

Reconfigurable Shorted Patch Antenna Using Via-hole Connection Control

Sumin Yun*, Yoongoo Kim, Youngjoon Lim, and Sangwook Nam
INMC, Seoul National University, Seoul, Korea
E-mail : ysoom@ael.snu.ac.kr

Patch antennas that have many attractive features like low-profile, planar surface are widely used in Wireless Body Area Network applications. As the patch antenna has a ground structure behind the patch, its radiation efficiency is higher than the antennas without ground structure in on-body environment.

Patch antenna has anti-symmetric E-field distributions across the center of the patch. When the patch antenna is resonating, the virtual ground is generated by the anti-symmetric E-field. Therefore, the patch antenna can be miniaturized by placing the shorting wall along the virtual ground. The length of the shorting wall strongly affect the resonance frequency of the shorted patch antenna. The inductance of the shorting wall increases as the length of the shorting wall decreases. Therefore, we can control the resonance frequency of the shorted patch antenna by adjusting the length of the shorting wall.

For the length control of the shorting wall, the straight via-hole array is utilized instead of the conducting wall. The connection of the via-hole is controlled by the switches located between the via-hole and patch. When the switch is on-state, the via-hole can connect the patch and ground. By changing the state of the switch, the electrical length of the via-hole array can be adjusted. Therefore, the center frequency of the shorted patch antenna can be adjusted by controlling the state of the switch. Fig. 1 shows the simulated S-parameters using the proposed technique on 1.57 mm height Duroid 5880. Using the proposed technique with 3 manipulable switch, the -10 dB bandwidth was expanded from the 24 MHz to 100 MHz around the 2.45 GHz.

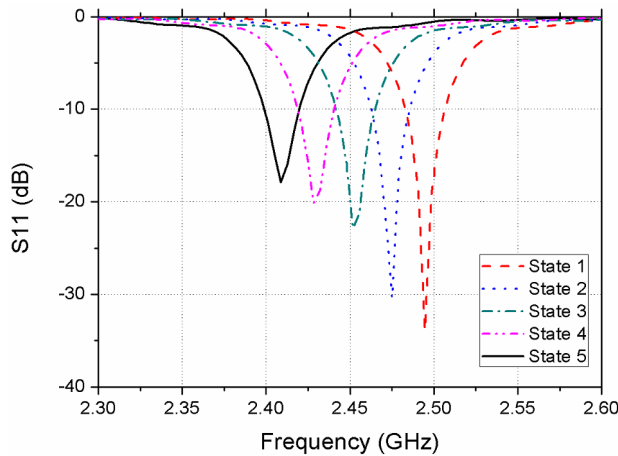


Fig.1. The reflection coefficient of the shorted patch antenna using proposed technique