ABSTRACT

Nowadays, wireless communication has improved from fourth generation technology (4G) to fifth generation technology (5G). One of the 5G technologies being developed is device-to-device (D2D) technology. D2D technology maximizes transfer data between user equipment (UE) in adjacent areas without base station (BS) intermediaries. The communication systems on the D2D use the same resource that used by cellular users (CU). Therefore, interference will occur between CU and D2D users so that it can reduce the performance of system services. To solve that problem, needed the proper allocation of CU resource to be shared with each D2D pairs.

In this study, the simulation process is carried out on two different system models that are one hop (without relay) and two hop (with relay) system models. Resource block (RB) allocation is carried out in the uplink communications. RB is allocated to each D2D pairs using allocation algorithm based on Particle Swarm Optimization (PSO) with the comparison algorithm that is Random Allocation Algorithm. PSO algorithm is a metaheuristic algorithm based on the application of daily life of birds in survival by studying and searching for the best position.

The simulation results show that in the first scenario for system model one hop, PSO Algorithm give the improvement performance of data rate and spectral efficiency 11.11% and energy efficiency 11.01% better than Random Algorithm. In system model two hop, PSO Algorithm give the improvement performance of data rate and spectral efficiency 9.28% and energy efficiency 8.48% better than Random Algorithm. In the second scenario for system model one hop, PSO Algorithm give the improvement performance of data rate, spectral efficiency, and energy efficiency 35.42% better than Random Algorithm and for system model two hop, PSO Algorithm give the improvement performance of data rate, spectral efficiency, and energy efficiency 32.5% better than Random Algorithm. However, in this simulation PSO Algorithm does not provide any improvement performance on the fairness value.

Keywords: *Device-to-Device, Resource block, Allocation algorithm, Particle Swarm Optimization, Random Allocation*