

ABSTRACT

This research focuses on the design and development of a Log Periodic Dipole Array (LPDA) microstrip antenna at a frequency of 24 GHz, which functions as a primary feeder for a millimeter wave lens antenna system in remote sensing applications. The urgency of this research is driven by the rapid advancement of wireless communication and remote sensing technologies that demand efficient and reliable antenna systems. The LPDA antenna was chosen because of its characteristics that offer wide bandwidth and high gain, making it ideal for high-speed data communication and remote sensing. The design of the LPDA antenna was carried out through a series of theoretical calculations and extensive optimization using CST Studio Suite 2019 software.

The final design of the standalone Log Periodic Dipole Array (LPDA) microstrip antenna successfully operated at a frequency of 24.18 GHz with a Return Loss (S11) of around -30 dB, VSWR 1.07, gain 9.38 dBi, bandwidth 558 MHz, and beamwidth 69.7°. Furthermore, the performance of the LPDA antenna was significantly improved by combining it with a spherical convex lens made of polycarbonate. This combination results in a substantial gain increase, from 9.38 dBi to 27.04 dBi, and a drastic narrowing of the beamwidth from 69.7° to 3.9°. In addition, the Return Loss is also optimized to around -40 dB. These improvements indicate a much more directional radiation pattern focus and higher efficiency, which are very important for remote sensing applications that require high spatial resolution and remote object detection capabilities.

Overall, the results of this study indicate that the design of a 24 GHz LPDA microstrip antenna combined with a spherical convex lens is very potential and efficient for remote sensing applications that require high-gain antenna systems and excellent directivity. The contribution of this study is expected to provide a significant basis for the development of more efficient antenna technology for future remote sensing and communication systems.

Keywords: *log periodic microstrip antenna, 24 GHz, remote sensing, lens antenna, millimeter wave, gain, beamwidth, return loss, VSWR, CST Studio Suite.*