

## Partial discharge simulation for a high voltage transformer winding using a model based on geometrical dimensions

M.S. Abd Rahman\*, L. Hao, P. Rapisarda, P.L. Lewin  
 The Tony Davies High Voltage Laboratory  
 University of Southampton  
 \*E-mail: [msar106@ecs.soton.ac.uk](mailto:msar106@ecs.soton.ac.uk)

In high voltage plant, ageing processes can occur in the dielectric and insulation system which are totally unavoidable and ultimately limit the operational life of the plant. For example, these unwanted processes can cause partial discharge (PD) activity inside a transformer and the presence of this activity will lead to further ageing and degradation processes until eventually there is catastrophic failure. Therefore, partial discharge condition monitoring inside a transformer and along a transformer winding has become an important research area to provide asset health information enabling the maintenance and replacement processes to be carried out effectively. There are various methods and models which have been proposed and discussed thoroughly in the literature in order to study PD activity in transformer windings and particularly for location of the PD source. This paper investigates PD signal propagation inside a transformer winding using a transformer winding model based on a lumped parameter network approach. The simulation model represents an interleaved disc type winding which consists of eight sections having internal winding series resistances (R), inductances (L), series and shunt capacitances (K,C), including the effect of their mutual inductances as shown in Figure 1. These parameters are derived using analytical calculations from the geometrical dimensions and the winding simulated using a circuit simulation package (PSPICE OrCAD). The simulation results are captured via both ends of the winding at terminal 1 and terminal 8 which are grounded through a small capacitive and resistive element to represent the bushing end and neutral to earth connection respectively.

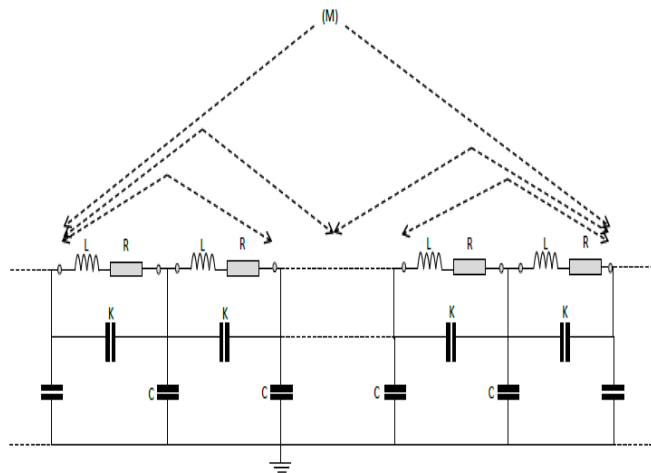


Figure 1: A lumped parameter network model of a transformer winding

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