Frequency-Reconfigurable Stacked Patch Microstrip Antenna Using Aperture-Coupled Technique

N. Ramli[a], M. T. Ali[a], A. L. Yusof1 , S. Muhamud – Kayat[a], and A. A. A. Aziz[b]
[a]Antenna Research Group (ARG), Microwave Technology Centre (MTC), Faculty of Electrical Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.
[b]Center Of Medical Electronic Technology (CMET), Sultan Salahuddin Abdul Aziz Shah Polytechnic, Persiaran Usahawan Seksyen U2, 40450 Shah Alam, Selangor, Malaysia

ABSTRACT
This paper presents a novel structure of a frequency-reconfigurable microstrip antenna fed with an aperture-coupled technique and stacked patch technology. The proposed antenna design has a unique structure; the radiating elements (top and bottom patch) are sorted in stacked substrate layers to indicate the different operating frequencies. One PIN diode switch integrated at the feedline is reconfigured to either ON or OFF mode to control the feedline's length, thus affecting the current distribution along it. Furthermore, a new coupling method in aperture-coupled technique is implemented, whereby the currents flow from the feedline's length will activate selected aperture slots on the ground and the wave will radiate to the selected patch at different substrate layers thus achieving the frequency reconfigurability. When the PIN diode switch is in ON mode, the proposed antenna is capable to operate at 2.6 GHz while in OFF mode, the antenna is able to operate at 3.5 GHz by using the same antenna. Therefore, the effects of an aperture slots characteristic and the PIN diode switch position along the feedline have been studied. The prototype of the proposed antenna is tested/fabricated with the biasing circuit to validate the antenna's performance in terms of return loss and radiation pattern. The results confirm that the antenna has a good agreement between the simulation and measurement results.

KEYWORDS: aperture-coupled technique, aperture slots, coupling, frequency-reconfigurable antenna, PIN diode and stacked patch