

Novel magnetic core materials impact modelling and analysis for minimization of RF heating loss

Abstract

The eddy current that exists in RF transformer/inductor leads to generation of noise/heat in the circuit and ultimately reduces efficiency in RF system. Eddy current is generated in the magnetic core of the inductor/transformer largely determine the power loss for power transferring process. The losses for high-frequency magnetic components are complicated due to both the eddy current variation in magnetic core and copper windings reactance variation with frequency. Core materials permeability and permittivity are also related to variation of such losses those linked to the operating frequency. This paper will discuss mainly the selection of novel magnetic core materials for minimization of eddy power loss by using the approach of empirical equation and impedance plane simulation software TEDDY V1.2. By varying the operating frequency from 100 kHz to 1GHz and magnetic flux density from 0 to 2 Tesla, the eddy power loss is evaluated in our study. The Nano crystalline core material is found to be the best core material due to its low eddy power loss at low conductivity for optimum band of frequency application.