

## ABSTRACT

The rapidly evolving condition of telecommunication technology development is needed for the global human being who communicates at all times for various purposes. Until now, the most advanced mobile telecommunication technology is 4G Long Term Evolution (LTE) which has been commercialized in Sweden in 2009. The technology brings advantages on the higher data rate transmission so that the communication will be more actual. Behind these advantages there is a scheme that is very influential on the reliability of 4G LTE standard, the Orthogonal Frequency Division Multiplexing (OFDM) modulation system.

The problem with the LTE system is the allocation of LTE resources and the allocation of power. The LTE resource is the Physical Resource Block (PRB) that will be appropriately allocated to the user for optimum quality of service. While the allocation of power is for having good fairness index between users.

In this final assignment the algorithm to be evaluated is Particle Swarm Optimization (PSO) algorithm for PRB resource allocation to the user. Using the waterfilling power allocation and the 2x2 Multiple Input Multiple Output (MIMO) antenna to improve performance.

Based on the simulation results, the scheme using waterfilling technique has a better fairness index system compared to the scheme without waterfilling technique, but it has poor performance in average user throughput and spectral efficiency. The scheme that use waterfilling has an average improvement of fairness value of 1.42% in all scenarios. The average user throughput and spectral efficiency get maximum on a scheme that use MIMO without waterfilling power allocation technique, the average user throughput is 7.96 Mbps and spectral efficiency is 0.96 bps / Hz in all scenarios. The entire scheme tested has the same time complexity that is  $O(NVY)$ .

*Keywords: Long Term Evolution, Orthogonal Frequency Division Multiplexing, Physical Resource Block, Waterfilling, Multiple Input Multiple Output, Particle Swarm Optimization*