Computation of three dimensional magnetic fields in transformers using integro-differential equation for the scalar magnetic potential

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An integral-differential method for three-dimensional magnetic field modeling is used to improve accuracy of the magnetic field computation in two-winding short circuited transformer as well as to estimate over-excitation of its magnetic system. The developed approach combines advantages of the finite element method and the numerical solution of the integral-differential equation for the scalar magnetic potential. Reliability of the developed approach is verified by the comparison with experimentally obtained information at the specially developed setup. The obtained results give possibility to investigate electrodynamic withstand of transformers in a short circuited mode of operation.

Keywords: finite element method, inductance, integral equations, magnetic field, transformer, short circuit.