ABSTRACT

Radar (Radio Detection and Ranging) is a commonly used device for transmitting electromagnetic signals and capturing reflections from target objects. This device can also identify an object through the presence of reflections or responses from the targeted object. A filter is a device that allows signals of a specific frequency to pass through while suppressing or eliminating unwanted signals. A hairpin filter is a neatly structured filter that employs the concept of a resonator fold from a parallel connector, specifically a half-wavelength resonator filter, which has a "U" shape.

In this final project, a microstrip-based bandpass filter using the hairpin method will be designed for an S-Band radar with a frequency range of 3GHz. The filter is designed with a bandwidth of 200MHz, with a transmission coefficient of ≤ -3 dB and a reflection coefficient of ≤ -10 dB. It is designed using CST software, and measurements are taken using a Vector Network Analyzer (VNA). The optimized simulation results were then realized, yielding a reflection coefficient of -18.46 dB, a transmission coefficient of -2.23 dB, and a VSWR of -1.27. These values were tested using a Vector Network Analyzer (VNA), resulting in a reflection coefficient of -18.46 dB, a transmission coefficient of -3.23 dB, and a VSWR of 1.266. There is a shift in the center frequency for the transmission coefficient results, yielding an excellent value of -2.25 dB at a frequency of 3.1 GHz. The frequency shift is approximately 0.1 GHz. The difference between the simulation and measurement results is analyzed in terms of fabrication imperfections. The comparison of these results is close to the target filter specifications.

Keywords: *Radar, Bandpass Filter, Hairpin, S-band, Microstrip*