preliminary arranged. Multi-pin plugs will be applied to house the cable connections, and the application of multi-connectors for the pipes is under investigation. Potential industrial solutions on qualified multi-connectors for the pipes are discussed. Piping optimization in the TMIHs reduces the total number of pipe connections by approximately 30% to minimize the time consumption during the remote handling on the test modules and the lithium target assembly.

[1] IFMIF International Team, IFMIF Comprehensive Design Report (CDR), IEA Report, December, 2003.
[2] K. Tian, D. Eilert, T. Heupel, T. Ihli, K. Lang, M. Mittwollen, A. Möslang, N. Scheel, E. Stratmanns, IFMIF Target and Test Cell – conceptual designs, boundary condition definitions and current status of preliminary engineering design, presented at ISFNT 09, Oct. 11-23, 2009, Dalian, China