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On Some Investigations on Ultra Wide Band Antenna using HFSS

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Abstract: ***This article deals with the Ultra-Wide Band (UWB) [1-2] antennas that are appraised in respect of various geometries, antenna design parameters and their experimental results. Several types of UWB antennas including special horn, micro-strip patch and array antennas in recent works are elucidated, while comparing their measured return loss, gain and radiation patterns. Projections to the long run developments of UWB antenna technology also are discussed here.***

Keywords: Ultra Wide bands Antenna, micro-strip patch, return loss, HFSS

1. Introduction

Ultra Wide Band (UWB) systems are defined as the systems which use electromagnetic signals having greater than 500MHz information measure or 2 hundredth information measure around its center frequency. UWB systems provide high data rates for wireless communications, radar and geolocation systems. Since the allocation of unlicensed various frequency bands (0-960 MHz, 3.1-10.6 GHz, 22-29 GHz) to UWB systems by Federal Communications Committee (FCC)[3], analysis on UWB has gained a lot of attention by academia and industry . High knowledge rates and low power needs of UWB systems make them feasible for portable commercial applications. In various applications, UWB technologies utilizes different modulation methods such as orthogonal frequency division multiplexing (OFDM) [4]or pulse-based methods. It is apparent that the antenna requirements of UWB systems would vary because of the used modulation types. Such requirement for designing UWB antennas depends on the modulation scheme. Due to the wide bandwidth, the antenna parameters become frequency dependent in UWB systems, thus complicating the analysis and design. The UWB antennas are enhanced by different properties of antennas such as being omni-directional[5] or employing microstrip type, horn geometry, or so. In this paper, we reviewed on UWB antenna [6-7] technology and various antenna designs together with their parameters.

Design parameters

For the design of UWB antenna focus should be on the structure [8] along with the material selection for Substrate, patch etc. In the HFSS [9] platform the design have been carried out and a suitable selection of FR4 _Epoxy as the dielectric is taken to continue with the design and the geometry has been taken simple rectangular patch as the shape of the micro strip patch antenna. In the figure 1 a rectangular micro strip patch antenna prototype has been shown. Similar design geometry has been selected for this work.

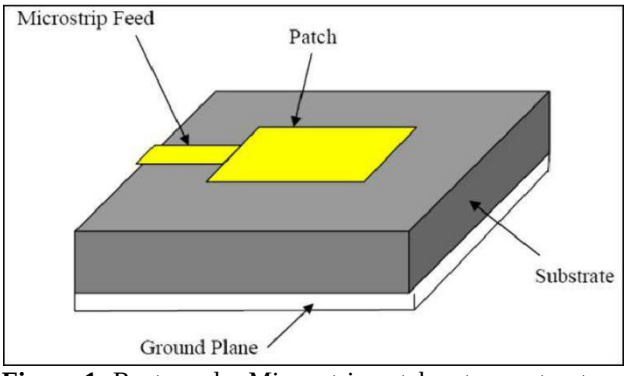

Figure 1: Rectangular Micro strip patch antenna structure with micro strip feed

2. Results

The HFSS software have been used here and the micro strip patch antenna have been developed in this platform. After analysing all parameters in the design the antenna is simulated and the results have been shown in the following figures (2-6) showing the H field variation, radiation pattern, return loss.

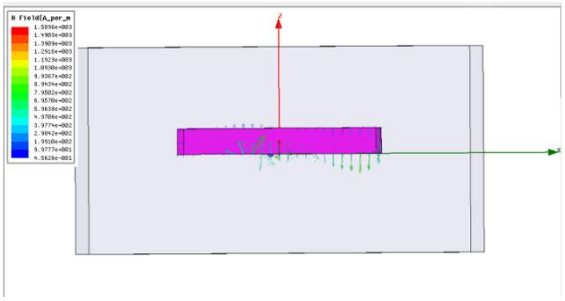

Figure 2: H field orientation in the geometry (Side view)

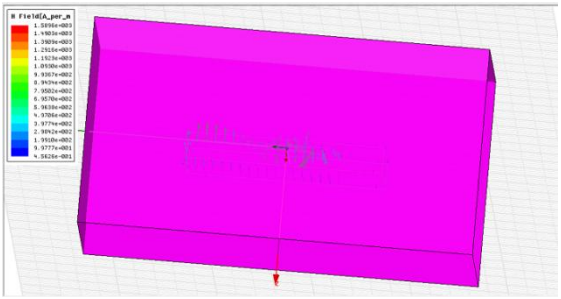

Figure 3: H field orientation in the geometry (Top view)

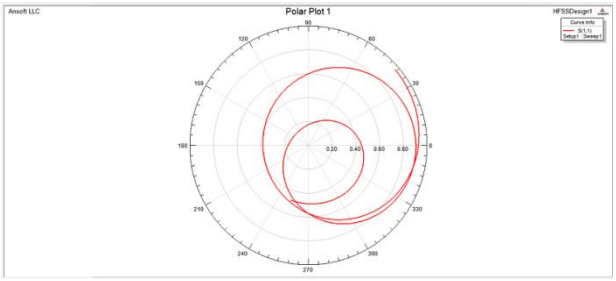

Figure 4: Radiation pattern of the micro strip antenna

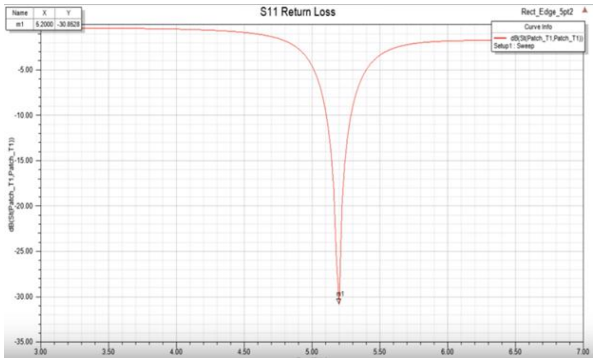

Figure 5: Return loss using HFSS

3. Conclusion

In this work some good results have been obtained with very simple geometrical structure – rectangular micro strip patch capable of working in the UWB. So, this antenna can be utilized in the UWB for further applications. In the future stress will be given to get different aspects of design structure for antenna design with some reconfigurable option. Also if possible some wearable antenna design may also be introduced in future.

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