

Effects of Transformer's Turn Ratio Mismatch Towards the Performance of Dual Active Bridge Converter

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Abstract. This paper presents the study of the effect of transformer's turn ratio mismatch on the performance of dual active bridge (DAB) converter. DAB converter was part of the components of a solid state transformer (SST) where it provides galvanic isolation as well as interface systems with different voltage level. In this study, a DAB circuit was developed and the performance was examined in both MATLAB Simulation and hardware-in-the-loop (HIL) simulation. The DAB system was examined under five different transformer ratio. The behavior of the DAB shows a comparable results under both test platform. The real-time performance of DAB converter has shown an efficiency up to 95.91 %.

Keywords: Dual active bridge converter, Transformer ratio, Hardware-in-the-loop, MATLAB Simulink.

1 Introduction

Recent years, the global growth of economy has led to the growing demand for energy in developing and emerging economies. This has brought to the needs of higher power capacity, efficient generation, transmission and utilization of electrical energy. With this, power electronics technology has been widely implemented in different parts of electrical system ranging from power generation to power utilization by end consumers.

The power electronics technology plays an important role in power system to control parameters such as frequency, voltage, active and reactive power as well as harmonics [1]. Therefore, the development of new, innovative and low-cost power converter has become the interest of various researchers. However, the complex hardware and software components often requires the time-consuming construction of the prototypes as well as poses the challenge of testing the system behaviour under various operating conditions. With the available of hardware-in-the-loop (HIL) platform, the development and validation of power converter as well as power grid can be easily carried out.