

ABSTRACT

Wireless communication system was required to be available in *high speed data rate* to giving such as sending data service, video streaming and video conference in realtime which is giving a good performance and able to work in *multipath fading channel* until finding the new technique to increasing spectral efficiency and repairing the quality of signal. All of that requirement can be overcome by using MIMO technique which is combined with *multicarrier modulation OFDM*. However, sometimes in wireless mobile communication signal from the desired user and signal interference using a same band frequency. This can be overcome by using *beamforming* technique in antenna.

This final project was examine the effect of using *beamforming* technique in increasing system performance that have been exist that is MIMO OFDM. *Beamforming* technique that was examined not held up to smart antenna technique, just examine the using of weighting factor with *adaptive algorithm* because the system that was held here just using single user. The *adaptive algorithm* was using here is LMS (Least Mean Square) algorithm.

Based on the result of this final project, MIMO OFDM with *beamforming* system can achieve SNR $\pm 13\text{dB}$ for silent user and SNR $\pm 30\text{dB}$ for moving user with velocity 5.4 s/d 10.8 km/hour. An increasing performance can be held by using more bit pilot. Using 25 bits and 68 bits pilot giving $\pm 2\text{dB}$ and $\pm 3\text{dB}$ better than 17 bits pilot for silent user while 160 bits pilot increase the performance up to $\pm 5\text{dB}$. Beside that, it is proved that the angle of signal arrival not influence the system's performance, and also the value of μ , which is only determine time convergence of error that held concern to the amount of symbols pilot. It is prove then that if the degree of separation between user desired and interferer is bigger, it's give a better performance. It is need SNR $\pm 10\text{dB}$ for 30° degree of separation, and SNR $\pm 12\text{dB}$ for 10° degree of separation.

Key words : MIMO, OFDM, *beamforming*, *adaptive algorithm*, *LMS algorithm*