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P3.143 Design of inboard first wall for the initial operation phase of JT-60SA

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This article introduces overview of inboard first wall of the JT-60SA device, especially for the initial operation phase including the first plasma. The objective of the inboard first wall is to protect magnetic sensors from plasma. There is no cooling water for in-vessel components in the initial operation phase of JT-60SA, and it will be installed in the later phase. Graphite armour tiles are employed. The first wall should withstand forces such as magnetic forces due to eddy and halo currents, acceleration due to plasma disruption and earth quake (5G in the three directions at the maximum), and heat loads such as radiation from plasma, limiter configuration and ECRH direct irradiation.

To address these requirements, the inboard first wall was designed, which consists of graphite tiles, stainless pedestals and support bases. The support bases are welded on the surface of the inboard vacuum vessel. The stainless pedestals are bolted on the support bases. Two graphite tiles are bolted on each support base. Shed roof shape of graphite tiles is employed to avoid heat concentration at side face of the tiles and to mitigate heat load during limiter configuration. Thermal structural numerical analyses are carried out, and it was confirmed that the stress is below the design stress against the predicted heat loads. It was also confirmed that the stress is below the limit against the predicted forces. Taking into account these analyses, it was confirmed the design of the inboard first wall for the initial operation phase was reasonable.

The inboard first wall in the later phase was also designed. The non-cooled stainless pedestals will be replaced by active-cooled copper heat sinks. The graphite tiles and the support bases will be re-used.

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