[1] : 5kVA output power single phase inverter by using enhancement mode GaN transistor at 50kHz switching frequency with the design of the output filter inductor based on a multilayer, high current PCB magnetics.

in this thesis three items are highlighted. First one is systematic approach is used to design the inverter. The losses of transistors are calculated by analytically with regarding modulation index. Second one pcb inductor design and last one is 5kVA single phase inverter which has not made up to now with GaN

[2] : This thesis develops a simplified finite-state predictive torque control (FS-PTC) algorithm based on selected prediction vectors (SPVs). The finite-state predictive torque control (FS-PTC) of motor drives is an MPC strategy. In FS-PTC, a finite number of possible control actions—voltage vectors in this study—are evaluated against control objectives (torque, flux and other system constraints) in an iterative prediction loop. After this, an optimum voltage vector is selected by minimising a predefined cost function and applied to the motor terminals via an inverter. The proposed SPVs strategy also assists reducing the average switching frequency for a two-level voltage source inverter fed induction motor (IM) drive. this thesis proposes to integrate the FS-PTC with a three-level neutral-point clamped (3L-NPC) inverter driven IM drive.

[3] : wide bandgap semiconductors (SiC, GaN), These components can switch much faster than their silicon counterpart, which can reduce converter losses and also decrease differential mode filter given the increase of switching frequency. However, such a fast commutation increases Electromagnetic

Interference (EMI) issues in the converter and loads connected to it. This paper investigate the trade-offs between losses and EMI issues of three-phase inverters used in future aircraft applications. Given the voltage DC bus of 540V, SiC MOSFETs are investigated and experimental results show the impact of these components on losses and EMI for different parameters.

[4] : Silicon carbide (SiC) MOSFETs and gallium nitride (GaN) high-electron mobility transistors are perceived as future replacements for Si IGBTs and MOSFETs in medium- and low-voltage drives due to their low conduction and switching losses. However, it is widely believed that the already significant conducted common-mode (CM) electromagnetic interference (EMI) emission of motor drives will

be further exacerbated by the high-speed switching operation of these new devices. Hence, this paper investigates and quantifies the increase in the conducted CM EMI emission of a pulse width modulation inverter-based motor drive when SiC and GaN devices are adopted. Through an analytical approach, the results reveal that the influence of dv/dt on the conducted CM emission is generally limited. On the other hand, the influence of switching frequency is more significant.

[5] : This paper is an effort to put together all the potential applications of Wide Bandgap (WBG) devices in AC electric drives. Low inductance motors, high speed motors, and electric drives operating in a high temperature environment are the main application areas of WBG devices. Low voltage permanent magnet motors and slotless motors have a low inductance and require a stringent high-bandwidth current regulation strategy to obtain an acceptable current ripple. Silicon (Si) devices cannot be used in this case due to their limited switching frequency. MW-level high speed motors have devices operating at high voltage and current levels and a high fundamental frequency (600-1200 Hz) that cause very high switching losses in Si IGBT devices. SiC devices have enabled the use of power electronic converters for MW-level high speed motors. Integrated motor drives (IMDs) are also benefitted by WBG devices as they reduce the size of the power converter and allow operation at a high junction temperature. Therefore, the inverter can be mounted on the motor itself which can be a significant heat source due to motor losses. Cooling requirements in high temperature environment applications such as hybrid Electric Vehicle (EV), ground vehicles in combat zones, and power converters used in space technology like land rovers etc., are greatly reduced due to low losses and high junction temperatures. Operation at high frequencies and high temperatures reduces the size of electric drive significantly.

[6]: Additional loss is produced when the speed of the PMSM drive system is changed with the common id=0 control strategy. Hence, in this paper, a method based on the decoupling control strategy is proposed to reduce loss of permanent magnet synchronous machines (PMSMs) in dynamic state. The new decoupling control strategy could reduce the additional loss compared with the traditional method by holding the value of id near zero. The simulation results validate the effectiveness of the proposed decoupling strategy. 08056373.pdf

[1] H. Meşe and I. Çadırcı, “Natural-air-cooled 5 kVA single-phase GaN inverter with paralleled multilayer PCB magnetics,” *J. Eng.*, 2017.

[2] M. Habibullah, “Simplified Finite-State Predictive Torque Control Strategies for Induction Motor Drives,” 2016.

[3] V. Dos Santos, B. Cougo, N. Roux, B. Sareni, B. Revol, and J. P. Carayon, “Trade-off between losses and EMI issues in three-phase SiC inverters for aircraft applications,” *IEEE Int. Symp. Electromagn. Compat.*, vol. 3, pp. 55–60, 2017.

[4] D. Han, S. Li, Y. Wu, W. Choi, and B. Sarlioglu, “Comparative Analysis on Conducted CM EMI Emission of Motor Drives: WBG Versus Si Devices,” *IEEE Trans. Ind. Electron.*, vol. 64, no. 10, pp. 8353–8363, 2017.

[5] A. Morya, M. Moosavi, M. C. Gardner, and H. A. Toliyat, “Applications of Wide Bandgap (WBG) devices in AC electric drives: A technology status review,” *2017 IEEE Int. Electr. Mach. Drives Conf. IEMDC 2017*, 2017.

[6] S. Ding, M. Ding, J. Hang, Q. Wang, and P. Zhang, “Loss Reduction of Permanent Magnet Synchronous Machines based on Decoupling Control Strategy,” pp. 2–6, 2017.