Characterization of heat loads from mitigated and unmitigated VDEs in DIII-D

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Abstract. Experiments have been conducted on the DIII-D tokamak to study the distribution and repeatability of heat loads and vessel currents resulting from vertical displacement events (VDEs). For unmitigated VDEs, the radiated power fraction appears to be of order 50%, with the remaining power dominantly conducted to the vessel walls. Shot-to-shot scatter in heat loads measured at one toroidal location is not large ($< \pm 50\%$), suggesting that toroidal asymmetries in conducted heat loads are not large. Conducted heat loads are clearly observed during the current quench (CQ) of both mitigated and unmitigated disruptions. Significant poloidal asymmetries in heat loads and radiated power are often observed in the experiments but are not yet understood. Energy dissipated resistively in the conducting walls during the CQ appears to be small (< 5%). The mitigating effect of neon massive gas injection (MGI) as a function of MGI trigger delay has also been studied. Improved mitigation is observed as the MGI trigger delay is decreased. For sufficiently early MGI mitigation, close to 100% radiated energy and a reduction of roughly a factor 2 in vessel forces is achieved.

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