# **CHAPTER 5**

# **FEA VERIFICATION**

## Introduction

In the previous chapter, optimization procedure of the proposed AFPM generator was described and required design parameters were found and tabulated by using genetic algorithms. 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 softwares are used. In our study, 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. As mentioned in Chapter-3, air gap flux density and induced emf values are investigated during the analyses. Related graphs and simulation results will be given in the following subsections. In addition to FEA analyses, material properties of the design will be described. At the end of the chapter, comparison of the optimization results and the 3D FEA analysis results will be given for the proposed AFPM. Another comparison will be made between commercial MW level wind turbines and proposed AFPM wind turbine generator.

**References**

[1] N. Rostami, M. R. Feyzi, J. Pyrhonen, A. Parviainen, and V. Behjat, “Genetic Algorithm Approach for Improved Design of a Variable Speed Axial-Flux Permanent-Magnet Synchronous Generator,” *IEEE Trans. Magn.*, vol. 48, no. 12, pp. 4860–4865, 2012.

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