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Supporting analysis of the ITER TBM Frame and Dummy TBM designs

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The validation and testing of tritium breeding blankets concepts, which are relevant for a future commercial reactor, is one of the goals of the ITER project. To achieve these objectives, mock-ups of breeding blankets, called Test Blanket Modules (TBMs), are tested in three ITER equatorial ports. Each TBM and its associated shield form a TBM-set that is mechanically attached to a steel frame. A frame and two TBM-sets form a TBM port plug (TBM PP). In case a TBM-Set is not available, it can be replaced by a Dummy TBM, steel made only. Both the design and manufacture of TBM Frames and Dummy TBMs are fully under the responsibility of the ITER organization.

This paper describes the summary of recent analysis activities to support the design of the TBM Frame and Dummy TBM, which is presently in the preliminary design phase. In the following, the main items addressed in this work are reported.

• A refined evaluation through full 3D models of the heat transfer coefficient (HTC) and pressure drop of water cooling system of TBM Frame and Dummy TBM; alternative cooling circuits studied, with the aim of minimizing thermal stress and pressure drop.

• Electro-magnetic (EM) analyses on the most recent design of TBM-sets and a TBM PP with two Dummy TBMs under cat. II, III and IV disruptions;

• Evaluation of the impact of the changes from CDR configuration on EM loads on Dummy TBMs

• Detailed thermo-mechanical analyses and structural integrity assessments of TBM Frame and Dummy TBM carried out according to RCC-MR 2007.

• Proposal of design improvement from the outcomes of the above analyses, to be possibly included in the FDR configuration.

The views and opinions expressed herein do not necessarily reflect those of the ITER Organization.

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