# H-Shaped Slotted UWB Antenna for Cu, X and Ku Band Applications

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## ABSTRACT
In this paper, we describe the formatting guidelines for IJCA Journal Submission. The proposed antenna is of H-shaped slotted for WLAN, wireless- A, Cu, X, Ku band comm. and various applications which has single band and compact in size. This antenna has h-shaped slot in the patch which is excited by the electromagnetic feeding technique. The substrate used to design is air having permittivity of 1. For this antenna VSWR, impedance bandwidth, radiation pattern E-field, and 3-D pattern is simulated for results. The antenna is simulated by the use of HFSS software for all the results. The bandwidth covers the range from 5GHz to the 15GHz which is very large bandwidth.

## Keywords
Wideband antenna, electromagnetic coupling, Gain, impedance bandwidth, HFSS.

## 1. INTRODUCTION
Micro strip Antennas[1] are very useful antennas at the microwave frequency range, and gives the many more advantages, having the low profile easy to fabricate , can be easily fed can be also arrayed with other microstrip elements. The pattern may be of hemispherical, with moderate directivity, very low weight, compact in size, structure can conformed to any surface and very low cost so as by these qualities these antennas are highly recommended for commercial as well military researches.

In the future communication will require the hug integration of devices and circuit elements which should have very limited equipment space. In the modern communication we need large amount of data transmission with high data rate, that's why the wideband antennas are so attracted. Various types of wideband and multiband antennas are proposed such as rectangular, triangular, slotted, DRA and having many different size and shapes. Microstrip antennas are made up of four parts patch, feed, ground and substrate.

The microstrip physical dimension is small but when it is measured in wavelength its electrical size is not so small. Most commonly used antenna has rectangular patch. The length of the antenna is reduced when dielectric is introduced and relative dielectric constant increases. The figure in view is H-shaped slotted [3] microstrip fed which has much higher bandwidth. The substrate used in antenna is air whose permittivity is $\varepsilon_r$-1 mounted over the modified ground. The aim of this paper to design a microstrip fed for slotted H-shaped antenna and studies the effects of height, length and permittivity on the pattern of radiation [4]. The simulations are carried out using finite element method software which is High Frequency Structure Simulator HFSS [5]. The bandwidth, radiation pattern and gain of the antenna are simulated, the results shows the bandwidth covers the range 5GHz to 10GHz which accommodate ate WLAN bands.

## 2. ANTENNA DESIGN
The method of the antenna described below at first to achieve wideband operation of Cu, X and Ku this monopole antenna is chosen. Second we have to achieve the omnidirectional 3D pattern coverage for this modified ground plane.

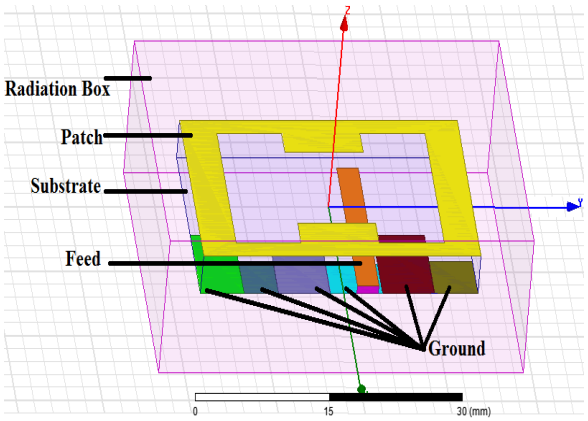



**Figure 1: Front view of the proposed Wide Band Antenna.**

Aim of design to have reduced, compact size plannar slotted patch[6] antenna. The antenna has four main part they are patch, substrate, ground and feed. The patch mounted above the substrate have the width of 32mm and length is 21mm and the substrate which is placed over the ground has width of 32mm and the length 21mm ,having the permittivity of air that is $\varepsilon_r$-1 which helps feed to make perfect match with patch. The patch which is above substrate has aslots of following dimensions L(7.5mm), J(24) H(11mm) and K(17mm)

The patch is fed by microstrip electromagnetic feeding technique, the feed has width of 2.5mm and length of 18.2mm and the ground is placed at -1.2mm below the substrate whereas the ground has irregular shape it is achieved by many simulation which is done to gain the large impedance bandwidth. The ground is also made up of perfect electric conductor metal.

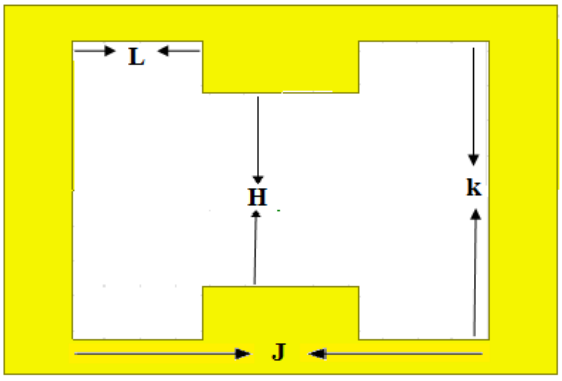
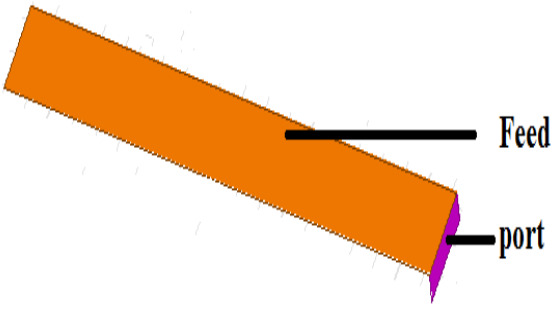
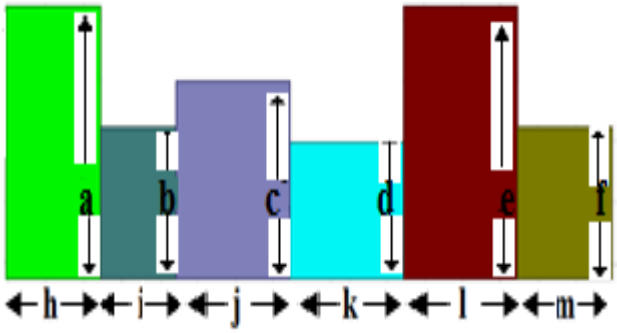



**Figure 2: Dimension of Patch slot.**




**(a)**




**(b)**

**Figure 3: Feed(a) and Ground(b) view of the proposed Wide Band monopole Antenna.**

**Table 1 Dimensions(in mm) of Ground**

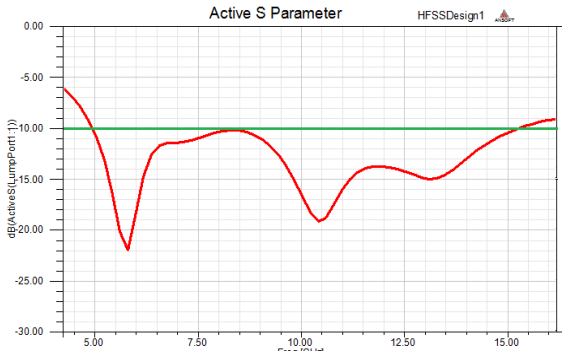
| Parameter | Dimension | Parameter | Dimension |
|---|---|---|---|
| **a** | **9** | **h** | **5** |
| **b** | **5** | **i** | **4** |
| **c** | **6.5** | **j** | **6** |
| **d** | **4.5** | **k** | **6** |
| **e** | **9** | **l** | **6** |
| **f** | **5** | **m** | **5** |

**Table 2 Dimensions for wideband frequency Antenna**

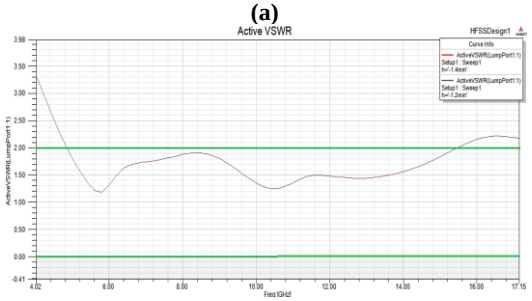
| Parameter | | Dimension (mm) |
|---|---|---|
| **Substrate length** | **Sl** | **21** |
| **Substrate width** | **Sw** | **32** |
| **Ground width** | **Gw** | **32** |
| **Substrate height** | **h** | **4** |
| **Feed line length** | | **18.2** |
| **Feed width** | | **2.5** |

## 3. SIMULATION RESULTS

The antenna design is simulated by the use of HFSS which solves by the use of finite element method. The simulated result of return loss(s11) is shown below -10dB, which it has very very large bandwidth starts from 5GHz to 15GHz and the dip achieved of curve is approx -22dB. The VSWR of the antenna which clarifies the result that shows the much better bandwidth range. The design of slotted patch [7] and ground which has irregular shapes and size, this design has made a very good agreement to achieve wide bandwidth.




**(a)**




**(b)**

**Figure 4: Simulated return loss (a) and VSWR (b) of the proposed Antenna.**

**Table 3 Important Parameters at resonant frequency of PRMA CPW-fed for wideband Antenna**

| Parameter | Results |
|---|---|
| Bandwidth | 10 Ghz |
| Gain | 2 dB |
| Directivity | 2 dB |
| Return loss S11 | -22dB |

The radiation pattern has omnidirectional 3D view which is able to resonate its power to environment, this antenna is very directive which is 2dB and the gain is about 2dB. The sloted antenna[8] is analysed for the various parameters for good agreement of bandwidth in this particular antenna it seen that height of substrate gives significant change bandwidth, reduced size of ground is also analysed for the good result of antenna the figure below shows the variation of Feed location.

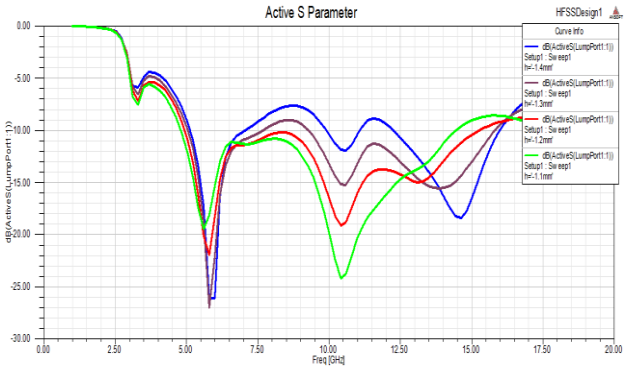



**Figure 5: Simulated return losses of the proposed antenna as a variation in feed location**

## 4. CONCLUSION

Wideband H-Shaped slotted patch[9] with reduced ground antenna is analysed and simulated with successful results. This antenna is capable to cover the WLAN, Cu, X, KA band, having the range of 5GHz to 15GHz bandwidth of 10 dB, can be also used for the military purposes. This antenna provides omninidirectional radiation pattern at azimuth plane. This antenna is very compact in size able to work at many frequency range of its bandwidth for vehicle laptops or receivers. The antenna is analyzed by finite element method by the use of HFSS microwave simulator It is hopeful that the simple structure of the proposed antenna, its compact size, and the degrees of freedom of its design, will make it an attractive choice for the Wideband antenna designers.

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