

# The Development of Technologies of High-Efficiency Static Electric Devices Using Large Scale Numerical Analysis

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## Abstract

The aim of the project is the development of method calculating iron loss at the high-frequencies (HF) band. Recently, many electromagnetic actuators are used for aviation, vessel and so on. And, in the future, more electromagnetic actuators will be used for them. Therefore, we have to develop compact power electronics system mounted on them because of their limitation of weight and size. For solving this problem, we make power electronics system drive the actuators at the HF band. Iron loss of inductor which is connected to power electronics devices (such as inverters) is increased especially at HF zone. But it is difficult for a classical method of calculating iron loss to consider the iron loss including that at HF zone. So the development of a new calculating method of iron loss is needed. In order to realize this technology, the large scale numerical analysis of electric devices is needed, too. This large scale simulation considers and reveals electromagnetic phenomenon in detail. The three-dimensional finite element method is used for this simulation.

In this year, the distribution of the magnetic flux density, the eddy current density and the loss is revealed in detail. Many steel sheets in the inductor core are modeled in this analysis. Some knowledge of this case is obtained and some subjects to downsize the inductor are also obtained.

**Keywords:** Large-Scale Simulation, Three-Dimensional Finite Element Analysis, Inductor, Skin Effect