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Modelling ITER Asymmetric VDEs through Asymmetries of Toroidal Eddy Currents

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The causes of plasma asymmetries and rotation during disruptions are still an open issue even though their effects are clearly seen on present machines like JET where the vessel has been observed to move horizontally during asymmetric VDEs. Strong horizontal forces are then expected to be related to the plasma asymmetries. In ITER, loads caused by asymmetric VDEs are expected to be among the highest mechanical loads. A model consistent with most of JET measurements has been developed assuming that the asymmetric loads are caused not by a direct exchange of current between plasma and structure (as in the case of halo or surface currents) but to asymmetric conductive paths which arise, in the structures, when the plasma column asymmetrically wets the wall. This model of Asymmetric Toroidal Eddy Currents (ATEC) has been implemented in detailed Finite Element (FE) electromagnetic analyses of locked and rotating AVDE experienced at JET. The results showed substantial match with all the main asymmetry related measurements done at JET. The same ATEC model is then used to assess loads on the ITER VV during asymmetric VDEs and detailed results are reported and discussed in this paper.

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Primary author: Mr ROCCELLA, riccardo (ITER Organization)

Co-authors: Dr JANESCHITZ, Guenter (ITER IO); Dr LEHNEN, Michael (ITER Organization); Dr RICCARDO, Valeria (CCFE); Mr SANNAZZARO, giulio (ITER IO); Dr ROCCELLA, massimo (L.T. Calcoli); Mr CHIOCCHIO, stefano (ITER IO)

Presenter: Mr ROCCELLA, riccardo (ITER Organization)

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