Influence of Air Gap Length and Cross-Section on Magnetic Circuit Parameters

A. Polit[1], R. Jez[1]

[1]ABB Corporate Research Center, Krakow, Poland

Abstract

The air gap is one of the most crucial part of magnetic circuits, especially in high-power inductors. It significantly modifies the parameters of magnetic devices by increasing the saturation current, linearizing B-H curve of magnetic circuit and causing a decreasing in the inductance. Therefore the optimal selection of shape and dimensions of the air gap is very important from the design point of view.

This paper is focused on presentation of optimal dimensions of the air gap with rectangular cross-section in function of air gap length and cross-section ratio. The COMSOL Multiphysics® software was used for simulation magnetic field distribution for chosen cases in such magnetic circuit.

The AC/DC Module was applied for the calculations.

In Figure 1 scheme of the simulated case is presented, where H corresponds to magnetic field intensity, μr relative permeability, a and b are core dimensions, d is the air gap length. By varying geometry parameters and relative permeability optimal solutions for this kind of magnetic circuit are proposed.

The presented results are dedicated to magnetic designers to prepare inductor cores designs optimally.

Figures used in the abstract

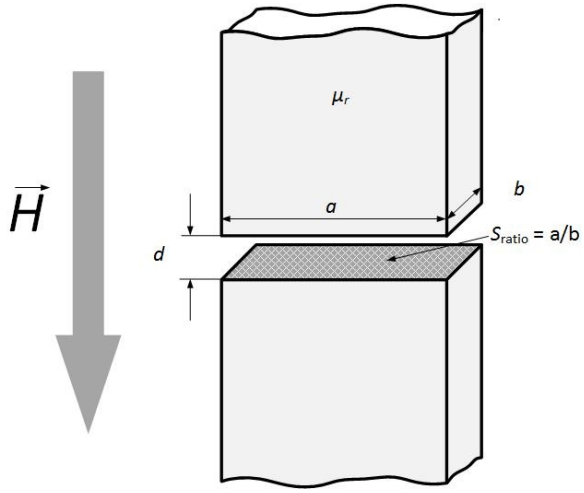

Figure 1: Simulated case model description