

Analysis of Short-Circuit Transients in the LHC Main Dipole Circuit

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In each of the 8 sectors of the Large Hadron Collider (LHC) there exists one main dipole circuit, where 154 superconducting dipole magnets are connected in series. In the case a short to ground event occurs, the current flows through the circuit fuse that is present in the grounding subcircuit. A simulation scheme utilising a common interface between PSpice and Matlab is proposed in order to include the intermittent blow-up behaviour of the fuse in the simulations and increase the accuracy of the circuit model. The worst-case values of the voltage to ground in the circuit and the conditions under which they occur are identified from the simulations where the intermittent behaviour of the fuse is included in the model. A comparison with the values in the case where the fuse behaviour is not simulated is presented. Potential solutions to reduce the peak voltages in the circuit are also discussed.