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Skin effect and magnetization of strap toroid magnetic core of pulse transformer

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The object of the study is a pulse transformer with a toroidal magnetic core wound by a transformer steel strap operating under short voltage pulses, at which the magnetic field has no time to steady in the core material. The pulse magnetic field diffusion in the steel strap of the core was analyzed using a 1-D model of dynamic losses, covering the effects of hysteretic and excess losses [1]. The dependence of excess losses in the core material on magnetic induction was measured in no-load experiments carried out while applying the rectangular voltage pulses to the transformer winding. The magnetic field diffusion in the strap was calculated at energization of the transformer winding from a constant voltage source. The oscillograms of current in the no-load experiments have verified the calculation results.

[1] M.J. Hofmann and H-G. Herzog. Modeling Magnetic Power Losses in Electrical Steel Sheets in Respect of Arbitrary Alternating Induction Waveforms: Theoretical Considerations and Model Synthesis. IEEE Transactions on Magnetics., vol. 51, No. 2, February 2015, 6300211.

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