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Abstract

Title: Development Process for a 2/3 MW, 13kV/7.2kV Converter

A comprehensive design and development of a 660kW, 20kHz, 13kV/7.2kV isolated converter is presented in this speech. The converter uses a 3-level Active Neutral Point Clamp (ANPC) and 2-level H-Bridge with a 20kHz transformer in an asymmetrical dual active bridge (DAB) arrangement. This converter, which will be a part of the next generation grid network structure, is designed to integrate a 13.8kVac system into a 4.16kVac system at 660kVA power level. The design process includes high voltage coordination such as creepage and clearance distances, electric field analysis, and packaging. Maxwell 3D/Simplorer FEA tool co-simulated with MATLAB/Simulink is used to simulate the electromagnetics, electrical, and electrostatic aspects. The analysis of transformer core, windings, leakage/magnetizing inductances, flux density, losses, efficiency and insulation coordination are also discussed. One important element is liquid cooling of the primary and secondary converter that is presented in detail. Results of transformer testing for high voltage and partial discharge are outlined.