THE IGNITOR LOAD ASSEMBLY STRUCTURAL ANALYSIS AND TOROIDAL FIELD COIL

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The structural analysis of the core (Load Assembly) of the Ignitor machine, considering the mechanical interactions of all its components has required the use of the Finite Element Method ANSYS program. The most advanced plasma evolution scenarios have been studied in detail. The in-plane and the out-of-plane load analyses have been carried out separately. Friction coefficients have been taken into account at the interfaces between relevant components. The results of the analysis show that the stresses produced are within the allowable limits at the considered temperatures of the magnet.
The out-of-plane loads give an average shear stress on the toroidal field coil (TFC) interfaces that is lower than the friction coefficient and do not increase significantly the in-plane maximum equivalent stresses. The only exception is given by the interlaminar shear stresses on the toroidal field coils. Interlaminar shear stress values on the TFC insulation have been validated by the results of the test that have been carried out.

In a previous design, a vapor nitrogen cryostat at atmospheric pressure had been envisaged for Ignitor. A new solution involves the use of a vacuum cryostat which, considering the new material adopted for the TFC plates (ETP copper has been replaced by OFHC) is consistent with a machined and welded cooling channel on each individual turn (each coil consists of 10 turns). Two full size TFC turns have been manufactured by Kabel Metal to identify the technical difficulties concerning the fabrication and the hardening of the OFHC material. Several samples of the cooling channel are machined and ready for welding in order to validate the Electron Beam (EB) process that has been adopted.