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Design of UWB MIMO Antenna for Diverse Wireless Application

1st M.VAMSIDHAR REDDY
Dept.of ECE
VelTech D.r RR & Dr.SR University Cheenai, India vtu15090veltech.edu.in

2ndM.ADITHYA
Dept.of ECE
VelTech D.r RR & Dr.SR University Cheenai, India vtu14188veltech.edu.in

3rd T.VASU KUMAR
Dept.of ECE
VelTech D.r RR & Dr.SR University Cheenai, India vtu14372veltech.edu.in

***Abstract*—*MIMO Transmission techniques improve perfor- mance beyond the capability of a single antenna system. UWB is the most promising technology which provides high data rate with in short range. The Federal Communication Commission (FCC) has approved a frequency band of unlicensed applications. Within the band of UWB some of the wireless Communication bands with different frequencies are also operating. So to avoid interference, band notch characteristics are proposed which eliminate existing wireless bands like WiMAX, WLAN. MIMO antennas are designed and simulated using HFSS and the antenna parameters like Return losses , Gain, VSWR, Radiation patterns and Envelop Correlation Coefficient are measured.*

Index Terms*—*MIMO, UWB, WIMAX, WLAN.

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I. INTRODUCTION

A. FCC

The Federal Communications Commission regulates inter- state and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia and U.S. territories. The Federal Communications Commission regulates interstate and international communica- tions through cable, radio, television, satellite and wire. The goal of the Commission is to promote connectivity and ensure a robust and competitive market.

B. WLAN

A wireless local-area network (WLAN) is a group of colocated computers or other devices that form a network based on radio transmissions rather than wired connections. A Wi-Fi network is a type of WLAN. anyone connected to Wi-Fi while reading this webpage is using a WLAN.

C. WIMAX

WiMAX, the Worldwide Interoperability for Microwave Ac- cess, is a telecommunications technology aimed at providing wireless data over long distances in a variety of ways, from point-to-point links to full mobile cellular type access.

D. UWB

Ultra-wideband is a radio technology that can use a very low energy level for short-range, high-bandwidth communications over a large portion of the radio spectrum. UWB has traditional applications in non-cooperative radar imaging. Most recent applications target sensor data collection, precision locating and tracking applications. UWB support started to appear in high-end smartphones.

Ultra Wideband antennas are specifically designed to trans- mit and or receive very short time durations of electromagnetic energy. It is well known that UWB antenna design remains the major factor in the progress of UWB technology.

According to the Federal Communication Commission UWB Positioning is defined as an RF signal that Occupies a portion of the frequency spectrum that greater than 20has a bandwidth greater than 500mH At present UWB is the Only commercially available wireless technology that delivers highly accurate highly Prease location. UWB offers advan- tages with respect to data transfer rate, immunity to multipath effect, high

ranging accuracy.

E. MIMO ANTENNA

MIMO (multiple input, multiple output) is an antenna technology for wireless communications in which multiple antennas are used at both the source (transmitter) and the destination (receiver).

Designing of MIMO antenna for its usage in portable wireless communication devices with its compact size to reduce mutual coupling between the antenna elements is of course, a challenging task. Mutual coupling arises due to minimal spacing of antenna. Placement of multiple antennas into a single, compact and slim body of wireless devices and making it resonant for a different wireless communication applications into a single device is a toughest challenging job. As the antenna elements are firmly coupled with each other, maintaining isolation characteristic between them is indeed a challenging task.

F. MIMO TECHNOLOGY

Mimo technology use multiple antennas at its both terminal transmitted and receiver ends for significant enhanced Perfor- mance of Transmission. The MIMO performance determine the Correlation of received signal by antenna elements The MIMO system Can it Increase the overall performance of antenna. The main challenge in mimo antenna is to reduce mutual Coupling between the antenna elements, mutual Cou- pling arises due to minimal spacing of antenna. Placing the multiple antennas in to single and making it resonant for a different wireless Communication Into a device is difficult thing. Mainating improved isolation between two mutually coupled antenna is Definitely a Challenging job. The Mimo antennas for DWB application are demonstrated to reduce interference caused by Close proximity of antenna elements and to improve Isolation. UWB antennas with various Variety of design structure reported the isolation less than -20 dB. The literature focuses on improving UWB and Mimo antenna Isolation is first the implementation of the unit element for the UWBMIMO is furnished. After the implementation of basic antenna and taking the reflection performance metrics is described. Coefficient analysis, the UWB -MIMO Antenna designed. The analysis of diversity.

II. RELATED WORK

We have implemented the various Aspects through the UWB-MIMO Antenna for diverse Applications and we have Absorbed the Current Distribution and Isolation and PRO- POSED DIVERSITY ANTENNA STRUCTURE,MIMO Performance Metrics, VSWR-VOLTAGE STANDING WAVE RA- TIO and Radiation pattern and MIMO Antenna Configuration and also we have absorbed that the UWB Unit element Antenna Configuration and the Challenges of Antenna and the ENVELOPE CORRELATION COEFFICIENT FOR THE PROPOSED ANTENNA.by using Ansys HFSS we have im- plemented the different Antenna And the Different Antenna shapes are placed in the Exact points in the Software.

III. IMPLEMENTATION

The Mimo return loss put in graphical representation is to find location of bandwidth The return loss in the commu- nication system can be defined as a power loss because of reflection or returned due to discontinuity the transmission line.Since the proposed antenna is a uwb- antenna, Form is made on the entire Ding. Frequency range from 34 to 10.6 GHz of a matter of consideration Over the full operational range , the average isolation of proposed antenna if more than -20Db

IV. SOFTWARE

A. ANSYS HFSS

- Ansys HFSS is a 3D electromagnetic (EM) simulation software for designing and simulating high-frequency electronic products such as antennas, antenna arrays, RF or microwave components,high-speed interconnects, filters, connectors, IC packages and printed circuit boards. Engineers world-wide use Ansys HFSS soft- ware to design high-frequency, high-speed electronics found in communications systems, advanced driver as- sistance systems(ADAS), satellites,and internet-of-things (IoT)products.
- This Software used as a 3D Full-wave EM Field Solver for High-frequency and High-speed Electronics Compo- nent Designs.
- This HFSS software utilizes a 3D full-wave Finite Ele- ment Method (FEM) by the field solver to compute the electrical behavior of complex components of arbitrary shape and user-defined material properties.

V. RESULT AND DISCUSSION

We have designed the various UWB MIMO Anten- nas,Parametric Analysis is taken for all the antennas.The parameters like Return loss,Mutual coupling,VSWR,Isolation and radiation Pattern or measured in each UWB MIMO Antenna Design.The Performance table is drawn to check which design is got improved isolation and effective in use.We Conclude that particular design which gives improved isolaton is our final UWB MIMO Antenna..

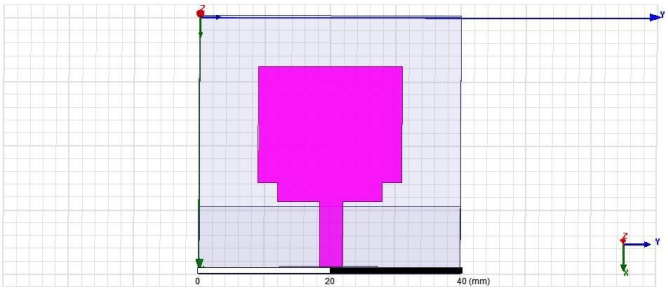

Fig. 1. Basic design of UWB MIMO Antenna

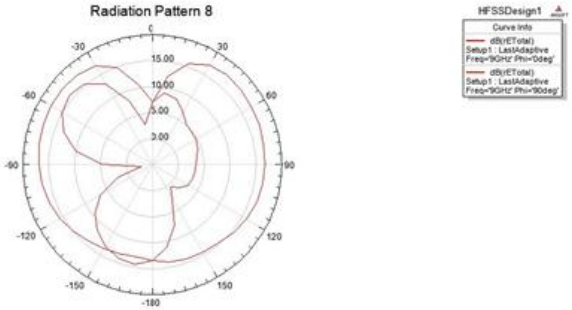

Fig. 2. RADIATION PATTERN 1

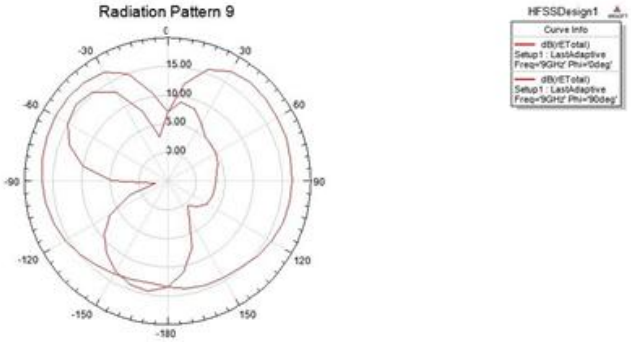

Fig. 3. RADIATION PATTERN 2

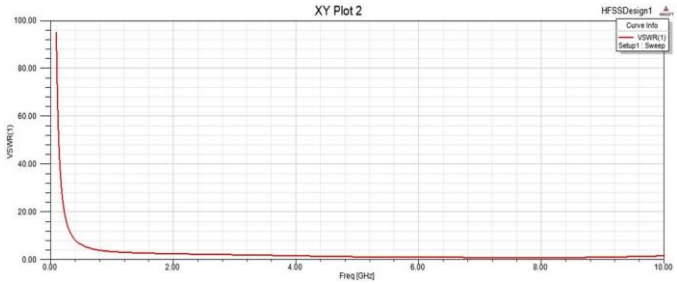

Fig. 4. vswr

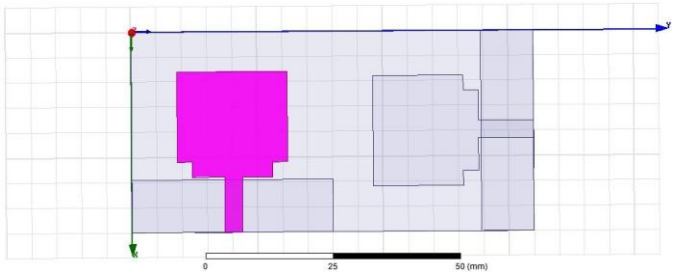

Fig. 5. UWB MIMO ANTENNA DESIGN 1.

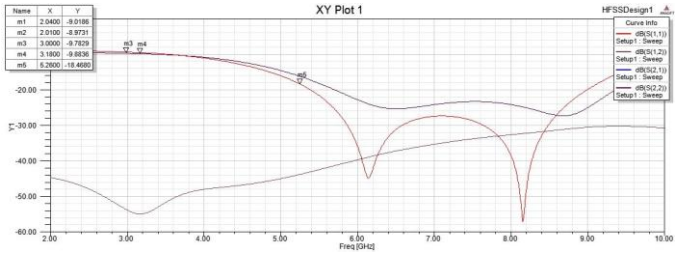

Fig. 6. OUTPUT OF UWB DESIGN 1.

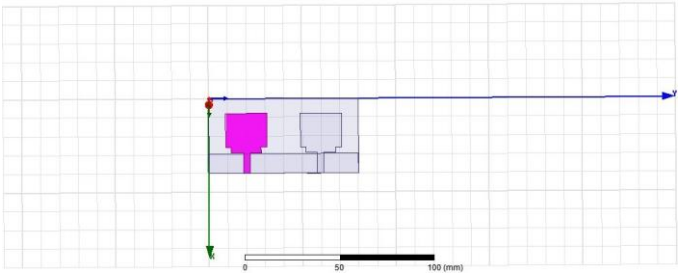

Fig. 7. UWB MIMO ANTENNA DESIGN 2.

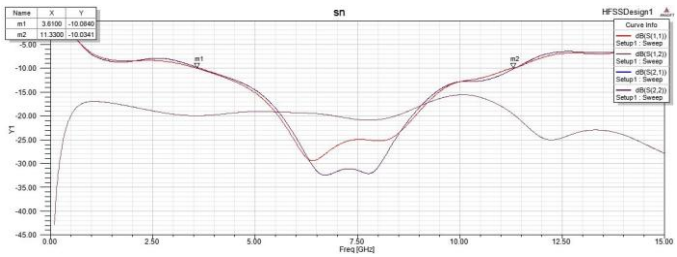

Fig. 8. OUTPUT OF UWB DESIGN 2.

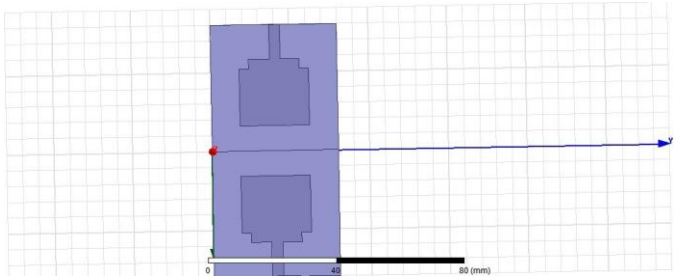

Fig. 9. Design of UWB Mimo Antenna 3

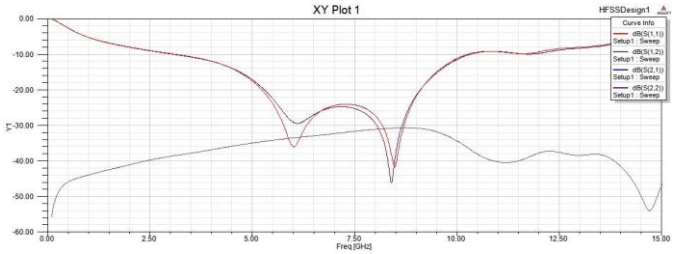

Fig. 10. OUTPUT OF UWB DESIGN 3.

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