ABSTRACT

Radio detection and ranging (RADAR) is a remote sensing technology. RADAR is able to overcome problems related to detecting and tracking objects that cannot use optical cameras. RADAR will radiate electromagnetic waves. If a wave hits an object, it will reflects back. The Adaptive Cruise Control (ACC) system that functions to control the braking and acceleration of a car automatically. ACC aims for the driver to rest for a moment by removing the gas pedal. The main focus of making the ACC system is the main lobe antenna that can control the driving path of the car in front to be at a constant distance with the same speed as the car in front.

In this research, the microstrip antenna design will be done using software. The working frequency of this antenna is at 77 GHz with a range of up to 150 meters so it is called the long range radar. Very high antenna frequencies can affect smaller antenna dimensions and gain, so using array techniques to increase gain. Substrate material with a low loss tangent suitable for high frequency. The antenna design uses Roger Duroid 5880 as a substrate. Patch design that is designed in the form of log periodic aims to get a large gain and bandwidth as needed. Feeding technique that will be used is by microstrip line. This antenna uses a unidirectional radiation pattern to determine the distance of the target in front of it. log periodic results in a wide bandwidth of more than 1 GHz. This research focuses on increasing the gain, reducing the beam and radiation patterns by using the analysis of the effect of the distance between array elements and the addition of the elements.

In a single patch log-periodic simulation, a gain of 4.775 dB and a beamwidth of 37.8 was obtained, thus optimizing the antenna to work at 77 GHz. The results obtained when changing the distance between array elements at a distance of λ_0 obtained beamwidth of 35.3° with gain of 5.84 dB while at distance of $\frac{\lambda_0}{2}$ beam was obtained 32.5°. The results obtained when adding an array of elements to 19 elements at a distance of $\frac{\lambda_0}{2}$ and beam of 32.5° with gain of 8.93 dB, these results indicate that the addition of elements can increase the gain and widen the beamwidth. The results of this research for array 1×16 were obtained *gain* equal to 8.721 dB, beamwidth as wide 12.7° and shape of the radiation pattern is *unidirectional*

Keywords: ACC, vehicle radar, antenna array, gain.