Analytical Model for AC Loss Calculation Applied to Parallel Conductors in Electrical Machines

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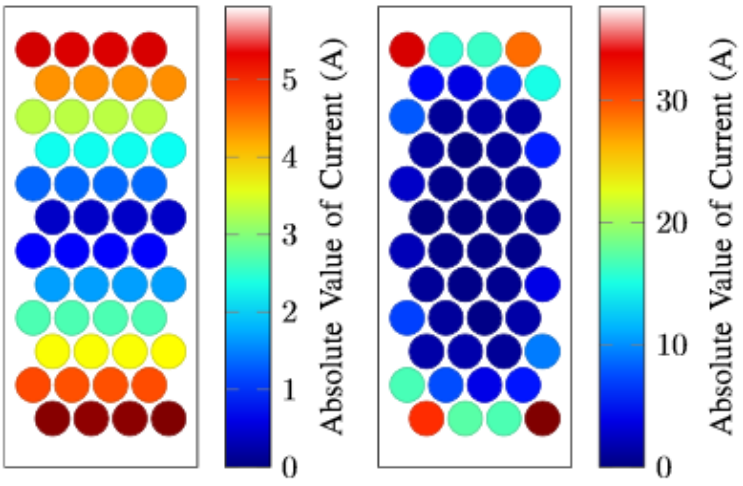
***Abstract* - In the design process of electrical machines, the frequency dependence of the resistance is often neglected, although previous investigations have shown that losses can drastically increase due to eddy current effects. On the other hand, simulations using Finite Element Analysis (FEA) with every single strand modeled and connected together in an external circuit are time consuming and therefore not practicable. To address this issue, this paper proposes an analytical method for calculating the AC losses of arbitrarily arranged and connected conductors. The basic idea is to solve the current sharing problem between parallel strands in 2D without any influence of the core, but with an imposed external flux, representing the slot leakage flux. The model was validated using a permanent magnet synchronous machine (PMSM). Although the results of the analytical model only deviate slightly compared to FEA results, the computation time is considerably reduced.**

Keywords— AC loss, circulating currents, parallel strands, proximity effect, skin effect



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