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ITR/P5-06: Progress of Manufacturing and Quality Testing of the ITER Divertor Outer Vertical Target in Japan

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Japan Domestic Agency (JADA) has started to manufacture 11 plasma facing units of an outer vertical target full-scale prototype which is just the same as those of a half cassette of ITER divertor. At the beginning of this activity, a joint technology and quality control for an interface between a plasma-facing material and a heat-sink material became key issues in the manufacturing process of the plasma facing units. In consequence of research and development, JADA achieved to increasing the success rate of the joint by improvements which are to metalize the joint surface of a carbon fiber composite by the use of Ti-coating with accurate thickness controlling, and also to change a buffer layer material from a soft copper to a Cu-W alloy. Moreover, JADA solved the problems of the quality control of joint interface by improved a system of an infrared thermography inspection which provides quick feedback to the manufacturing process about the presence of defect in the joint.

In the staged procurement of the plasma facing units for the full-scale prototype, a pre-prototype was manufactured as a final exercise toward the manufacturing. The result of the infrared thermography inspection indicates a good performance. Based on the result from the pre-prototype, the first 6 plasma facing units were manufactured at the end of June 2012. The manufacturing of the rest is scheduled in 2013.

In parallel to above development, research and development of the W monoblocks enough to endure the repetitive heat load of more than 20 MW per square meter has been started. JADA successfully completed the high heat flux testing of two mock-ups which are manufactured by using a non defect bonding. The result indicates that the soundness of the non defect bonding is sufficient against the repetitive heat flux of 20 MW per square meter for 1,000 cycles except for the recrystallization.

This paper presents the overview of achievements and clarifications of technical and quality issues for the manufacturing activity and the quality control of the divertor in Japan.

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