# **CHAPTER 5**

# **FEA VERIFICATION**

## Introduction

In the previous chapter, optimization procedure of the proposed AFPM generator was described and required design parameters were determined and presented by using genetic algorithm optimization. As a principle in electrical machine design, it is important to verify the design in terms of electromagnetic and electrical performance before the production [1], [2]. For this purpose, modern analysis techniques and computer programs are used. In this chapter, design parameters of the optimized generator will be used in the 3D FEA modelling and analysis in order to verify the electromagnetic and electrical performance of the proposed AFPM generator. ANSYS Maxwell® is employed during the 3D finite element analyses. Analysis configurations of the magnetostatic, no-load transient and full load transient simulations will be presented in the following subsections. As mentioned in Chapter-3, air gap flux density and no-load induced emf values are investigated during the analyses. In addition, full load analysis of the proposed AFPM generator is made in order to calculate the coefficient of eddy losses acting on the permanent magnets. Related graphs and simulation results will be given in the following subsections. At the end of the chapter, comparison of the optimization results of analytical design and the 3D FEA analysis will be given for the proposed AFPM generator with related error rates. Another comparison will be made between commercial MW level wind turbines and the proposed AFPM wind turbine generator.

**References**

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[2] J. F. Gieras, R.-J. Wang, and M. J. Kamper, *Axial Flux Permanent Magnet Brushless Machines*, vol. 3 ed. Dordrecht: Springer Netherlands, 2008.