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OVERVIEW OF THE LAST PROGRESSES FOR THE EUROPEAN TEST BLANKET MODULES PROJECTS (O2B-H-200)

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The long-term objective of the EU Breeding Blankets programme is the development of DEMO breeding blankets, which shall assure tritium self-sufficiency, an economically attractive use of the heat produced inside the blankets for electricity generation and a sufficiently high shielding of the superconducting magnets for long time operation. In the short-term so-called DEMO relevant Test Blanket Modules (TBMs) of these breeder blanket concepts shall be designed, manufactured, tested, installed, commissioned and operated in ITER for first tests in a fusion environment.

The Helium Cooled Lithium-Lead (HCLL) breeder blanket and the Helium Cooled Pebble Bed (HCPB) concepts are the two breeder blanket lines presently developed by the EU. The main objective of the EU test strategy related to TBMs in ITER is to provide the necessary information for the design and fabrication of breeding blankets for a future DEMO reactor. EU TBMs shall therefore use the same structural and functional materials, apply similar fabrication technologies, and test adequate processes and components.

This paper gives an overview of the last progresses in terms of system design, calculations, test program, safety and R&D done these last two years in order to cope with the ambitious objective to introduce two EU TBM systems for day-1 of ITER operation. The engineering design of the two systems is mostly concluded and the priority is now on the development and qualification of the fabrication technologies. From calculations point of view, the last modelling efforts related to the thermal-hydraulic of the first wall, the tritium behaviour, and the box thermal and mechanical resistance in accidental conditions are presented. Last features of the TBM and cooling system designs and integration in ITER reactor are highlighted.

In particular, this paper also describes the safety and licensing analyses performed for each concept to be able to include the TBM systems in the ITER preliminary safety report (RPrS). Finally, overview of recent R&D progresses in fabrication, tritium experiments and test facilities development is given.