

An UWB Antenna with Dual Band Notches for 3G/Bluetooth/WiMAX

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Abstract: A new planar monopole antenna which covers 3G, Bluetooth, WiMAX, and the UWB bands and also exhibits dual band-notched characteristic is presented. Presented antenna consist a square radiating patch with a pair of L-shaped slits, and two U-shaped slot and a ground pale with a V-shaped strip. The proposed antenna has been successfully simulated and measured. Experimental results shows that the proposed antenna yields an impedance bandwidth of 2–16 GHz with VSWR<2 , except the dual notched band. The designed antenna has a small size area of $10 \times 12 \text{ mm}^2$.

Keywords: Bluetooth, Dual band Notches, L-shaped slits, U-shaped slits, Ultra wide band antenna.

INTRODUCTION

Recently, a considerable amount of research has been devoted to the development of ultrawideband (UWB) antenna for its enabling bulky data transmission rates, low standing wave ratio, constant gain, and constant group delay over the entire operating frequency band. However, there are some other existing narrowband services that may cause interference with the UWB band, such as WLAN, WiMAX, and ITU. To solve this problem, it is desirable to design antennas with band-notched characteristics. In this paper, a monopole antenna that covers 3G, Bluetooth, WiMAX, and the UWB band but exhibits dual bandnotched characteristic is presented. First, by inserting a V-shaped protruded strip on the ground plane, bandwidth is improved, single band-notch function is provided by cutting a pair of L-shaped slits in the corners of a square radiating patch, and dual bandnotch characteristic is obtained by cutting two U-shaped slot in the radiating patch. The size of the designed antenna is smaller than the UWB antennas with band-notched function reported recently, which has a size reduction with respect to the previous similar antenna. Good return loss and radiation pattern characteristics are obtained in the frequency band of interest. Simulated and measured results are presented to validate the usefulness of the proposed antenna structure for UWB applications.

ANTENNA DESIGN

Fig. 1 shows the geometry of the designed UWB antenna. The antenna is printed on an FR4 substrate of thickness 1.6 mm and permittivity 4.4. The width of the microstrip feed line is 2 mm. The basic antenna structure include a square radiating patch, a feed line, and a ground plane.

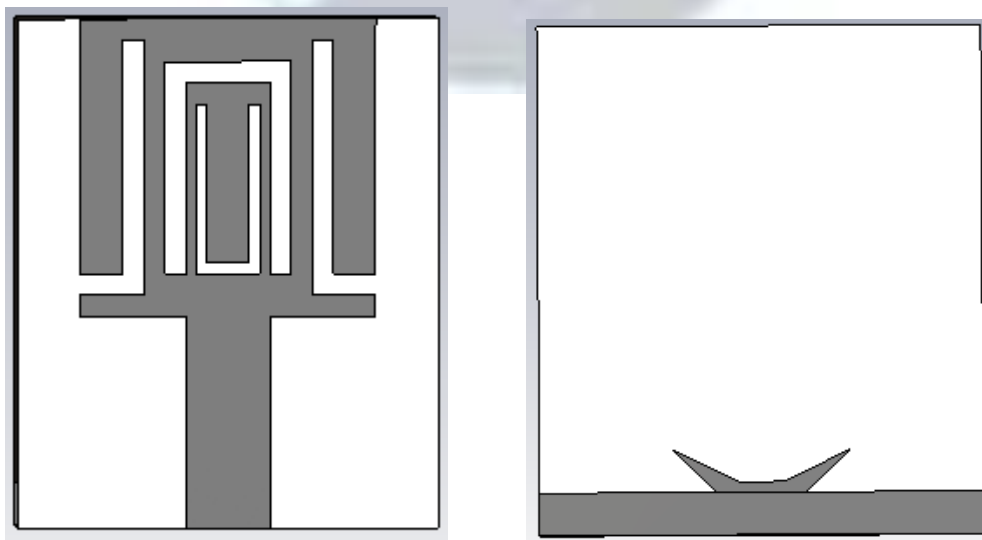


Fig.1. Geometry of the proposed antenna. (a) Front view (b) Back view (unit: millimeters).

TABLE I DIMENSION OF PRESENTED ANTENNA

W_{sub}	W_g	W_p	W_f	L_{Sub}	L_g	L_p	L_f	L_{LSlot}	W_{LSslot}	L_{USlot}	W_{USlot}	l_{uslot}	W_{uslot}
10	10	7	2	10	1	7	5	6	.5	5	.5	4	.25

RESULT AND DISCUSSION

The presented antenna is successfully measured and simulated by CST Microwave Studio 2011 Software. Fig.2. shows the measured VSWR for the antenna. and in Fig.3. measured return loss is shown. For single band-notch characteristics, two L-shaped slits in the corners of the radiating Patch is being used, and by adding an two U-shaped slot in the center of the Radiating patch, a dual band-notch function is achieved. Notches that covers 3G/Bluetooth/WiMAX GHz bands. The simulated current distribution on the radiating patch at the notch frequencies of 5.5 and 7.7 GHz for the proposed antenna is presented in Fig.4. and Antenna gain also shown in Fig.5.

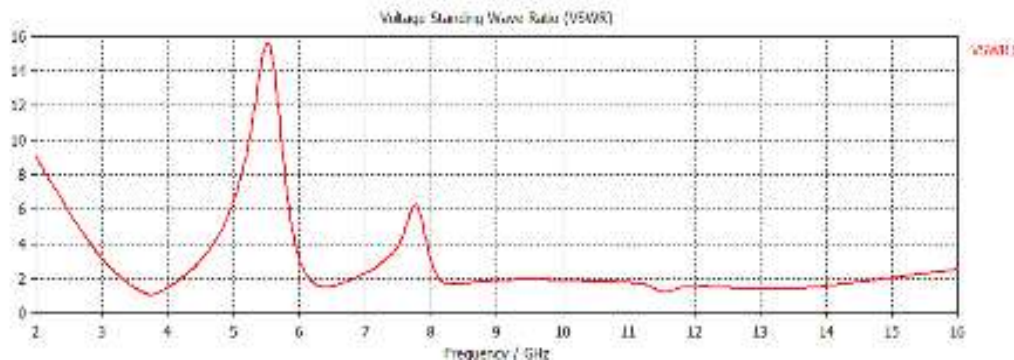


Fig.2. simulated VSWR characteristics for the proposed antenna.

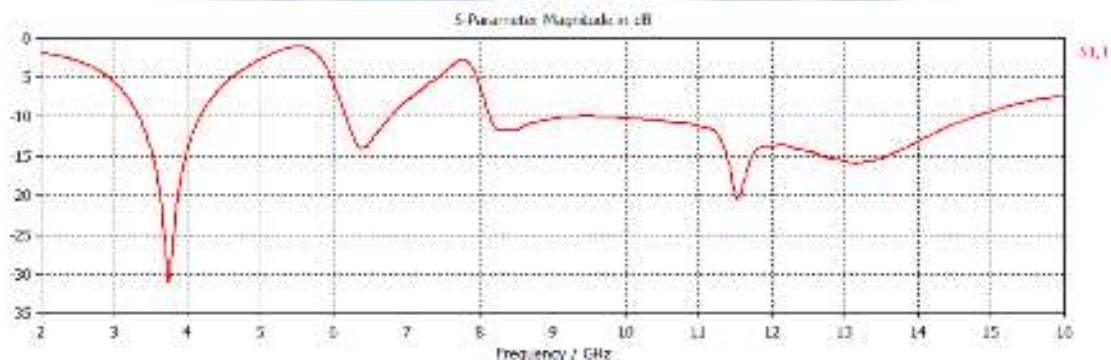


Fig.3. Measured Return loss curve of the designed antenna.

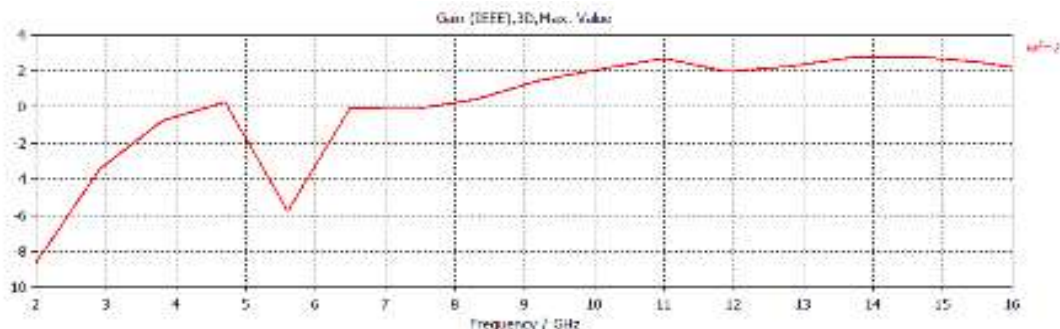


Fig.4. Measured Gain of the structure

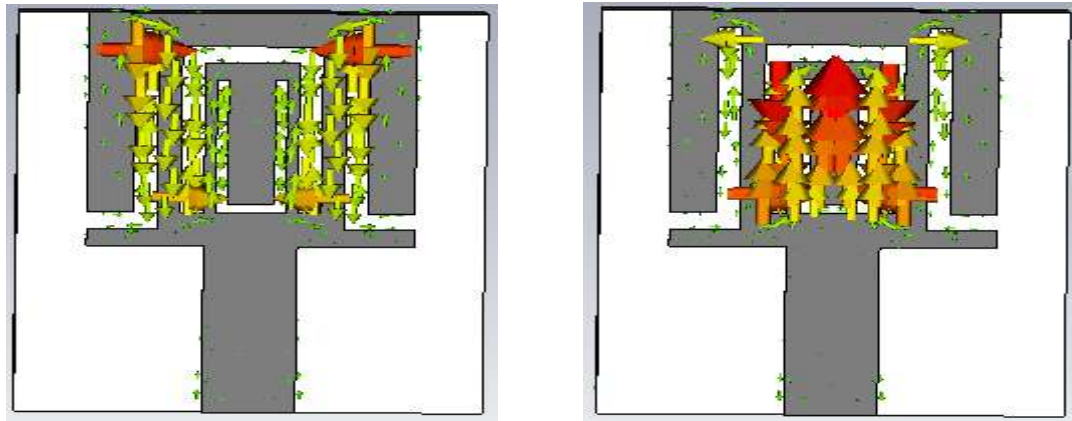


Fig.4. Simulated surface current distributions on the radiating patch for the proposed antenna shown in Fig. 1 at (a) 5.5 GHz (first notch frequency) and (b) 7.7 GHz (second notch frequency).

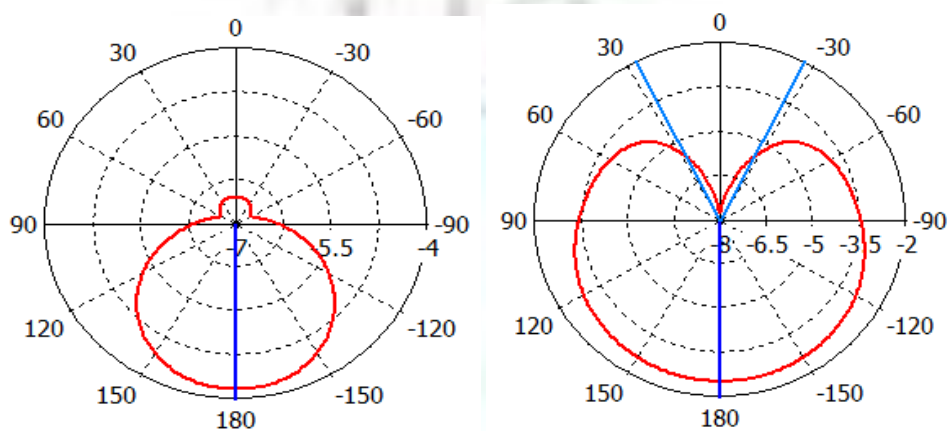


Fig.5. Farfield Pattern for the presented antenna.

CONCLUSION

In this paper a planar monopole antenna for 3G, Bluetooth, WiMAX, and UWB band applications is presented. Presented Antenna works in range b/w 2-16 GHz By cutting two L-shaped slits and two U-shaped slot with variable dimensions on the radiating patch dual band-notch characteristics generated and also by inserting a V-shaped strip on the ground plane, additional resonances are excited, and hence much wider impedance bandwidth can be produced. The presented antenna has very small size.

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