THE ITER EC H&CD UPPER LAUNCHER: TRANSIENT MECHANICAL ANALYSIS

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Four Electron Cyclotron Heating (ECH) Upper Launchers (UL) are foreseen for plasma stabilization purposes in ITER. The mission of the UL is to mitigate NTMs and the sawtooth instability by localized heating and current drive with high precision and accuracy. Special attention is to be aimed to the structural design of the UL, because of highly restrictive space requirements. The ECH upper launcher has a length close to 6m and the nominal gap to the neighbouring components is 20mm. Electromagnetic perturbations could induce forces on the conductive materials and result in an excessive displacement of the portions that are located far from the fixation.

During the last years, the design of the UL has been optimized by means of static simulations of the structure. The peak loads obtained by the electromagnetic simulation of the eddy currents induced during an upward VDE (considered as the worst case disruption scenario for the UL) were used. Static simulations are a fast tool for comparing different structure configurations and optimization of the UL design, but they do not provide a complete picture of the real situation, since they do not take into account for dynamic effects that could lead to larger displacements.

In this paper, modal and transient analyses of the structure of the quasi-optical design (Preliminary Design Review status) of the Upper Launcher are presented. The results of transient and static analysis have been compared together and the dynamic amplification factor (DAF) with respect to the transient loads have been assessed. The transient study and the modal analysis have shown that the EC upper launcher has a stiff structure with relatively high natural oscillation frequencies (compared to the duration of the VDE) and that the dynamic effects do not constitute a critical issue.

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