ABSTRACT

The development of technology in the telecommunications sector encourages the presence of 5G technology to provide better services. 5G services that require greater capacity with data speeds of 10 to 100 times faster. So that 5G technology takes advantage of the millimeter wave spectrum to provide capacity, data rates and broad coverage for the overall connection. The release of 3GPP 15 states that beamforming technology can meet the requirements of 5G networks because it can increase 5G broadcast and traffic beam coverage. Beamforming is the process of combining signals on array elements to form radiant radiation (beam radiation) and aligning the signal to form a beam in a certain direction. The butler matrix is one of the techniques used in beamforming. In this study, a rectangular array microstrip antenna was designed with 4x4 MIMO modeling and butler matrix method. To get results in accordance with the specifications of the 28 GHz 5G antenna, iteration is carried out on each antenna element. The use of the butler matrix method aims to obtain the phase difference in each element of the designed antenna, so that the direction of radiation produced by the antenna can focus on the required direction. The design of the 4x4 butler matrix uses 2 design scenarios, then determines the best scenario to be combined with a 4x4 MIMO array microstrip antenna. After the 4x4 MIMO array microstrip antenna with 4x4 butler matrix was successfully designed, the performance against the parameter specifications set at the 5G frequency of 28 GHz was sufficient to increase the value of the gain parameters and radiation patterns. The initial gain on Element 1, Element 2, Element 3 and Element 4 is 9.17 dBi respectively; 8.93 dBi; 8.93 dBi and 9.17 dBi to 11.1 dBi; 10.8 dBi; 10.8 dBi and 11 dBi. Radiation pattern is unidirectional with different radiation directions, seen from the point of view of the elevation element 1 main emission direction at an angle of 0.0° and HPBW of 13.6°, 2 elements of the main emission direction at an angle of 8.0° and HPBW of 24.8°, 3 main beam direction elements at an angle of -8.0° and HPBW of 24.5°; 4 main beam direction element at an angle of -22.0° and a HPBW of 16.1°. This proves that the use of a 4x4 butler matrix in the design of a 4x4 MIMO array microstrip antenna can increase the acquisition value and obtain a directional antenna radiation pattern with different radiation directions.

Keywords: Technology 5G, Beamforming, MIMO 4x4, Butler Matrix.