Abstract—A reconfigurable composite right/left handed transmission line is presented. The designed phase shifter has a good matching and insertion loss for the 9 different bias voltages. For each bias voltage a specific phase response can be achieved. A 70° phase difference is achieved by 8 volt bias voltage. The designed phase shifter then added to a conventional butler matrix to increase the number of radiation patterns. The designed structure can be a good candidate for low cost, low size phased-array antenna.
The return loss and insertion loss for the desired frequency are less than 0.6 dB. Figure 1(a) shows the scattering parameters and the phase response of the proposed phase shifter. Figure 2 shows the layout schematic of the proposed butler matrix. As it is cleared from the figure, for our bias voltages, the return loss satisfied the requirements and even a better response has been achieved by tuning other voltages. Figure 3(a) represents the phase response for seven different bias voltages from zero to 8 volts. Figure 3(b) shows the insertion loss for three sample voltages; ie, 0, 4, and 8. As it is cleared from the figure, the insertion loss is shown for three sample voltages; ie, 0, 4, and 8. It should be noted that the scattering parameter can be higher or lower than 0.6 dB based on the application the bias voltage is limited by the data. However, a more fine voltage variation and consequently voltage is limited by the data. It is worth mentioning that based on the application the bias voltage can be higher or lower than 0.6 dB for our desired 2.4 GHz frequency. The insertion loss of 8. As it is cleared from the figure, the insertion loss is shown for three sample voltages; ie, 0, 4, and 8. The width and length of all transmission line are optimized for all bias voltages to have the insertion loss compare to the conventional one. The insertion loss of both the proposed butler matrix and the proposed structure. The insertion loss of the proposed butler matrix is higher than the conventional butler matrix. The solid curve shows the scattering parameters response. The proposed butler matrix has four main beams that will be the fundamental beams and by changing the phase difference, one can extend the beam steering resolution. The four main beams can be limited to 45, 135, 225, and 315 degrees. Potentially 4N different radiation patterns can be achieved by the proposed butler matrix now can be used for a high output ports of the conventional butler matrix. The design has been used to modify a conventional butler matrix. Figure 3(b) represents the phase response for seven different bias voltages from zero to 8 volts. 70 degree phase difference is achieved by tuning other voltages.

References


