UWB Trapezoidal Antenna with a Band-Notch Characteristic

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***Abstract*—This paper presents the analysis of CPW-fed trapezoidal monopole antenna added with parasitic elements and slot. The U slot applied on trapezoidal patch to investigate the effects of slot geometrical altering to the notch and operation frequency.**

Keywords—notch frequency, parasitic element, U slot and dimension adjustment

I. INTRODUCTION

Federal Communication Commission (FCC) released that UWB communication system operating in frequency range from 3.1GHz to 10.6GHz. In our previous work, the parasitic elements implemented to CPW-fed trapezoidal antenna to enhance the operation bandwidth [1]. This technique produces wide bandwidth which is from 3.2GHz to 11.5GHz. However, UWB applications can co-exist with other narrow band services that occupy the same spectrum such as the IEEE 802.16 WiMax operating at 3.4GHz–3.69GHz and IEEE802.11a WLAN operating at the 5.15GHz–5.825GHz band[2]. These bandwidths will create an interference and many methods introduced in an effort to get rid of such frequencies such as embedded omega slot and fractal shaped ground plane [3], U-shaped slot line [4, 5], slot and metallic ring [6], split ring resonators (SRRs) [7] and electromagnetic band gap structures (EBGs) [8].

In this paper, U slot is implemented on CPW-fed trapezoidal antenna added with parasitic element. The changes of band-notched frequency will be observed through adjustment of slot dimensions. At this stage the model has been simulated using the time domain solver, Computer Simulation Technology (CST) Microwave Studio.

II. ANTENNA STRUCTURE AND DESIGN

A. Design of UWB Antenna without Slot

Fig. 1 shows the geometrical structure of fabricated CPW-fed trapezoidal antenna added with parasitic elements. This antenna's total size is 38mm x 51mm x 1.6mm and designed on a substrate with dielectric constant 4.4. The dimensions of antenna are M = 38mm, N = 51mm, W1 = 17.5mm, W2 = 2.6mm, W3 = 32mm, L1 = 7.8mm, L2 = 19mm, L3 = 11.2mm, L4 = 3mm, L5 = 8.6mm, L6 = 1.5mm, L7 = 4mm, g = 0.2mm and h = 1.6mm. The simulation has been done and antenna is fabricated on FR4 for real measurement.

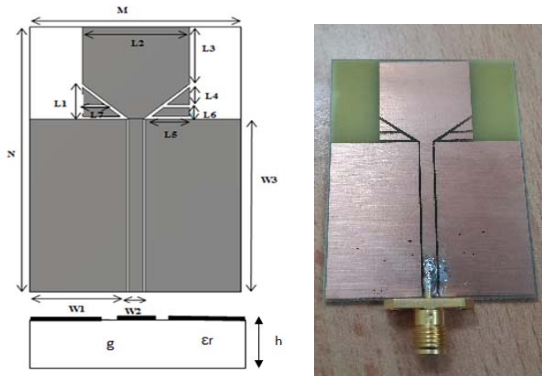

Fig. 1. Geometry of fabricated antenna.

B. U Slot Insertion

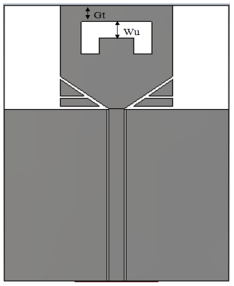

Fig. 2. Inserted U slot on trapezoidal patch

A U-slot is loaded on the antenna in order to achieve the desired impedance to the design and slot dimensions are experimentally adjusted to find the effects on frequency. Fig.2 shows the width of slot, W_u is gradually transform from 0.5mm to 1mm, 2mm and 3mm. Every changes of W_u value accompanied with adjustment of slot position on trapezoidal patch which involved the changes of G_t value from 3mm to 6mm and 9mm.

III. ANALYSIS AND RESULT

Fig.3 shows the return losses of the CPW-fed trapezoidal antenna without slot for simulation and real measurement. The simulated result shows the antenna operates in frequency ranges 3.2GHz–11.5GHz. The measured data is compared with simulated data and had a good agreement.