ABSTRACT

The development of technology in the healthcare field continues to progress rapidly. This is no exception in the field of heart health. Heart health has become an area of concern due to the high number of individuals affected by heart disease. Monitoring heart health is typically conducted by measuring one of the vital signs, namely heart rate. One example of a medical device used to check heart rhythms in hospitals is the electrocardiogram (ECG). However, electrocardiograms can only be found in hospitals or clinics. This sometimes poses a problem for people who want to check their heart health.

Therefore, a device is needed that can enable the general public to measure heart rate rhythm conditions in real-time and is easy to use as an early warning tool. A real-time heart rate detection system can be created through wearable devices. This device is designed using a wearable antenna combined with the use of a pulse heart rate sensor. The antenna is designed with frequencies of 2.4 GHz and 5 GHz, allowing it to efficiently transmit or receive radio signals in the environment. In this research, a planar monopole antenna is designed and realized using an Dual Band circular patch, with FR-4 as the substrate material and copper for the ground plane and patch. A Uniplanar Compact Electromagnetic Band Gap (UC-EBG) is added to the design of this planar monopole antenna.

The simulation results of the antenna at frequencies of 2.4 GHz and 5 GHz showed a return loss of -13 dB and -14 dB, a VSWR of 1.545 and 1.452, and a gain of 4.160 dBi and 6.312 dBi. In the SAR testing at a distance of 20 mm, the results were 0.602 W/kg at 2.4 GHz and 0.212 W/kg at 5 GHz. The radiation pattern for the simulation results was unidirectional. After the simulation, the fabricated antenna was measured. The measurement results at frequencies of 2.4 GHz and 5 GHz showed a return loss of -14.203 dB and -14.069 dB, a VSWR of 1.435 and 1.392, and a gain of 1.519 dBi and 3.206 dBi. The radiation pattern measurement results were the same as the simulation results, which were unidirectional. The antenna measurement results affect the antenna's speed in transmitting heart rate data. This speed affects the accuracy of the heart rate measurement. The accuracy testing of the designed device used a smartwatch as a comparison. The accuracy obtained from the testing was 95.27% for stationary conditions and 84.25% for moving conditions.

Keyword : Wearable Antenna, Monopole Planar, UC-EBG