IJSART - *Volume 4 Issue 6 – JUNE 2018* *ISSN* [ONLINE]: 2395-1052

# Design of Compact ACS Feed Microstrip Antenna For UWB Application

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***Abstract-*** *In this article, a compact Asymmetric Coplanar Strip (ACS) Feed Microstrip antenna has been summarized and reported. Designed antenna has very compact size of 12m x 24 mm and has been simulated over the CADFEKO EM Simulation tool. Proposed ACS antenna has been simulated against the Ultra-Wide Band (UWB) operating region with frequency of 3.10 GHz to 10.60 GHz. Simulated antenna shows <-10 dB reflection coefficient bandwidth all over the UWB region and poses 90% of operating efficiency. Proposed antenna has been modeled with semicircular patch and slotting methods have been adopted for proper UWB operation. Antenna has been simulated with FR-4 dielectric substrate with effective dielectric constant of 4.4 and loss tangent of 0.02.*

***Keywords***- Asymmetric Coplanar Strip, Compact antenna, CADFEKO, Microstrip antenna, Ultra-Wideband.

## I. INTRODUCTION

Now a day, wideband communication applications are trending to fulfill the requirements of high data rates and hence higher bandwidths. High data transmission and receptions is a key feature of today's modern communication applications. To enhance the data rates and throughput of a communication channel, various digital modulation schemes has been proposed and evaluated [1]-[2]. This all system has prime requirement of an efficient and suitable transmitting sections to achieve the expected data rates and related transmission characteristics. Ultra-Wideband (UWB) system was proposed in 1866 to fulfill the high data rates, throughputs, and bandwidth requirements of existing communication systems [3].

UWB system offers challenging features in faded wireless media with various benefits and improvements in data transmission capabilities. UWB system ranges from 3.10 GHz to 10.60 GHz of wireless spectrum of microwave applications and channels. It supports enhanced 7.50 GHz of active bandwidths supporting advanced high data rates of communication protocols and realizations. Microstrip antenna system offers good remedy for UWB feasibility in the current application scenario of wideband communication systems. Proposes antenna has been simulated at UWB band of application and has been carried out with ACS technologies.

## II. ANTENNA DESIGN AND CONSIDERTAION

Proposed ACS feed antenna has been designed by using cavity model formulae for antenna design [3], [5]-[10].

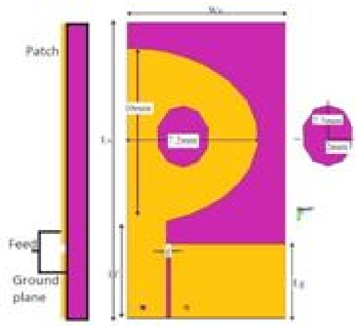


Fig. 1. Proposed antenna geometrical details.

TABLE I. ANTENNA DESIGN PARAMETERS.

| Parameters | Calculated values |
| --- | --- |
| Resonance frequency (Fr) | 3.1GHz to 10.6 GHz |
| Relative permittivity of substrate (εr) | 4.4 |
| Loss tangent ( tanδ) | 0.02 |
| Substrate height (h) | 1.6mm |
| Effective dielectric constant (εeff) | 3.88 |
| Substrate length (Ls) and width (Ws) | 24mm x 12mm |
| Patch radius (Rp) in Z direction | 7.2mm |
| Patch radius (Rp) in X direction | 10mm |
| Feed line length (Lf) | 8.2mm |
| Feed line width (Wf) | 3mm |
| Ground plane length (Lg) | 6mm |
| Ground plane width (Wg) | 8.7mm |

Simulated antenna geometry shown in fig. 1 and has been evaluated and developed in method of moment (MOM) based CADFEKO antenna simulation tool [4].

## III. ANTENNA PERFORMANCE EVALUTION AND RESULTS

Proposed antenna has been simulates against the UWB band of 3.10 GHZ to 10.60 GHz and analyzed against various parameters including reflection coefficient, Voltage Standing Wave Ratio, Impedance magnitude, Co and Cross polarizations, Gain, efficiency and so on. Simulated antenna reflection coefficient magnitude in dB is shown in fig. 2. Proposed antenna offers <-10 dB reflection coefficient at simulating UWB (3.1 GHz to 10.6 GHz) frequencies. Proposes ACS-UWB antenna provides 6.50 GHz of wide bandwidths at

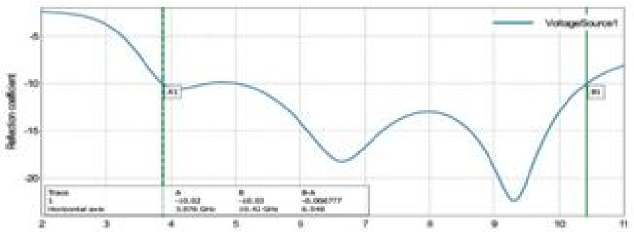

Fig. 2. Reflection coefficient magnitude of proposed antenna.

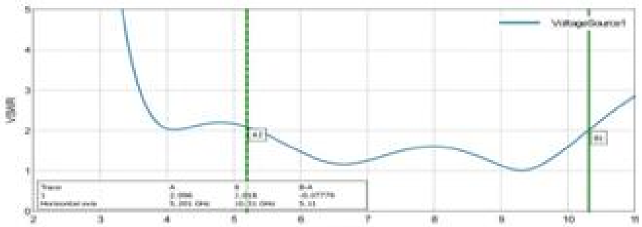

Fig. 3. VSWR magnitude of proposed antenna

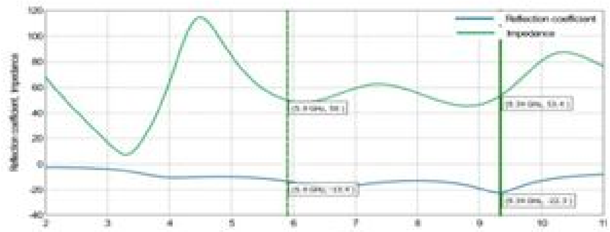

Fig. 4. Impedance magnitude of proposed antenna.

UWB band. VSWR magnitude of proposed ACS-UWB antenna is shown in fig. 3. Fig. 4 Impedance matching characteristics of proposed antenna is shown in fig. 4. Simulating antenna offers best impedance matching capabilities a UWB operating bands and poses zero mismatch .Simulated antenna effectiveness in terms of efficiency is shown in fig. 5. Simulated antenna has approximately 90% of effectiveness at simulating UWB frequencies.

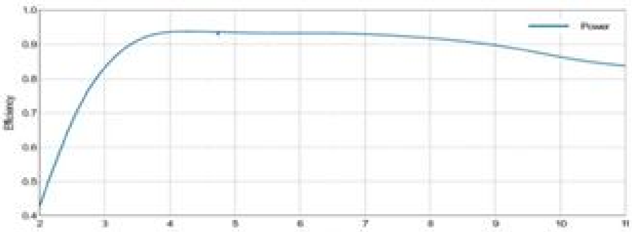

Fig. 5. Simulated efficiency of proposed antenna

Radiation patterns of simulated antenna have been shown in fig. 6. Simulated antenna challenges > 20 dB co-polarized operation and > 19 dB cross polar operations at faded wireless channel. Simulated gain of proposed antenna with 2D polar plot is shown in fig. 7. Polar gain of 2.7 dB has successfully achieved as shown in fig. 7.

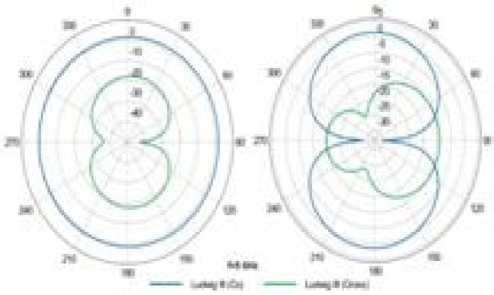

Fig. 6. Radiation Patterns of proposed antenna.

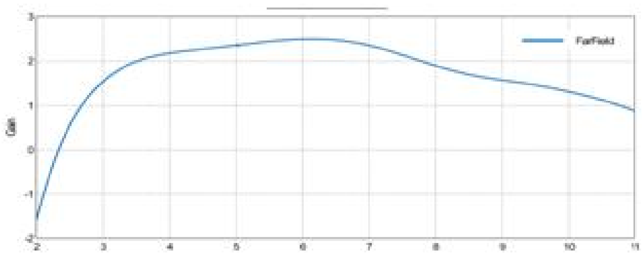

Fig. 7. Gain of proposed antenna.

## IV. CONCLUSION

A compact ACS feed antenna for Ultra-wideband (UWB) applications has been presented. Proposed antenna has been simulated for low-profile FR-4 material. Proposed antenna has very compact structure and can be suitable for advanced high-data rate wireless applications. Simulated antenna exhibits6.54 GHz of working Reflection coefficient bandwidth having< -10 dB return loss. Proposed antenna has good impedance matching capabilities with almost 50 ohm of impedances. Simulated antenna offers approximately directional pattern in E-plane and omnidirectional radiation pattern in H-plane of propagation.

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