

## Dynamic Assessment of the ITER Tokamak Machine Spherical Bearings under VDE Electromagnetic Loads

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### Abstract

This paper details the methodology followed for the determination of the loads transferred from the Tokamak machine to the Tokamak building structure in case of Electromagnetic loads (VDEs) in the ITER project. The resulting forces are useful for the design of the dynamic test necessary for the qualification of the sliding bearings located in the interface between the machine and the building. The results of current Cat IV VDE analyses yield significant upwards forces that could imply, when combined with pressure and gravity loads, net uplift forces. Thus, separation at some supports could take place in transient Cat IV VDEs, potentially resulting in impact forces being transferred through the bearing to the cryostat support when parts (Tokamak machine and building) come into contact after the temporary gap generated is closed either due to EM loads, gravity loads or both. For the determination (peak load, duration, and amount of momentum transmitted) of these impact forces, non-linear transient analyses must be undertaken. To achieve this goal, ABAQUS implicit and explicit calculations are performed with a complex 3D Finite Element of the machine and the central part of the building. Once the dynamic reactions are determined, these forces together with a local FE model of the spherical bearing are used to determine the key parameters and the experimental setup required for the qualification of the bearings.