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P3.147 Thermo structural analysis of the in-vessel components of the ITER plasma position reflectometry system on the high field side

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The Plasma Position Reflectometry (PPR) diagnostic systems, to be installed in the International Thermonuclear Experimental Reactor (ITER), will measure the edge electron density profile of the plasma, providing real-time supplementary contribution to the magnetic measurements of the plasma-wall distance. Some of the diagnostic components will be placed inside the vacuum vessel (VV) and therefore directly exposed to the plasma, subjected to high radiation doses which will contribute to increase the thermal loads in the PPR system and may cause irradiation induced changes in the material properties. The thermal loads may cause excessive temperatures on some of the PPR in-vessel components compromising their structural integrity. Therefore, the main objective of this work was to estimate the temperature distribution on the PPR in-vessel components and the associated thermal stresses in order to assess their structural integrity. All PPR in-vessel components are made of austenitic stainless steel 316L(N)-IG.
For this purpose, finite element models of the PPR in-vessel components of gap 6 were developed, using ANSYS V18.2, based on the most up-to-date CAD models of the PPR in-vessel components available in ENOVIA. These CAD models were then analysed, using CATIA R23 and ANSYS SpaceClaim V18.2, to mitigate inaccuracies and clashes. Afterwards, the thermal loads were applied and steady-state and transient finite element analyses conducted. The thermal stresses were then determined by carrying out structural analyses. The results of the analyses are presented and discussed from the point of view of the structural integrity of the components.

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