

# Simulation Study of Microstrip Patch Antenna for Satellite Communications

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**Abstract:-** Among the communication technologies the satellite technology [1] is one of the emerging fields. This field is developing fast and advancements are also coming day by day. The satellite communication is getting popular due to radio communication, weather forecasting, broadcasting and many more applications are being served by satellites. As per the usage of satellites and due to weather conditions the satellite frequency bands are required to be shifted to the higher order bands of microwave frequency. This study is focused on this frequency of use for satellite antennas. Studies have been made to find a solution to this problem. Micro strip patch antenna [2,3] has been suitably chosen to support the satellite communication.

**Key Words:** satellite, radio communication, Micro strip patch antenna, HFSS

## 1. Introduction:

The recent developments on satellite technology are looking for further investigations on higher microwave frequencies. In the higher frequencies access to wider bandwidth may be achieved. Due to the increasing use of satellites congestion has become a serious issue in the lower frequencies. So, technology is also developing towards the higher frequency use. In this work the findings are based on the frequency of use looking at the antenna design on Ansoft HFSS software. The Ansoft HFSS software is a relatively better tool for simulation study in the fields of antenna modeling. Micro strip patch antennas have been studied to optimize the application area.

## 2. Design of the Antenna:

The Micro strip patch antenna has been designed using suitable selection of the materials for patch, substrate and feed line. In this antenna design the transmission line models has been taken into consideration and have been successful in solving the antenna for the purpose of higher frequency of Microwave band. The antenna has been shown in the figure 1 in HFSS platform. Rectangular[4] shape of the path have been selected for this antenna design. For the antenna design the permittivity of the dielectric substrate has been selected 4.4(FR4 Epoxy) and height of the substrate is 1.3mm. The patch is feed with 50 ohms input impedance[5,6]. The length of the patch is 30mm.

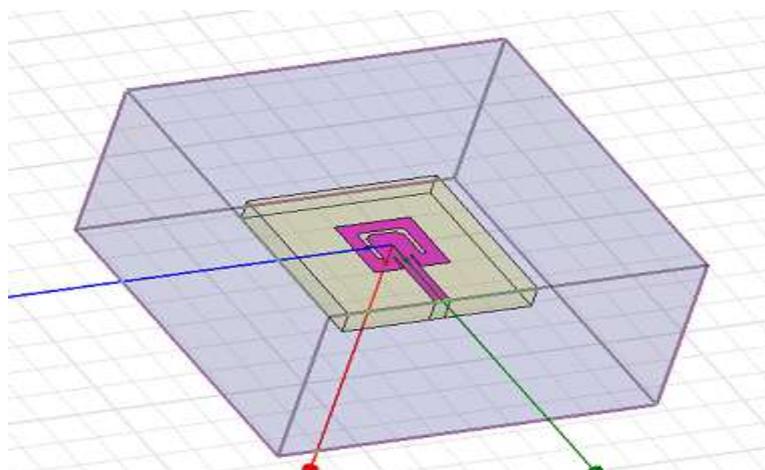


Figure 1: Patch antenna designed on HFSS

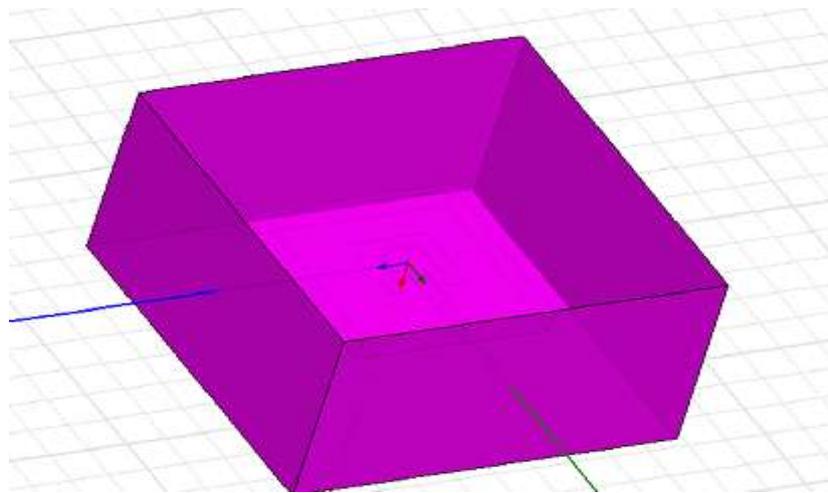


Figure 2: Patch antenna(Another view) designed on HFSS

### 3. Results and discussions:

The simulation results of the rectangular micro strip patch antenna is shown in the figure 3 and 4. It is very clear from the figure that the antenna shows good results for  $S_{11}$  plot and also for VSWR of the antenna.

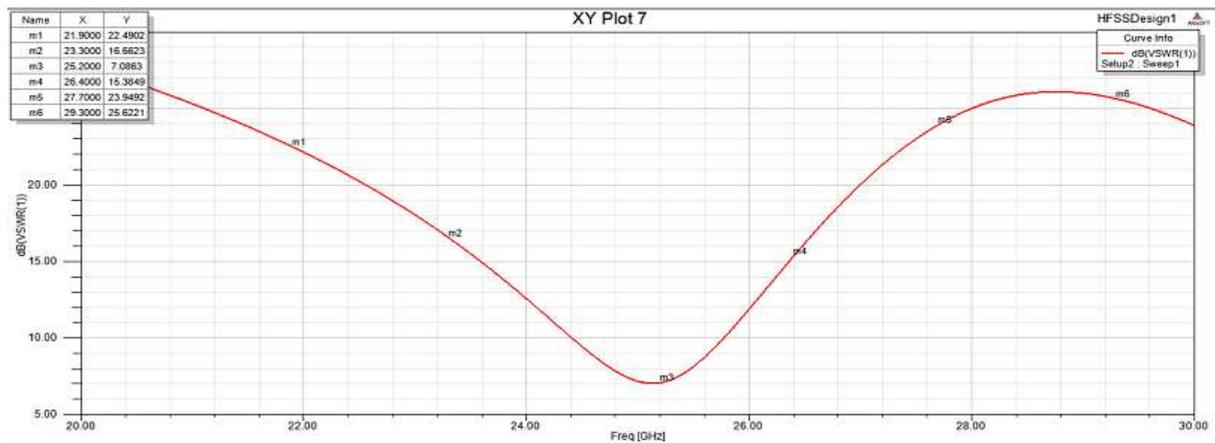


Figure3: VSWR

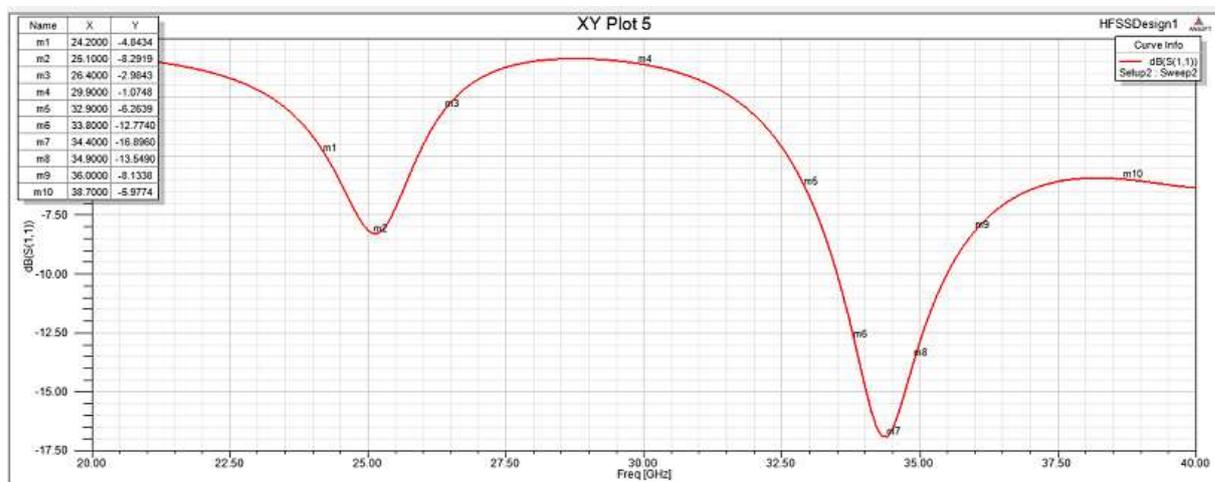


Figure 4: The return Loss

#### 4. Conclusion:

Significant results have been obtained for this antenna with Return loss of -17dB at 34 GHz. So, the designed antenna can be introduced in the satellite communication system. The simulation studies have been made in this article and some exploration may be introduced in near future.

#### REFERENCES

- [1] Morgan and Gordon, Communication Satellite Handbook, 1989
- [2] Pozar, and M. David, "Microstrip antennas", Proceedings of the IEEE, vol. 80(1), pp. 79-91, Jan 1992.
- [3] J.R. James, and P.S. Hall, Handbook of Microstrip Antennas, vol. 1. IEE, Peter Peregrinus Ltd: Clarendon, 1989, pp. 1-17.
- [4] M.W. Shute, and C.S. Brown, "A study of the polarization properties of a rectangular polarizationmaintaining fiber", Journal of Lightwave Technology, vol. 7(12), pp. 2013-2017, Aug 2002
- [5] R. Ravanelli, C. Iannicelli, N. Baldecchi, F. Franchini, "Multiobjective optimization of an isoflux antenna for LEO satellite downhandling link," Microwave Radar and Wireless Communications (MIKON), 2010 18th International Conference on , vol., no., pp.1,4, 14-16 June 2010.
- [6] C. Balanis 1982 Antenna Theory; Analysis and Design (second edition Wiley and Sons, New York)

#### BIOGRAPHIES



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