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WLAN Band Rejection of UWB Exponential Tapered Slot Antenna

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Abstract
A frequency notched Ultra-Wide Band (UWB) antenna using exponential tapered slot is proposed here. The notch frequency is achieved by introducing a quarter wavelength spur-line in the feeding microstrip line of the antenna. The designed antenna is highly compact with an over-all size of 60mmX60mm exhibiting a -10 dB impedance bandwidth ranging from 1 GHz to 18GHz. The antenna provides consistent gain and stable radiation pattern. The L-shaped spur lines contribute to the notch frequencies at 5 GHz aimed to avoid interference from WLAN band.

Keywords: ETSA, Microstrip Fed, SPUR LINE, UWBA

1. Introduction

Over last ten years after the FCC permitted [1] its civil application within the frequency band from 3.1 GHz to 10.6 GHz the UWB technology has achieved an unprecedented growth and popularity amongst academic researchers and wireless industries. Some of the narrow band such as FBWA mainly around 3.15 GHz, WiMAX ranging from 3.3-3.7 GHz, IEEE 802.11 –WLAN in the frequency band of 5.15-8.15 GHz, with the FCC licensed UWB band requires the efficient design of frequency notched UWB antenna to reject signals from these interfering bands depending on user's requirement. Various techniques have been proposed but most of the designs are based on defecting the radiators and / or the ground planes with etched slots [2, 4].CSRR has also been used [5]. The concept of frequency notched UWB antennas have been reported in [6, 7] by loading split ring resonator (SRR) pair along the CPW feed line. This paper describes a new and simple technique of designing frequency notched UWB antennas by embedding a quarter wavelength spur line on the feeding microstrip line of the radiator. Launched electromagnetic power is coupled from microstrip to the slot line which is gradually tapered giving rise to the radiation power along the length of slot and the antenna behave as an end fire radiator. Fig 1 shows the schematic of the proposed antenna both for exponential and linear tapered slot antenna. Proper impedance matching is ensured by properly terminating the microstrip and slot with a circular stub of diameter D2 and D1 respectively. The antenna is etched on a substrate of thickness h = 0.787 mm and dielectric constant ε_r = 2.2 with an over-all dimension of 60mm×60mm.

The length and the width of the tapered slot line are optimized to achieve the desired traveling wave mode of radiation as these parameters greatly impact the radiation characteristics of the antennas. Details of all the design parameters for both the antenna is shown Table 1.

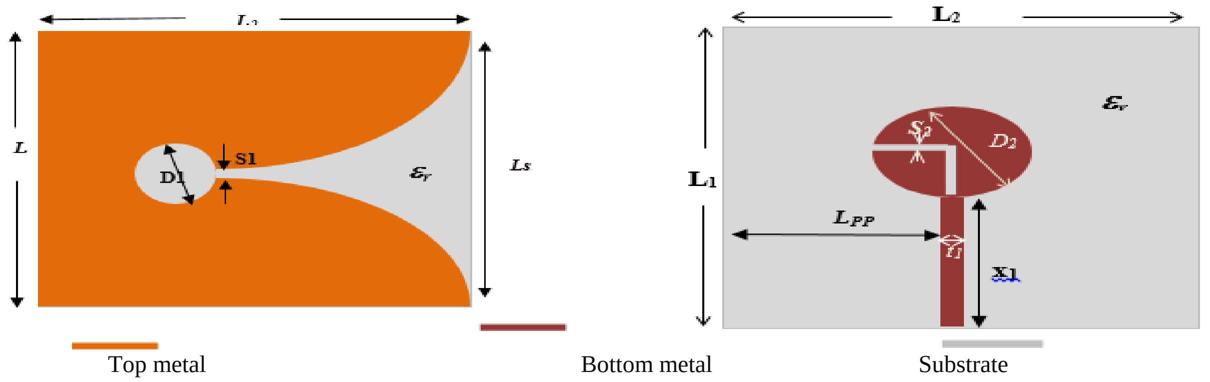

Fig 1: Schematic of the proposed antenna (a) Top view (exponential Tapered) (b) Bottom view

Table 1: Designed parameters of proposed antenna

Parameters	L_1	L_2	L_s	L_{s1}	t_1	L_{PS}	L_{PP}	S_1, S_2	D_1	D_2
Value (mm)	60	60	16	26	2.4	3	16	0.32	30	18

2. Results and Discussion

The proposed antenna, with and without the spur-line in feeding microstrip line, is designed and simulated using a commercial EM simulator [8]. Fig 2 shows the simulated S11magnitude of the proposed ETSA antenna with and without the spur-line loaded in the feed of the radiator. As can be seen from the figure, the conventional ETSA without any spur line coupled to the feed line operates from 2 GHz to 18 GHz. The same antenna when loaded with a quarter wavelength spur line in the feeding microstrip line, a distinct frequency notch is observed at 5.1 GHz corresponding to the resonance frequency of the spur line.

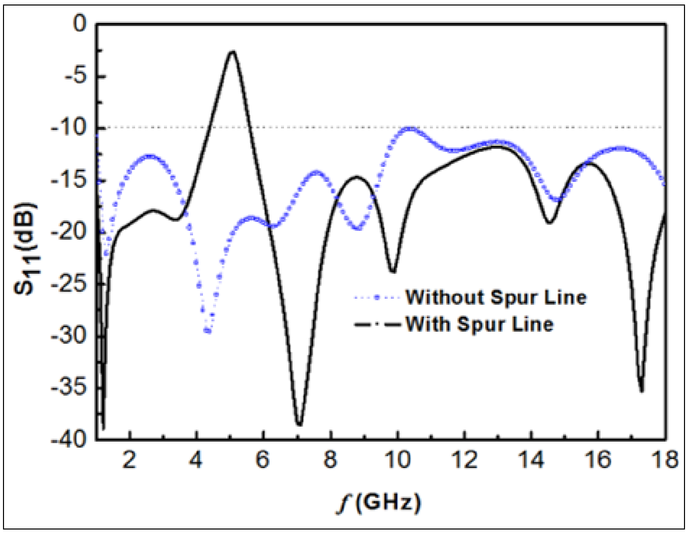

Fig 2: Simulated S_{11} characteristics of the proposed spur line loaded (ETSA) compared with a conventional ETSA without spur lines

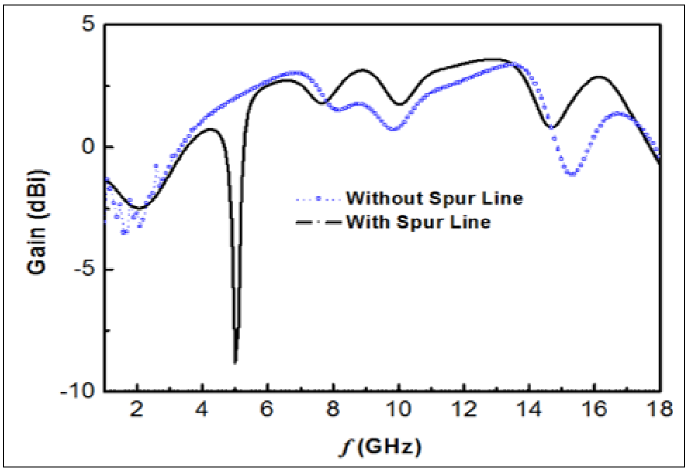

Fig 3: Simulated Gain characteristics spur line loaded ETSA compared with a conventional ETSA without spur line

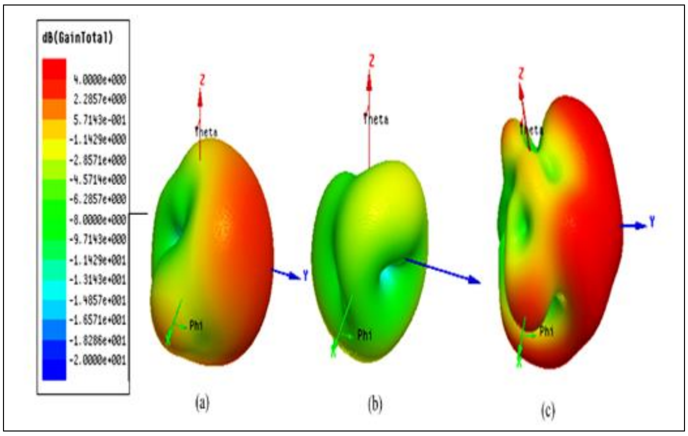

Fig 4: Simulated 3D polar plot of the proposed spur line loaded microstrip fed linearly tapered slot antenna at (a) 4 GHz (b) 5.1 GHz (notch frequency) and (c) 13 GHz. All the plots are in same scale

The simulated peak gain as a function of frequency of the proposed antenna with and without the spur line is shown in Fig 3. The plot shows a sharp reduction in gain of -9 dBi at the notch frequency contributed by spur line resonance. The overall gain of the antenna at other frequencies (3.5-14 GHz) is well above 1 dBi with a peak gain of 3.6dBi at around 13 GHZ for both the configurations.

3. Conclusion

A new concept of designing frequency notched UWB antenna is proposed by loading a spur line along the feeding microstrip line of a linearly tapered slot antenna. The concept can be extended to design multiple notched antennas by accommodating more number of spur lines on the microstrip. It can also be customized for wideband rejection purpose.

4. References

1. Federal Communications Commission (FCC), Washington, DC, First report and order in the matter of revision of Part 15 of the commission's rules regarding ultra-wideband transmission systems, ET-Docket, 2002, 98-153.
2. Nguyen, Dang Trang, Dong Hyun Lee, Hyun Chang Park. Very compact printed triple band-notched UWB antenna with quarter-wavelength slots. IEEE Antennas and Wireless Propag. Let. 2012; 11:411-414.
3. Zhang Y, Hong W, Yu C, Kuai ZQ, Don YD, Zhou JY. Planar Ultrawideband antennas with multiple notched bands based on etched slots on the patch and/or split ring resonators on the feed line, IEEE Trans. Antennas Propag.2008; 56:3063-3068.
4. Liao XJ, Yang HC, Han N, Li Y, Sun YH. UWB antenna with dual narrow band notches for lower and upper WLAN bands, Electron. Lett. 2010; 46:1593-1594.
5. Jiang D, Xu Y, Xu R, Lin W. Compact dual-band-notched UWB planar monopole antenna with modified CSRR, Electron. Lett. 2012; 48:p20.
6. Sidiqui JY, Saha C, Yahia Antar MM. Compact SRR loaded UWB Circular Monopole Antenna with Frequency Notch Characteristics, IEEE Trans. Antennas Propag. 2014; 62(8):4015-4020.
7. Sidiqui JY, Saha C, Yahia Antar MM, Compact Dual SRR Loaded UWB Monopole Antenna with Dual Frequency and Wideband Notch Characteristics, IEEE Antennas and Wireless Propag. Lett (Accepted for Publication).
8. High Frequency Simulation Software, Ansoft corp. v.14.