

Question 11

Q: Why does the calculated inductance of an air-core coil not coincide with the actual measurements? (Magnetic analysis/Actual measurements/Coil)

A: As an air-core coil has a larger magnetic field space, a larger air domain should be specified for analysis. Experience indicates the size of the space should be three to five times as large as the size of the coil. Please adjust the size to check for better coincidence between them.

The algorithm of the calculation follows the equations below:

$$L = \int A \cdot J \, dV,$$

$$B = \nabla \times A,$$

where

L: Inductance,

J: Current density,

A: Magnetic vector potential,

B: Magnetic flux density vector.

The distribution of current density, J, is determined from turns and shapes.

The difference between the calculation and actual measurements does not come from the current density J but from the magnetic vector potential A, which is determined from the magnetic flux density vector B.

If the magnetic flux density distributions of the actual model and the simulated model are different, the calculated inductance can be different from the actual measurements.