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Seismic analyses of the Double Closure Plate Sub-Plate for the ITER Electron Cyclotron Upper Launcher during the Vacuum Vessel baking scenario

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Four Electron Cyclotron Upper Launchers (EC UL) will be used at ITER to counteract magneto-hydrodynamic plasma instabilities by aiming up to 20 MW of mm-wave power at 170 GHz. This mm-wave power will be injected through eight ex-vessel waveguide assemblies for each EC UL to the in-vessel waveguides. The power exiting the in-vessel waveguides located inside the Port Plug will be directed by quasi-optical mirrors to specific plasma locations. The Double Closure Plate Sub-Plate (DCPSP), which defines the border between ex-vessel and in-vessel components, was introduced in order to minimize the openings exposing the interior of the plug to avoid the near environment activation in case of maintenance or intervention on the in-vessel components. The seismic event taking place during the Vacuum Vessel (VV) baking scenario was identified as one of the most stringent load combinations for the DCPSP. The modal analysis of the DCPSP shows that the natural frequencies are far from the peaks of the ITER reference spectra at the Port Plug flange. Therefore, the feasibility of analysing the seismic event by using a static method as a replacement of the Response Spectrum method is also investigated. Then, the results due to the seismic event are to be combined with the ones produced due the loads occurring at the DCPSP during the VV baking scenario. The stress distribution produced from this load combination is categorized and compared with the allowable design limits in order to evaluate the mechanical integrity of the DCPSP. This work was supported in part by the Swiss National Science Foundation. This work was carried out within the framework of the ECHUL consortium, partially supported by the F4E grant F4E-GRT-615. The views and opinions expressed herein do not necessarily reflect those of the European Commission or the ITER Organization.

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