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P4.144 Thermal-hydraulic analysis for first wall and vacuum vessel thermal shield of Divertor Tokamak Test facility

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The Divertor Tokamak Test (DTT) machine has been proposed by ENEA, in collaboration with other Italian institutions, to investigate power exhaust solutions with an experiment integrating all DEMO relevant physics and technology issues. The DTT machine will be able to host, in different phases of its life-time, advanced divertor magnetic configurations (snowflake, super-X, double null) and liquid metal solutions, able to withstand the large loads expected in the DEMO fusion power plant. The first wall (FW) has been designed with stainless steel cooling pipes coated with a W layer deposited by plasma spray technique. It shall be compatible with liquid metal divertors and therefore be heated at a temperature of 300 ℃ to avoid the liquid metal condensation. In this case it is necessary to consider gas rather than water cooling. To minimize the heat transferred to the superconductive coils the vacuum vessel (VV) is kept at 100 ℃ with water and a Vacuum Vessel Thermal Shield (VVTS) cooled with helium at 70K is interposed between the VV and the coils. In this work the preliminary results of the thermal-hydraulic analysis carried out with ANSYS Workbench software are presented for both the FW, using CO2 as coolant, and the VVTS.

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