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P2.137 Development of welding scheme for ITER Divertor Dome

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The Russian Federation is responsible for manufacturing and delivery 54 main and 4 spare Dome, that is the part of ITER divertor cassette.

The main elements of the Dome are: Umbrella manifold, Outer and Inner manifolds made of 316L(N)-IG steel, the tubes of 19,05 mm and 141.3 mm diameter with 1.65 mm and 9.53 mm of thick walls respectively made of 316L steel and 34 plasma-facing units of Umbrella, Inner and Outer Particle Reflector Plates (PFUs)

Welding of Dome involves: the laser welding of manifold plugs and PFUs covers, multi-pass orbital welding of the structural pipes with manifolds and single-pass of the connecting pipes of PFUs.

The welding of Dome is one of the most complicated and main manufacturing operations for the Dome. The complexity results from abundant of welding on Dome where the each weld shrinks and causes strong welding stresses and strains. This might cause strong warping distortions and displacement of parts of the Dome those making it impossible to obtain the dimensions specified in the drawings.

To reduce and to control the welding strains, the special jig for assembly and welding of structural pipes between manifolds was developed and the orbital welding sequence was chosen on the basis of the results of numerical simulation.

The welding shrinkage of connection pipes of PFUs has been estimated with the aim to reduce and to control the welding shrinkage and strains between manifolds stubs and PFUs and the special sequence of assembling and welding of connection tubes between manifolds and PFUs was developed.

The report highlights the results of modeling and prototyping of the above mentioned assembly schemes with the aim to obtain the correct geometry according to the drawing, methods for solving of the emerging technological problems.

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