

Asymmetric wall force reduction in ITER and JET disruptions

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It has been thought that asymmetric vertical displacement event (AVDE) disruptions in ITER might produce large electromechanical forces on the walls and other conducting structures surrounding the plasma. It is shown that ITER AVDE disruptions should produce a small asymmetric wall force, comparable to JET. This is demonstrated in simulations [1,2] with the M3D 3D MHD code [3] and confirmed in JET experiments [4] in which the current was quenched with massive gas injection (MGI). In ITER the current quench (CQ) time, τ_{CQ} , is less than or equal to the resistive wall penetration time, τ_{wall} . JET is in a different parameter regime, with $\tau_{\text{CQ}} > \tau_{\text{wall}}$. JET simulations were validated by comparison [1] to JET shot 71985 data and were in good agreement. The wall time was then artificially increased, keeping τ_{CQ} fixed, and it was found that the wall force decreased. The reduction of the asymmetric wall force was also found in experimental data [4] of JET MGI mitigated disruption shots. Further simulations [2] were carried out of ITER AVDEs. The asymmetric wall force was calculated for a wide range of CQ times. For $\tau_{\text{CQ}} < \tau_{\text{wall}}$, the force was not much larger than in JET. A fast CQ may cause production of runaway electrons (REs). The effect of replacing part of the current with REs on MHD behavior will be discussed. Simulations using a modified version of M3D with a fluid RE model [5] will be presented.

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