ABSTRACT

In order to meet the demand for high data rates, the millimeter-wave (mm-wave) band, which has never been used before, is being implemented in 5G systems. The challenge in using the mm-wave band is the high signal attenuation due to atmospheric loss, rain attenuation, and penetration loss, which requires antennas with high gain. In addition to high gain, antennas with circular polarization are an advantage because they are more resistant to multipath fading and have mobility with respect to antenna orientation. Patch antennas are one type of antenna that can be used in designing antennas that work at 5G mm-wave frequencies and circularly polarized. However, patch antennas have low gain and bandwidth.

To overcome this problem, in the work on this final project, several variations of patterned layers were used by adopting the structure of square ring and split ring. Square rings and split rings are metasurface structures that can be used to increase antenna gain and bandwidth. Meanwhile, a patch antenna with a diagonal slot method will be used in achieving circular polarization. A patterned layer is laid on top of the single element antenna.

Based on the results of antenna synthesis with some variations of patterned layers that have been designed, some of the best results are obtained on each key parameter. On the S_{11} bandwidth side, the split ring 1 3x3 patterned layer variation was able to increase the S_{11} bandwidth of the antenna by 0,53 GHz. On the 3dB AR bandwidth side (circular polarization), the square ring 3x3 patterned layer variation was able to increase the 3dB AR bandwidth of the antenna by 0,28 GHz. In addition, on the gain side, the square ring 3x3 patterned layer variation increases the antenna's center frequency gain by 1,71 dBi and the split ring 2 5x5 variation patterned layer increases the antenna's highest gain by 2,07 dBi.

Keywords: 5G mm-wave, Patch Antenna, Patterned Layer, Metasurface, Gain, Bandwidth.