ABSTRACT

The fifth generation (5G) technology is the development of cellular communication systems after 4G with large data transfer capabilities. 5G offers higher data acceleration, lower latency, and has strong device connectivity on telecommunications networks. 5G technology has three spectrum ranges to provide wider coverage, namely sub-1 GHz, 1-6 GHz, and above 6 GHz. Antenna is a primary component needed in the formation of a 5G network, as well as transmission lines, for example on BTS. Rectangular waveguide is needed because it transfers energy well from the transmitter output to the antenna, if the wave transmission process does not use waveguide, there will be large losses.

In this final project, rectangular waveguide is designed using 3D printing with transverse electric wave (TE_{10}) mode working at S-Band frequency with center frequency of 3.5 GHz intended for 5G BTS. Polylatic acid material is used on the outside with the inside of the rectangular waveguide using copper. In this research, the results obtained meet the desired specifications with a center frequency of 3.5 GHz, this waveguide is only effective in passing signals in the range of 3.3-3.7 GHz in simulation. The simulated VSWR value obtained at S_{11} and S_{22} is 1.176 while the implementation VSWR value obtained at S_{11} and S_{22} is 4.03 and 2.257. The simulated return loss value at S_{11} and S_{22} is -21.808 dB while the implementation return loss of S_{11} and S_{22} is -4.473 dB and -8.29 dB. The simulated transmission loss value obtained at S_{21} and S_{12} is -14.786 dB while the transmission loss value of the implementation of S_{21} and S_{12} is -31.464 and -32.103 dB. The simulated impedance value obtained at S_{11} and S_{22} is 52.964 Ω and the simulated impedance value at S_{21} and S_{12} is 19 dB, while the implementation impedance values at S_{11}, S_{21}, S_{12} and S_{22} are 27.345 Ω, 48.673 Ω, 48.424 Ω and 24.959 Ω.

Keywords : Rectangular Waveguide, 3D Printing, 5G.