

**FIVE PHASE SPACE VECTOR MODULATION VOLTAGE  
SOURCE INVERTER USING LARGE VECTOR ONLY**

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## ABSTRACT

AC machine with a phase number higher than three enables utilization in electric drives and considered for several applications today. The multi-phase gives more advantages compared to three-phase counterparts. Furthermore, devising appropriate control algorithm is also important while modeling of Voltage Source Inverter (VSI). Besides, space vector is used as the method that preferred real-time modulation techniques and widely use for digital control of VSI. Since then, the study on Five Phase Space Vector Modulation (SVM) and VSI using large vector has been developed. However, this study concentrate on the outer most decagon space vector only that does not include the whole of the decagon, d-q plane. Furthermore, this study does not include the zero vectors at the time switching and only active vector were used for the time switching for each sector. The waveform of Line to Line Voltage, Phase to Neutral Voltage and Pole Voltage has been compared between theoretical waveform that has been calculated from Microsoft Excel and validate through simulation using MATLAB/Simulink. The Total Harmonic Distortion (THD) is compared with different modulation index and showed that the THD percentages reduced when the modulation index increased.

**Keywords:** Five Phase System, Space Vector Modulation, Large vector, Voltage Source Inverter, Total Harmonic Distortion

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# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND OF STUDY

Recently, a multiphase machine can be more freedom in designing compare to three-phase motor drives. This multiphase system allows to upgrade the number of technical and economic characteristics and to extend the application system field wider. In addition, it can be utilized to improve the drives performance. The variable ac drives need a power electronic converter as their supply while the number of phases does not have to be the same and it also can be considered as design variable [1]. Multi-phase motor posses several advantages over conventional three-phase such as reducing the amplitude and increasing the frequency of torque pulsations, reducing the rotor harmonic currents and current in per phase without increasing the voltage per phase, and lowering the dc-link current harmonics and higher reliability [4]. Therefore, multiphase drives are very suitable for electrical/hybrid vehicles, ship propulsion, aerospace applications and high power applications [9].

Space vector modulation (SVM) is an algorithm to control the pulse width modulation (PWM) for three-phase inverter. In SVM, it can generate the sine wave compared to the PWM that only generate a square wave modulation. It also provides a high voltage to the motor with lower total harmonic distortion. SVM is one of the preferred real-time modulation techniques and is widely used for digital control of voltage source inverters [2] and [3].