

**INVESTIGATION OF QAM BASED ON MEAN  
SQUARE ERROR (MSE) CHANNEL ESTIMATION  
(CE) FOR MIMO-OFDM PILOT BASED SYSTEM**

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With the name of ALLAH Most Gracious and Most Merciful

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## ABSTRACT

Channel Estimation (CE) is functioning as a medium to reduce the diversity and error in MIMO-OFDM system which containing few other techniques which are Least Square Error (LSE), Mean Square Error (MSE) and Discrete Fourier Transform (DFT). The diversity in MIMO-OFDM is based on the lowest Bit Error Rate (BER) of each result by the estimation of Quadrature Amplitude Modulation (QAM) scheme size. Fast Fourier Transform (FFT) and Inverse Fast Fourier Transform (IFFT) are the main optimizer as it convert input signal or output signal from frequency domain to time domain or vice versa either on serial or parallel block. The Multiple Input Multiple Output (MIMO) is perform in the transceiver technology so that it can improve the performance of the radar, satellite or any other devices that uses signal frequency as the input. The Orthogonal Frequency Division Multiplexing (OFDM) is the technique that use for many companies, distributors, researchers, industries and many other signal processing usage for many years. There is Channel Estimation (CE) which consists of different statement to obtain high gain and a better performance of Bit Error Rate (BER). This is why the study of Mean Square Error (MSE) is made so that the technique can reduce the error and perform a better Bit Error Rate (BER). The Least Square Error (LSE) and Discrete Fourier Transform (DFT) BER are not shown because these are other CE techniques and Mean Square Error (MSE) is used just by applying the algorithm from Least Square Error (LSE) and converted into MSE with combination of few complex matrix correlations.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

In this chapter, it is mainly about the overview about the project or project background will be describe and explain. Generally, certain techniques, schemes or problem solving are used in the project and the expected performance will be discussed and be explained. The project is made to achieve the objectives based on problem statements in the scope of the project. Last but not least, the organization of the project also will be touch in this project report to show the flow of the thesis.

### **1.2 PROJECT BACKGROUND**

Wireless technology with transmitting and receiving ability have become the most indulging technology which we can see it growing fast for past 40 years of evolution of the communication system from one way communication to two ways communication and now even live video call can be perform. Everything made easier by the improvement of the wireless technology which are now up to 4G Long Term Evolution (LTE). All of this improvement is achieved by the improvement made to the Orthogonal Frequency Division Multiplexing (OFDM) system to perform a high bit rate and efficiency, better coverage, and of course reduce the cost of system maintaining [1, 2].

Orthogonal Frequency Division Multiplexing (OFDM) is a method of encoding digital data on multiple carrier frequencies. Orthogonal Frequency Division Multiplexing (OFDM) has developed into a popular scheme for wideband digital