In this paper a single element antenna with stepped feed rectangular patch for Wireless LAN has been shown and relatively analyzed to be improved with new technologies of miniaturization. This microstrip antenna consists of single square patch element fabricated onto the FR4 substrate and the forward radiating part with a Nickel as a dielectric substrate. Previously after utilizing the stepped patch in feed end, filters were added to obtain high performance, but we noticed to make a good performance by utilizing our technique. There are many problems in case of designing of a microstrip antenna, but the main disadvantage was the s-parameter that was required for the bandwidth increment. The problem we managed to handle was alternative to the complex microstrip filter theory. An alternative achievement that was required to replace filters due to high system complexity was the Meandering of patch. A high frequency domain analysis was required for maintaining filter theory radically typical solving profiled systems. We managed to interfere the theory by virtually putting the concept of surface currents that are a mainly due to the discontinuities of the edged microstrip. Finally we analyzed the two bow tie structure and find it possible to increase the efficiency of s-parameter and Bandwidth. We observed the utility of the s parameter thus to increase the bandwidth. By raising s parameter to a very high level so that we can tradeoff it with the required BW of the microstrip antenna. We also varied the surface currents instantaneously to be proven high gain structure by using a stepped patch and varying its surface current by using Half bow-tie and Full Bow Tie shaped slotted structure to get a high reflection loss of −35 dB and −53 dB respectively that makes it a sensible design without changing the resonatic frequency. A polygonal cut is utilized for creating a shape of a Bow Tie. We managed a bandwidth of 1.2 GHz at 9.2 GHz. Finally CST Microwave studio electromagnetic tool is utilized for the antenna design.

**Keywords:** Half Bow-Tie Slotting (HBTS), Full Bow Tie Slotting (FBTS), Meandering, Stepped Feed, Miniaturization, Ultra High Gain (UHG)

**INTRODUCTION**

Conventional microstrip antennas in general have a conducting patch printed on a grounded microwave substrate, and have the attractive
features of low profile, light weight, easy fabrication, and conformability to mounting hosts.

Microstrip antennas are also relatively inexpensive to manufacture and design because of the simple 2-dimensional physical geometry. They are usually employed at UHF and higher frequencies because the size of the antenna is directly tied to the wavelength at the resonance frequency. Thus, size reduction and bandwidth enhancement are becoming major design considerations for practical applications of microstrip antennas. For this reason, studies to achieve compact and broadband operations of microstrip antennas have greatly increased. Much significant progress in the design of compact microstrip antennas with broadband, dual-frequency, dualpolarized, circularly polarized, and gain-enhanced operations have been reported over the past several years.

We proposed research direction on these previous outcomes, took there benefits and provided more improvised output from it. Those are Firstly, the design process of a monopole broadband Multi Resonatic Microstrip Patch Antenna (MRMPA) suitable for multifunctional wireless communication bands. By creating a step at the corners using the proposed method a dual-mode antenna is obtained (Tilanthe et al., 2012). Secondly compact, planar Ultra Wideband (UWB) monopole microstrip antenna is proposed which offers dual band notch characteristics with enhanced rejection at frequency bands, and four different filters were applied (Alishir Moradi et al., 2013).

MATERIALS AND METHODS

The antenna is printed on FR-4 substrate of thickness 1.59 mm and a relative dielectric constant $\varepsilon_r$ of 4.4. The patch having dimension $W \times L$ is excited using a 50 ohm microstrip line. The ground plane is modified to achieve a better impedance matching. The ground plane area is reduced by removing the metal which is present beneath the patch. Also the rectangular slot is optimally cut from the ground plane with the dimension $L_c \times W_c$ to get wide band impedance matching.

![Figure 1: Showing Structure Variables](image1)

![Figure 2: Showing Structure Values](image2)

Material of patch is Copper (annealed) and cutted ground in front end is replaced by nickel. We introduced new method of meandering onto this microstrip antenna that are:

1) Half Bow-Tie Slotting.
2) Full Bow-Tie Slotting.

1) **Half Bow-Tie Slotting:** Basically bow tie slotting is a type of meandering of patch which is made to improvise the antenna reflection loss to an extent. This type of meandering involves cutting of a patch into its half so that it will be shaping like a halved Bow tie. The major
concept is basically surface current transforming due to the bow tie shape as explained in the introduction. Generally the antenna gain has to be increased and a good resonant bandwidth is a requirement for every antenna engineer. We comment the behavior of this type of slotting as a issue, so major work of the engineer reduced, i.e., use of the filters, etc. We observed in the theory of Bow tie slotting the acceleration of electrons due to the change in the surface current over the patch. Due to the Bow tie slotting the efficiency of the antenna increases about 10% of the previous. But the fractional bandwidth does not increases.

Will be formed that results in the high reflection losses as shown in figure of half bow tie slotting. The surface current will increase radically in the forward direction of the radiation path.

2) Full Bow-Tie Slotting: The full bow tie slotting type is a again a type of slotting of the patch which in turn increases reflection efficiency of the antenna. A full bow tie is the improvisation in the half bow tie slotting where in HBTS, the slotting is only in the feed side the FBTS has slotting in both feed side and front side.

FBTS is a high improvement in the reflection loss about –53 dB, Now the bandwidth and Q factor are inversely proportional. The main advantages are given below:

1) High increment in s-parameter.
2) Miniaturization in the antenna size.
3) Reliable antenna.
4) It can be indirectly utilized to increase Bandwidth at the same resonant frequency.
5) Operates also at high resonant frequency.
6) It can be an alternative to the filter theory.

As the figure shows that when a polygonal cut patch is a made into the antenna surface the direction of surface current changes instantaneously and results in the acceleration of charges at good energy level. This energy level increases the radiation path of edges due to contraction and expansion in the path given to the flow charges.

\[
\frac{d}{dt} I = \frac{d}{dt} \frac{d}{dt} (Qs)
\]
RESULTS AND DISCUSSION

1. This is a simple patch that has UHG and no modification is done in the base phenomenon here. Reflection loss is –33 dB approx. at 9.2 GHz.

2. Here the modification technique is used, i.e., HBTS and the S11 increased slightly Approx 10% from the previous S11.

3. In this FBTS is used ant achieved about 150-200% increment in the S11 parameter.

4. This one is the utilization of antenna by ground slitting to increase the bandwidth.

5. Improving VSWR

We found that VSWR also increased by Full Bow Tie slotting Deceasing the amplitude of reflecting wave.
CONCLUSION
With Full and Half Bow tie Slotting Meandering is quite exclusive method for the antenna design. Although the area of meandered patches have been explored for decades, No technique without filters optimization can be obtained to increase the resonance power with applied miniaturization of the antenna. The technique of slotting patch help in reducing the size of antenna upto a quite extent, Conclusively we can say that a full bow tie slotting can achieve a good S11 parameter to level of increment about 150- 200% with same resonatic frequency also HBTS antenna obtain 10% improvement from the previous design of application.

These type of slotting help us to reduce the efforts to use the theory of filter which is complicated in nature as this technique HBTS and FBTS can be applied onto the antenna arrays. This slotting can be used for Conformal antenna which are highly responsible for flexible integrated design of the antenna for communication purpose.

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