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P2.158 Upper port #02 and #08 structure integrity report

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This presentation shows results of calculations of the Upper port plug (UPP) and ex-vessel components of ITER upper ports №2 and №8. Detailed finite-element models of modernized UPP construction were developed taking into account nonlinear contact interaction between the diagnostic shield module and the UPP structure. In the structural analysis under design loads the stress-strain state (SSS) taking into account the bolts pretension was obtained. Besides, in the new FE model pipelines structure of the cooling system was considered.

In thermal analysis of the UPP for baking and normal operation modes the neutron analysis data was taken into account. The UPP cooling systems' hydrodynamic characteristics were calculated including the flow-pressure characteristics. Subsequently, the whole UPP construction flow and pressure characteristics were evaluated taking into account the presence of throttling devices in the UPP hydraulic circuit.

Seismic analysis was carried out with the linear spectral method based on the response spectra received from the UPP Generic model analysis. The input response spectra were taken at the points of the port attachment to the vacuum vessel. The spectral power density analysis of the interface effects was carried out in Ansys. Results were considered at the anchorage points of the UPP to the port and converted to response spectra for linear spectral analysis of the UPP construction. Seismic analysis of the ex-vessel components was carried out based on the response spectra at the UP point of the ITER building.

Ponderomotive force distribution in the UPP and ex-vessel components under different scenarios of plasma disruption was calculated. Electromagnetic model was significantly refined. So, it was possible to analyze each part of the UPP construction separately and determine the extremely loads acting on it. Based on the electromagnetic analysis data the structural analysis of the UPP and ex-vessel components under electromagnetic loads was carried out.

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