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Simulation of the electromagnetic wall response to plasma wall-touching kink and vertical modes with application to ITER CALIN ATANASIU, National Institute for Laser, Plasma and Radiation Physics, Bucharest, Romania, LEONID ZAKHAROV, LiWFusion, P.O. Box 2391, Princeton, NJ 08543, USA, KARL LACKNER, MATTHIAS HOELZL, ERIKA STRUMBERGER, Max Planck Institute for Plasma Physics, Garching, Germany — Realistic simulations of electric current excitation in three-dimensional vessel structures by the plasma touching the walls are necessary to understand plasma disruptions in tokamak. In large tokamaks like ITER, the wall-touching kink modes cause large sideway forces on the vacuum vessel determined by the sharing of asymmetric electric current between the plasma and the wall. Our model covers both eddy currents, excited inductively by vertical modes, and source/sink currents due to current sharing between the plasma and the thin conducting wall. The developed finite element approach calculates the electromagnetic wall response to perturbation of magnetic fields and to current sharing between the plasma and the wall. The current density entering/exiting the wall surface from the plasma and the time derivative of the magnetic vector potential of the plasma are the input values. The magnetic field and the vector potential from the wall currents are returned as output. Our model has been checked against analytical examples of a multiply-connected domain of a real ITER wall.

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