A study on the Ultra Wideband Tapered Slot Antenna with Band-Rejection Characteristic

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Abstract

This paper proposes a novel Ultra Wideband (UWB) tapered slot antenna (TSA) that has both enhanced impedance bandwidth for UWB RF front-ends and band-rejection characteristic of 5GHz WLAN band limited by IEEE802.11a and HIPERLAN/2. To obtain these two characteristics of wideband and band-rejection at TSA, a broadband microstrip-slotline transition with multi-arm stubs and λ/4 short stubs are used respectively. From the measured results, it can be shown that wide bandwidth of 1.99 octaves from 2.8 to 11.09 GHz for VSWR<2 is obtained while 5.05 ~ 5.93 GHz band is rejected.

Introduction

Recently, UWB technique has become one of the most fascinating technologies in indoor communications. It has the merits of high speed transmission rate, low power consumption and simple hardware configuration over conventional wireless communication systems. According to the regulations released by FCC, the UWB systems for indoor communications have been allocated to the spectrum from 3.1 to 10.6 GHz in order to prevent unnecessary interference with other radio systems [1]. However, the use of 5.15 ~ 5.825 GHz band is limited by IEEE802.11a and HIPERLAN/2 since the power level of 5GHz WLAN is very higher than that of UWB system. Therefore, a band-rejection filter should be used in UWB RF front-ends, and this will increase complexity over whole UWB system, finally make it less attractive.

Several antennas with band-rejection characteristic have been studied due to the advantages of composing compact RF front-ends [2-4]. In this paper, these concepts are applied to a TSA by inserting λ/4 short stubs. Finally, the proposed antenna not only covers the UWB band but also rejects the limited band. To verify the validation of the proposed antenna, the simulated and measured return losses versus frequency are presented. Also, radiated power ratio between passed band and rejected band are also presented.

Antenna Design

The proposed TSA is fabricated on the FR4 epoxy substrate with 0.5-oz copper, 0.6 mm substrate height, and dielectric constant of 4.5. The configuration of the proposed antenna is presented in Fig. 1. It is shown that multi-arm stubs are added on feeding network for enhanced bandwidth, and λ/4 short stubs are inserted into tapered slot radiator symmetrically to reject the 5.15 ~ 5.825 GHz band limited by IEEE802.11a and HIPERLAN/2 [5-6].