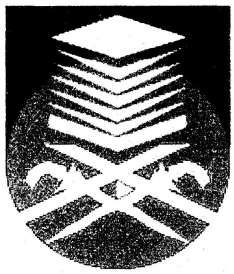
SAFE COMMUTATION STUDIES FOR SINGLE PHASE MATRIX CONVERTER OPERATION AS INVERTER

This thesis is presented as fulfillment for the award of the

Bachelor of Electrical Engineering (Honours)

Of

UNIVERSITI TEKNOLOGI MARA



MOHAMMAD SAIFULLAH B NORIZAN

Faculty of Electrical Engineering

UNIVERSITI TEKNOLOGI MARA

40450 SHAH ALAM

ACKNOWLEDGEMENT

ALHAMDULILLAH. It would be a great pleasure for me to include the almighty ALLAH to be the first in the list that receives my humble gratitude as His invaluable and meaningful help has granted me the opportunity and ability to get the thesis completed.

I would like to express my sincere gratitude and appreciation to my project supervisor, ***Pn Siti Zaliha Mohammad Noor*** for his idea, guidance, support which proves to be truly encouraging and useful in the helping me to lead the project to success.

Finally, to all people that involved directly or indirectly with full willingness of contributing their effort, time, energy and idea in helping me completing this thesis. There are no exact words that can express my feeling of gratitude toward them except thank you.

ABSTRACT

The aim of this project is to study safe commutation of the single phase matrix converter operation as inverter. The XILINX chip XC4005XL field programmable gate array (FPGA) is used to control input voltage of a fully controlled single phase Insulated Gate Bipolar Transistor (IGBT) bridge inverter. Sinusoidal Pulse Width Modulation (SPWM) technique was used to calculate the switch duty ratio to synthesize the AC output. The model was implemented using MATLAB/Simulink with the SimPowerSystem Block Set. Safe-commutation strategy was implemented to solve switching transients by establishing a current path for the stored energy of the inductance in the load to dissipate during dead-time, thus avoiding the generation of voltage and current spikes. Investigations are also made on the behaviour of using filters to reduce ripples in the output waveform. Simulation and experimental results for with commutation and without commutation strategy are presented to verify proposed operation.

TABLE OF CONTENTS PAGE

CHAPTER 3: SINGLE PHASE MATRIX CONVERTER OPERATION AS INVERTER

CHAPTER 4: COMMUTATION PROBLEM

CHAPTER 5: MODELING AND SIMULATION

CHAPTER 6: XILINX FPGA IMPLEMENTATION