ABSTRACT

The development of technology encourages the high demand for millimeter wave (mmWave) frequencies, one of the applications is automotive radar systems at a frequency of 24 GHz which requires antennas with high gain and optimal directivity. This research focuses on designing a 2x2 microstrip array antenna as a lens antenna feeder to meet these needs. The initial design still does not meet the given target parameters so optimization is carried out by adding parasitic elements to achieve the target parameters without increasing the dimensions of the antenna. The optimized microstrip antenna with dimensions of 20x20 mm provides excellent performance at 24 GHz with a return loss of -43.6 dB, gain of 11.22 dBi, bandwidth of 3.379 GHz, and HPBW of 34.9°.

This antenna design will be coupled with a lens element to validate the results of the study. The results of this combination show a drastic improvement in performance, with an increase in gain to 28.24 dBi and an HPBW that narrows to 4.5° and a main lobe direction of -1°. Although the return loss value at 24 GHz decreases to -22.54 dB, these results prove that the 2x2 array microstrip antenna design with parasitic elements can be used as a coupling in lens antennas to produce high gain and directivity and is very suitable for automotive radar applications.

Keywords: *Microstrip Array Antenna, Lens Antenna, Automotive Radar, Gain*