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PD/P8-13: Procedures to Interface Plasma Disruption Simulations and Finite Element Electromagnetic Analyses

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Very high mechanical loads act on the ITER vacuum vessel and in-vessel components during EM transients (mainly plasma disruptions) because of the interaction between the currents induced in the conductive structures by those EM transients and the external high magnetic fields typical of the tokamak operations. For the design of many ITER components the EM loads are the most challenging and thus great care must be taken in their assessment. While the plasma disruptions are mainly simulated (basing on extrapolations of measurements done in existing tokamaks) by means of 2D axis-symmetric Magneto-Hydro-Dynamics (MHD) codes the load assessment on the structures is usually carried out with 3D Finite Elements (FE) analyses. The accuracy of the method used to interface the MHD and FE codes has been proven critical for the reliability of the EM analyses results. The Secondary Excitation (SE) method has been developed to solve the issues related to the transferring of information between the axis-symmetric MHD and the 3D FE codes. The SE method has also shown to be suitable to perform detailed analyses (zooming) of small components inside complexes structures like ITER vessel and cryostat. The way to perform the EM zooming is described in the second part of this paper. This method allows the EM analyses of small components while avoiding the huge and time consuming work required by the contextual modelling of their environment.

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