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P2.145 Use of dimensional variation models for the PS2 Upper Subassembly of the ITER Vacuum Vessel

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The ITER Vacuum Vessel is a torus-shaped, double shell stainless steel structure made up of nine welded sectors, with five being manufactured by the European Domestic Agency of the ITER Project (Fusion for Energy). Despite the large sector dimensions (around 11 x 7 x 6 metres) and the considerable weld lengths (in excess of 1.7 kilometres per sector) each sector must achieve very tight dimensional requirements, of the order of 0.1% of overall sector dimensions.

With the aim of carrying out an early assessment of the risk of dimensional nonconformities and a prompt definition of mitigation actions, a number of 3D statistical dimensional variation models have been developed by Fusion for Energy using 3DCS software. Each model is representative of the functional tolerances and assembly processes of a given sector subassembly, allowing both to predict the expected dimensional variations in specific areas and to help identify the tolerances and process accuracies contributing the most to a given variation before manufacturing activities start.

This paper describes the 3D model developed to assess the compliance with the requirements in terms of steps and gaps before welding of the first manufacturing stages of the Poloidal Segment 2 (PS2) Upper Subassembly. The document presents the statistical results obtained and the outcome of the process of replacing the statistical tolerance variations by deviations based on as-built information of the parts. Very good agreement between model results and observed deviations was found, especially when using as-built data of the parts.

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