ABSTRACT

The microstrip antenna is a wireless communication device that has small dimensions but has performance that can support the implementation of 5G technology. The operating frequency of a microstrip antenna, which has the appearance of a thin plate, can be calculated using the antenna's size or dimensions. However, Microstrip Antennas have a number of drawbacks, including low gain and efficiency, a small bandwidth, and surface waves that can disrupt the emission pattern. The radiation patterns from microstrip antennas that operate at 3.5 GHz or the 5G frequency are detrimental to the body.

Based on the above problems, a solution is given in the form of adding a metamaterial structure, namely an electromagnetic band gap structure with a mushroom-like shape. The use of this structure can improve efficiency, good radiation pattern, and reduce the effect of radiation on the body. To reduce the effects of radiation on the body, the antenna must have a SAR value of <1.6.

The test was carried out under two conditions, namely simulating a conventional antenna on a hand phantom and simulating an antenna with the addition of the EBG structure on a hand phantom. The results of the simulation of a conventional antenna against a hand phantom with a distance of 0 mm show that the SAR value generated on a conventional antenna is 1.9484 W/Kg. Whereas the antenna simulation results with the addition of the EBG structure to the hand phantom with a distance of 0mm show the resulting SAR value of 0.9059 W/Kg. This shows that the addition of the unit cell EBG structure can reduce the SAR value to 46.67%.

Keywords: *antenna microstrip, 5G, Electromagnetic Band Gap* (EBG), *mushroom-like, Spesific Absorption Rate* (SAR).