

# A Review of the Analytical Calculation of the AC-Resistance of Armature Windings

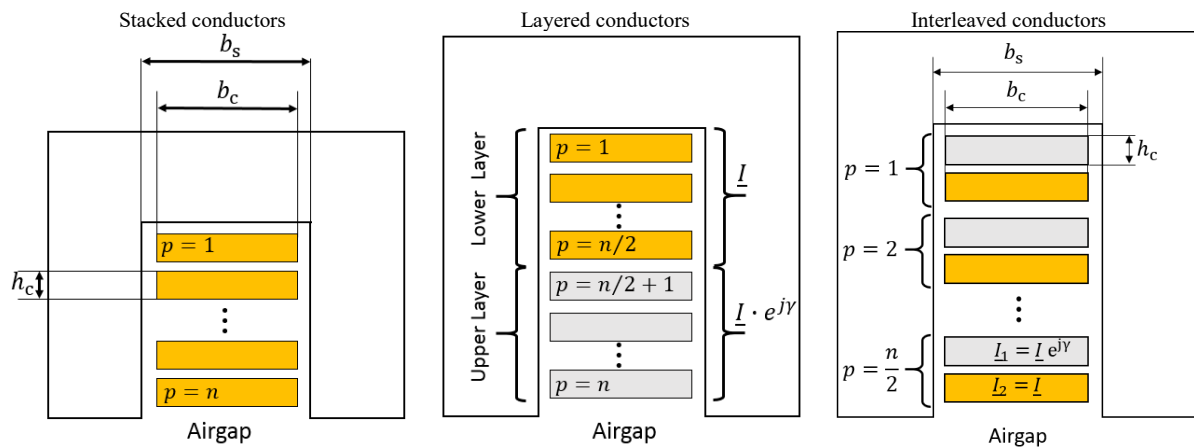
D. Bachinski Pinhal<sup>1</sup> and D. Gerling<sup>2</sup>,

<sup>1</sup>FEAAM GmbH, D-85579 Neubiberg, Germany

<sup>2</sup>Universitaet der Bundeswehr Muenchen, D-85579 Neubiberg, Germany

**Abstract-** It is known that eddy-current effects lead to increased ohmic losses when time-dependent currents flow through conductors. The higher losses can be considered by introducing an effective resistance value referred to as AC-resistance. Conductors inside slots surrounded by ferromagnetic material are of especial interest when designing electric machines. The AC-resistance can be calculated analytically when certain assumptions are made. An analytical derivation of the AC-resistance for rectangular conductors inside rectangular slots can be found in several pieces of literature. However, literature addressing circular conductors inside slots is scarce. This paper reviews the calculation of the AC-resistance for conductors inside slots including a discussion on circular conductors. First, the formulae applicable to rectangular conductors are reviewed. Second, the calculation for circular conductors is presented introducing a more precise notation than found in literature.

**Keywords—** AC-windings, Eddy-currents, Electric machines, Proximity effects.



Different settings of rectangular conductors in a rectangular slot discussed in the paper.

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