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P3.155 Assembly methodology and results for WEST platform PFCs positioning

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Since 2013, CEA has carried out an in-depth modification of the Tore Supra tokamak to build the WEST platform, targeted at supporting the ITER tungsten divertor detailed design, manufacturing and operation. The changes included the modification of the magnetic configuration with new in-vessel coils, the replacement of all carbon Plasma Facing Components (PFCs) by new tungsten elements and the upgrade of the radio frequency heating systems as well as plasma diagnostics.

One of the technical challenge of this tokamak transformation consisted in assembling and accurately positioning interlinked new WEST components (supports, coils, PFCs, thermal shield panels, embedded diagnostics…) in an existing machine with numerous vessel geometric imperfections and asymmetries. All the PFCs structures were located in the magnetic referential system with a sub-millimeter accuracy and the misalignments between neighboring divertor sectors were kept under 0.3 mm, i.e. in the relevant tolerance requirements presently considered for the ITER tungsten divertor. At the same time, the volume allocated for the plasma was enlarged thanks to a minimization of the distance between coil structures and the vacuum vessel.

The paper will summarize the work performed during WEST assembly phases and will present the key technologies and methods that were used to reach this level of precision in the components integration. It will describe both the design principle applied for tailoring interfaces between components and the advanced metrology technics used. The specific handling tools developed to accurately position large frames (up to 10 tons for both upper and lower divertor structures) and the kinematic modelling performed to prepare and check assembly trajectories will also be presented. Finally, metrological results will be discussed with a focus on component alignment achievements with regards to ITER PFCs assembly needs.

Presenter: GARGIULO, Laurent (IRFM CEA)

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