Antenna designing for multi range frequency application

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Abstract:

Antennas play a major role in today's world as they are used in various applications such as smartphones, TVs, radio stations and at various other platforms. Antennas have evolved from many forms like from an olden days Yagi-Uda antenna to a modern day horn antenna thus telling us its vast importance. An attempt has been made in this paper to make an antenna capable of working in between the three ranges of frequencies.

1 Identification of problem

For the identity of the hassle i have long past through masses of studies papers and complied their work.

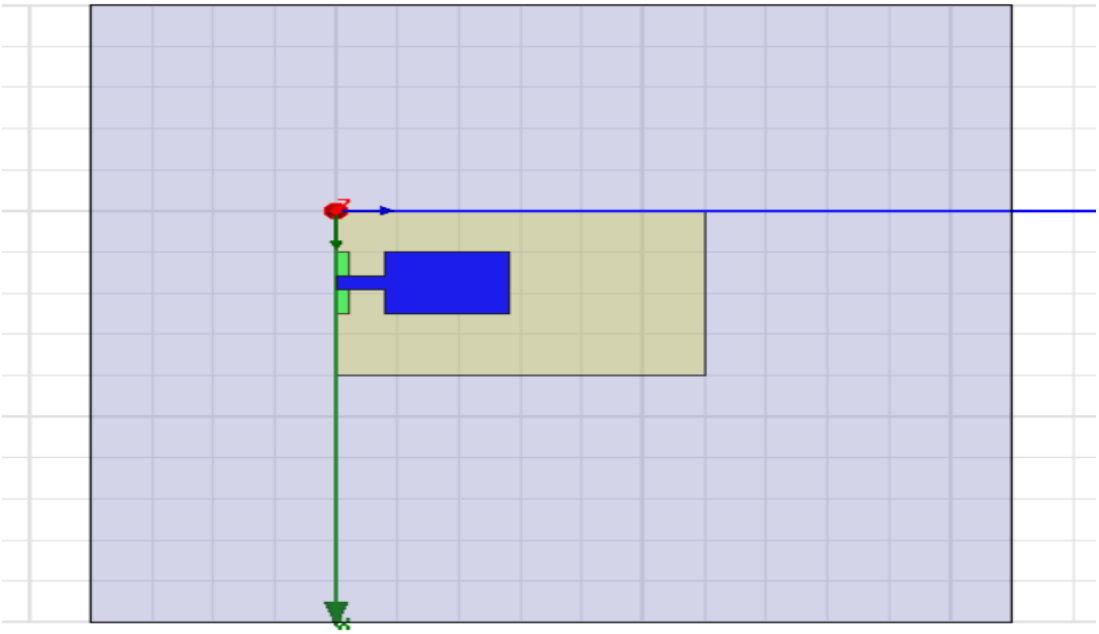
The overall performance of a T-fashioned monopole antenna as an ultra-wideband transmitting or receiving antenna is tested by a manner of fixing the lengths of the monopole and transmission arm, a ten-dB bandwidth of one hundred ten% is accomplished on the equal time as retaining a monopole-like radiation sample. An antenna component of the same antenna is used as electromagnetic interference (EMI) sensor is likewise supplied incident electric powered subject. The consequences for antenna thing display an ultra-wide bandwidth with the move-polarization isolation of more than 86 dB/m for the T-monopole.

A singular frequency range omnidirectional monopole antenna is furnished. The proposed antenna is a step size-shaped metallic-plate monopole, that is made from a copper plate (a zero.2mm thick brass sheet used on this take a look at). The proposed antenna indicates progressed radiation from all directions for frequencies across a completely large running bandwidth (frequency

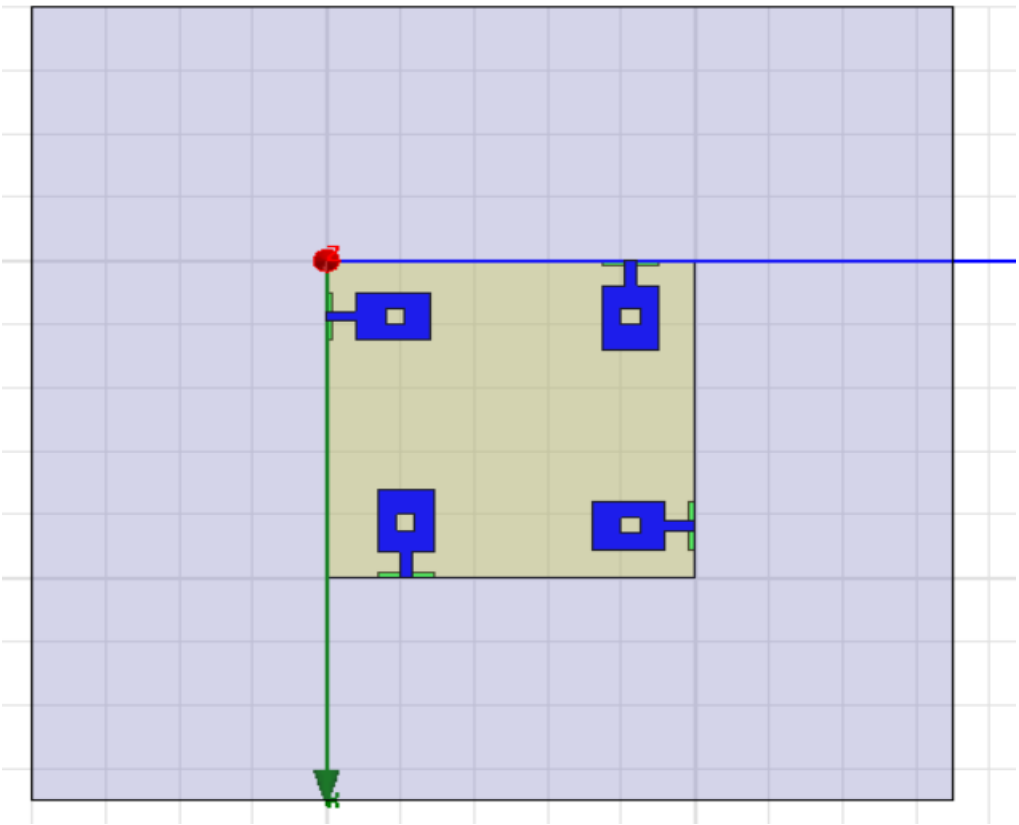
ratio approximately 1: three), compared to a corresponding planar monopole antenna.
A (CPW)-fed monopole antenna is designed, which consists of a rectangular monopole patch attached at the bottom, a T-long-established CPW floor within the notch, and a tapered CPW floor out of the notch. The simulated and experimental results show that the antenna achieves a fractional impedance bandwidth of 161% for dB, which is ready for 2.1 instances of the traditional one.
The monopole strip acts as a feed for the monopole slot and additionally functions as an inexperienced radiator. The monopole slot generates 1 / 4 wavelength slot mode inside the antenna's decrease band, at an identical time because the monopole strip contributes its region-wavelength mode within the antenna's higher band. Through the inclusion of a vertical strip that can be enclosed within the handset casing or be a part of the bezel surrounding the outer fringe of the handset casing and related to the bottom edge of the gadget floor aircraft, the impedance matching of the exciting slot mode can be drastically superior.
A form of the can have the typical twin-band resonant miniature twin-frequency planar mono-work characteristic with the meticulous layout. pole antenna, that's designed with the aid of the use of a but within the precise applications, they frequently inverted-F provides inverted-L structure and undertake loading short circuit needle in the balanced loading of inductance in the antenna shape k 4 1 to attain the antenna structure.
A four slotted floor aircraft is accomplished to a monopole antenna for two frequency programs in this letter. A trapezoid patch and a quasi-fractal slot structure are made up of FR-4 dielectric substrates because of the radiator and the ground plane, respectively. Certain evaluation is made up to speak about the impact of the parameters on the going for walk bands for the additional design. Ultimately, a design example is offered and compared to a comparable antenna with a stable ground plane to authorize the furnished technique.

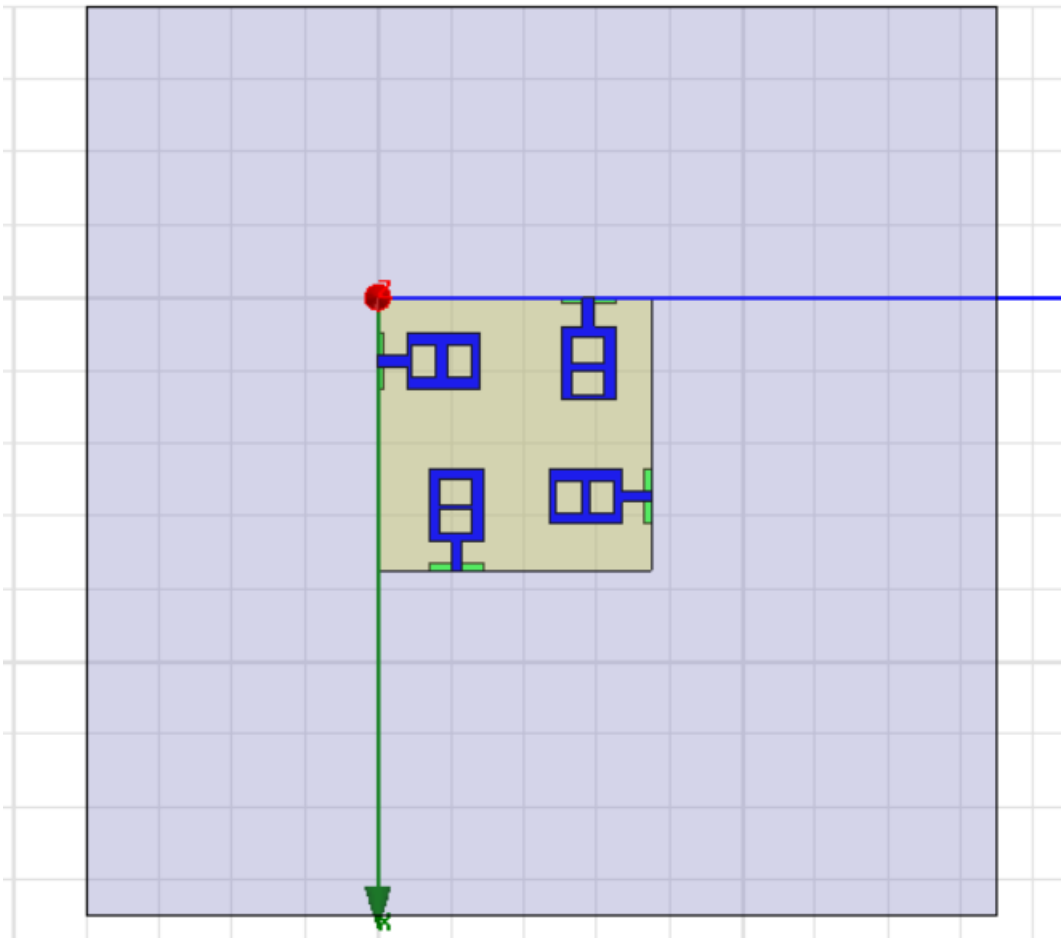
Design specifications

2 Basic design of the monopole antenna



3 Modified design of the antenna





The design is made and executed on the Ansoft HFSS software. A microstrip monopole antenna is designed using a substrate, a feed line, a radiating patch, partially grounded patch. The substrate has been taken of the dimensions of 75∗75 mm, the radiating patch has been introduced with two slots in between the radiating patch, and the monopole antennas have been arranged in this fashion for it to work in between three frequency ranges.
Printed monopole antenna can be designed in any shape and listed above are a few of the shapes that can be chosen for the antenna designing

Analysis

The frequency is calculated by using the given below formula:

$$F=7.2/ (L+r+p) \text{ GHz}$$

Where,
L= height of the planar monopole antenna
R=effective radius of the equivalent cylindrical monopole antenna
P=length of 50 ohms feedline in cm
Using the above formula we can compute the frequency range of the antenna.

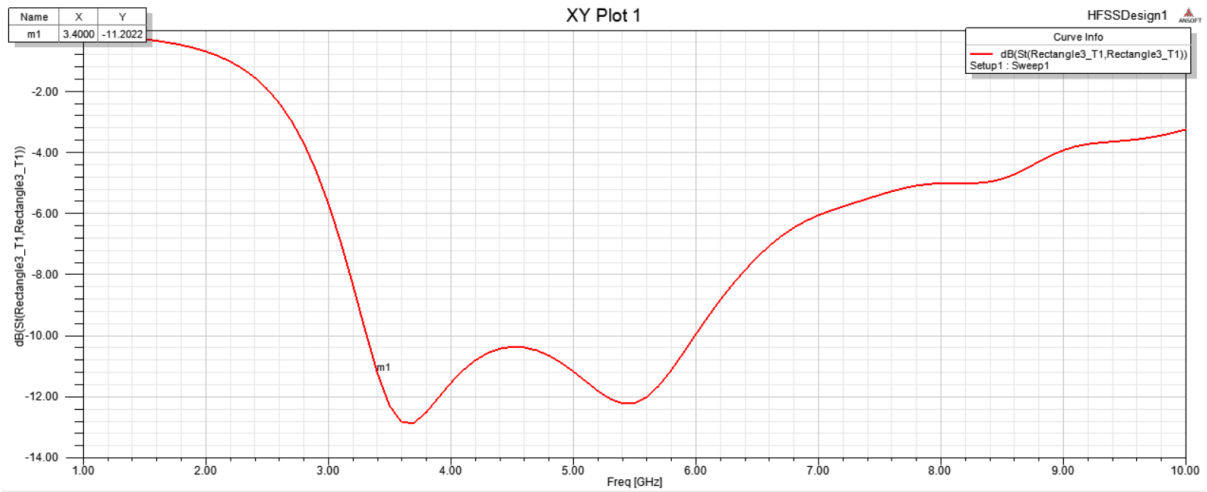
For a rectangular radiating block the parameters L, r vary as follows

If l and W are the length and width of the radiating block then,

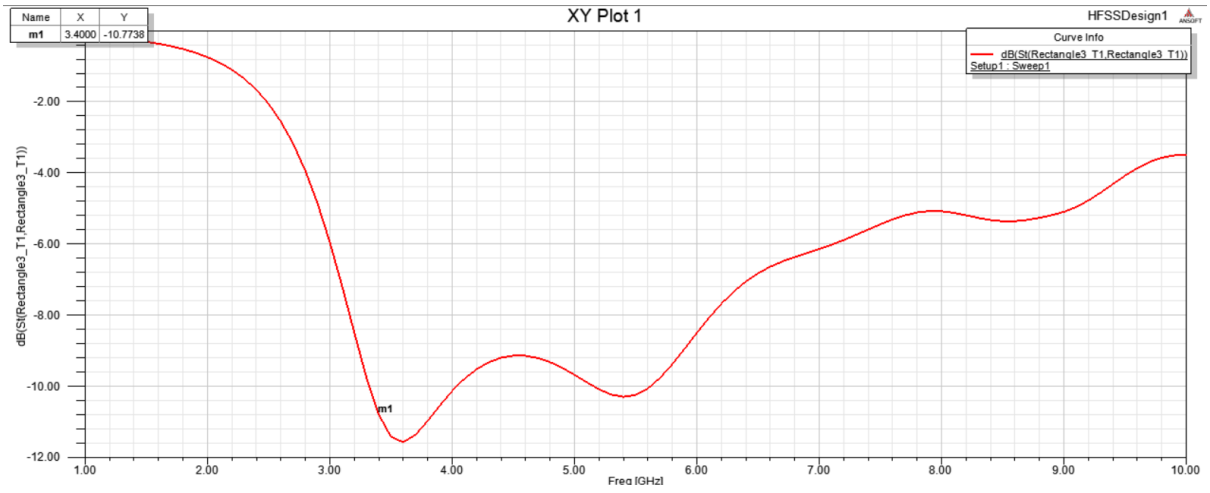
L=l and r=W/ 2∗pi (pi=3.14)

OUTPUTS:

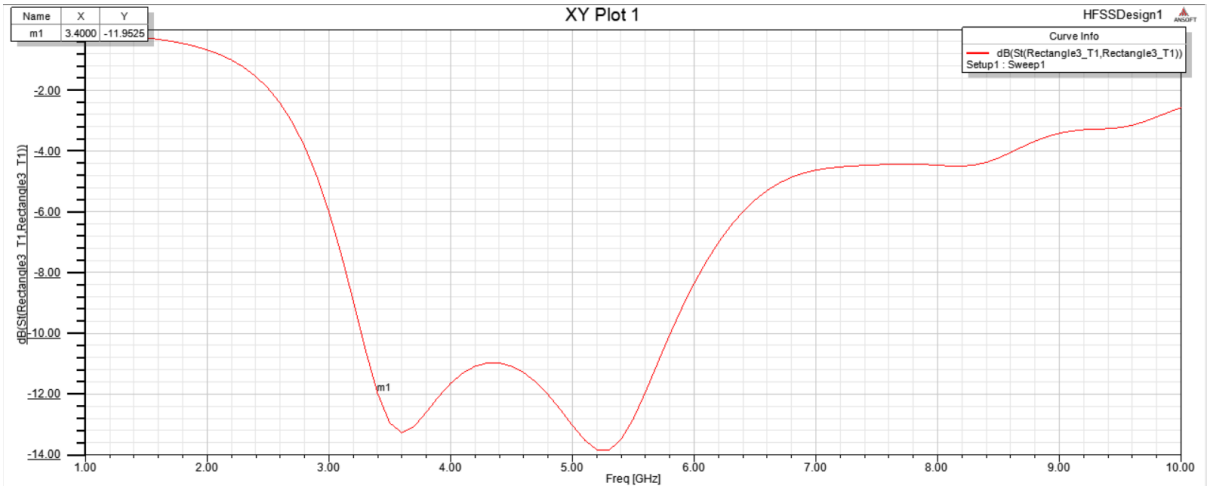
For 4.5mm and -10 mm



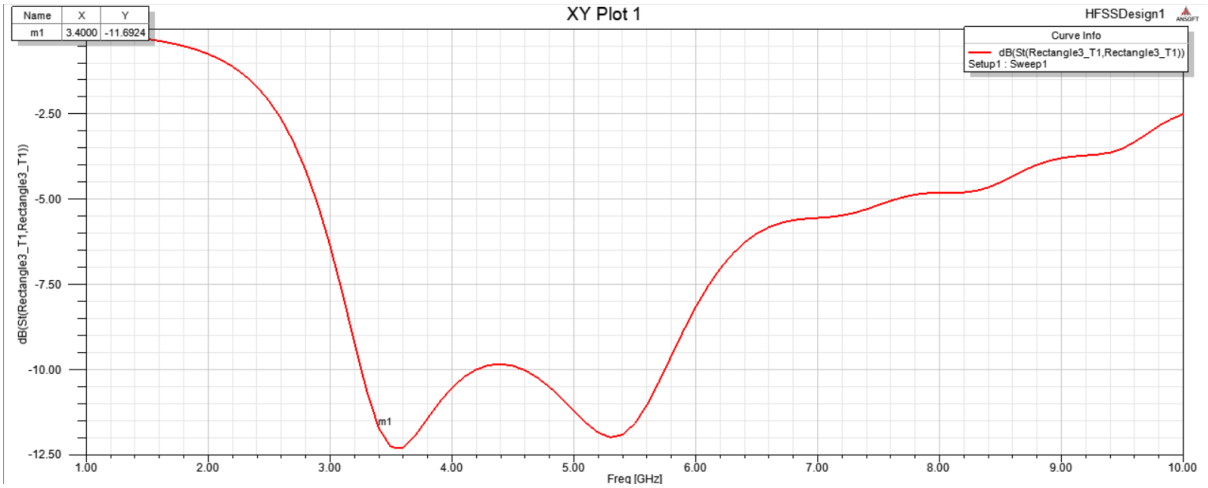
4.8 mm and -10mm



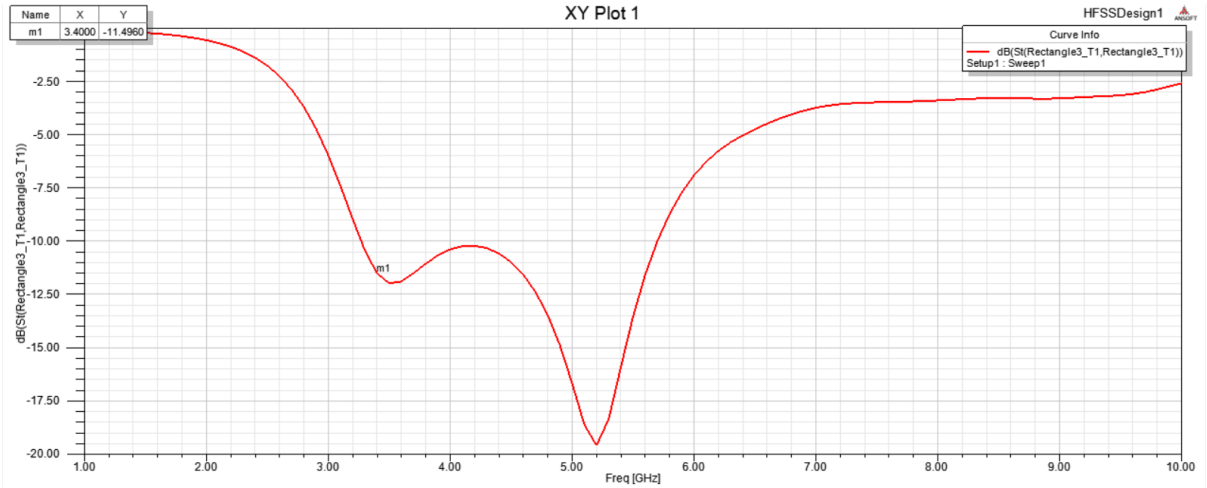
3.9mm and -10mm



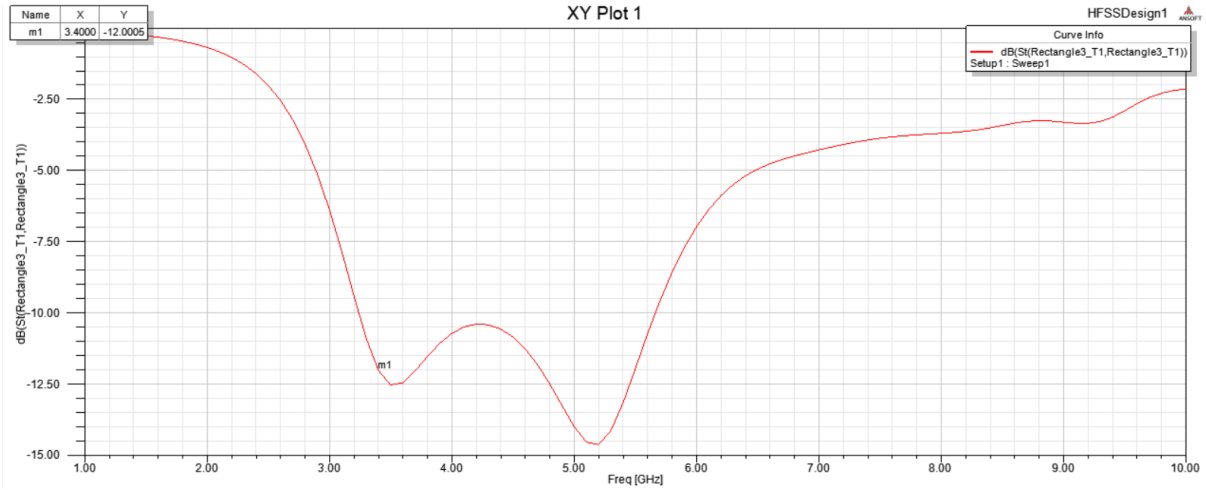
4.25mm and -10mm



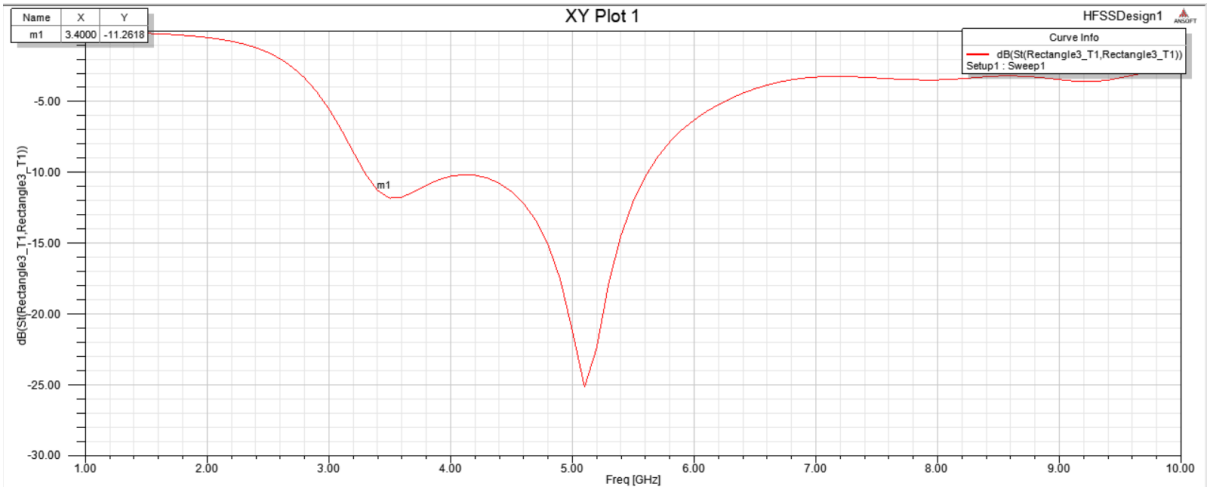
2.5mm and -10mm



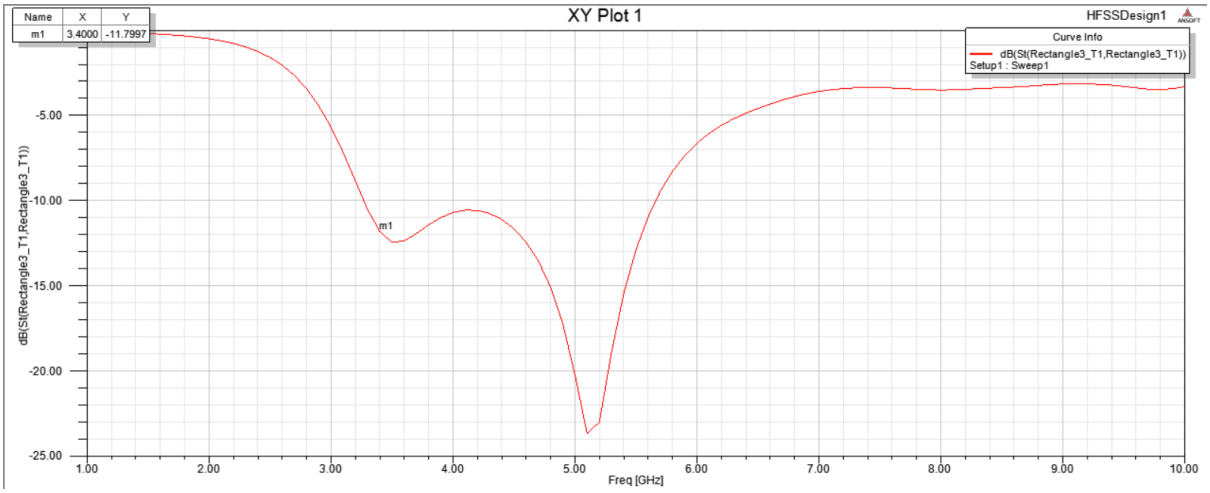
3.5mm and -10mm



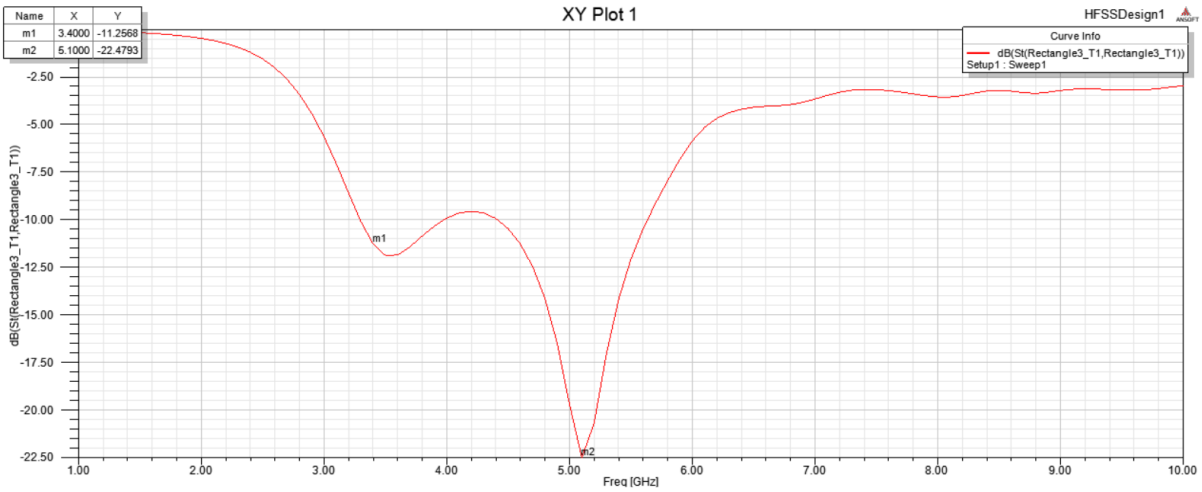
1.75mm and -10 mm



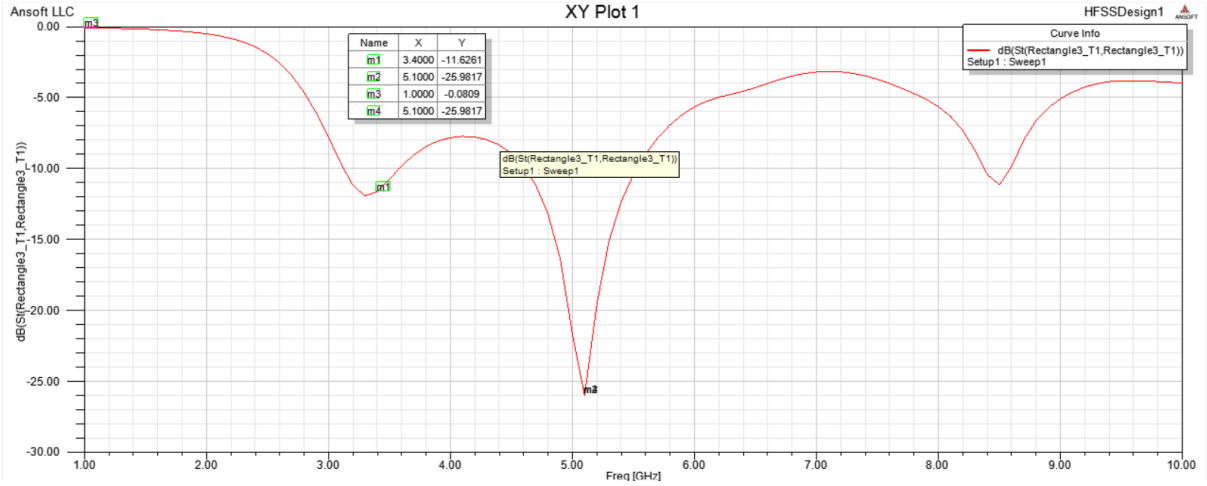
2mm and -10 mm



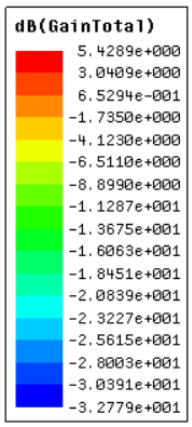
For the modified antenna

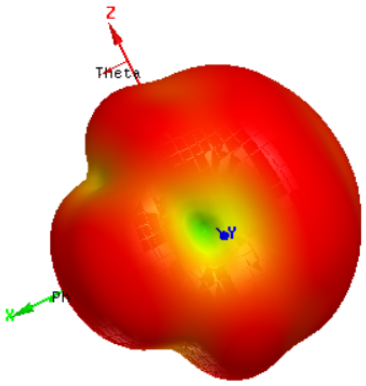


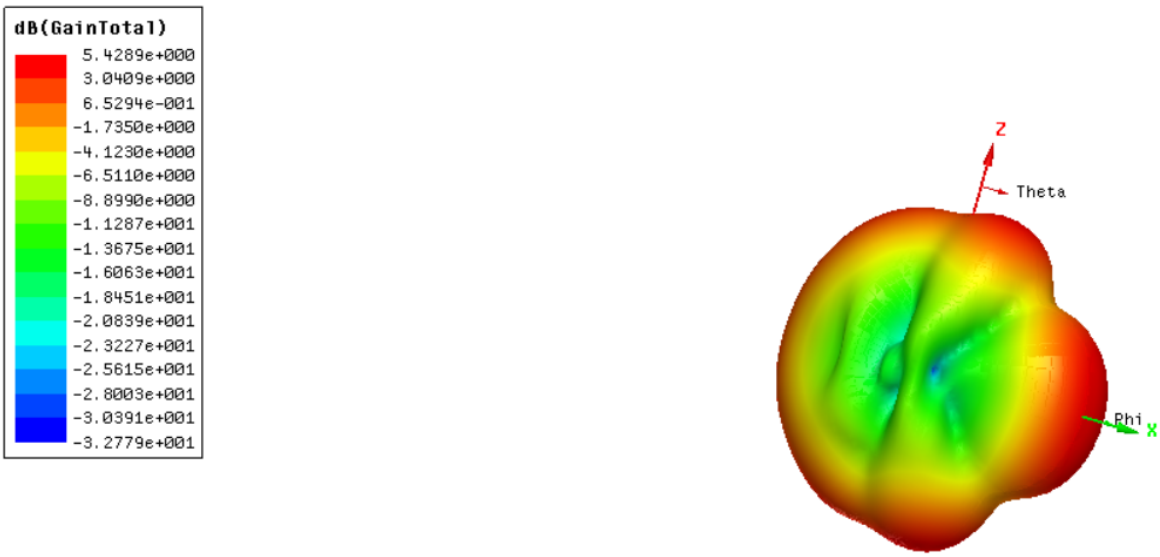
For the newly modified antenna

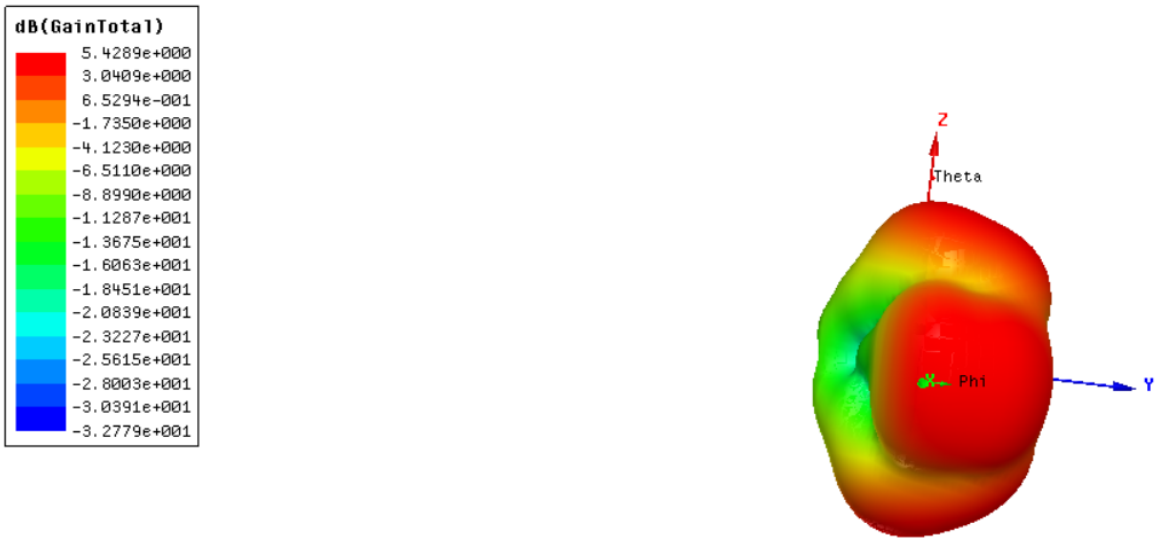


The 10 db line is considered as the industrial standard for the gain measure.
Radiation pattern

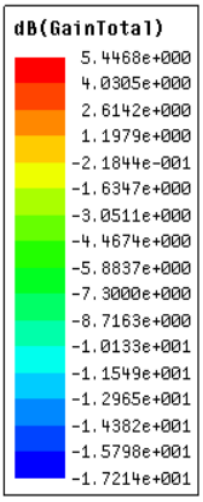


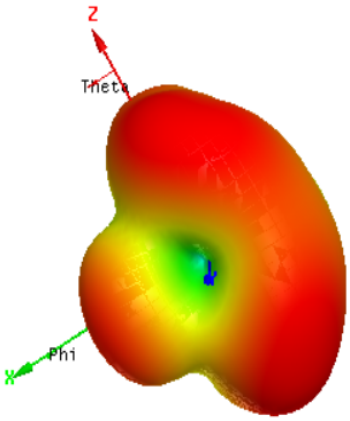


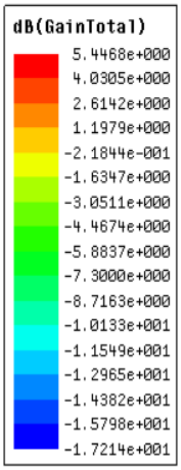




Radiation pattern for the newly modified antenna.


dB(GainTotal)
5.4468e+000
4.0305e+000
2.6142e+000
1.1979e+000
-2.1844e-001
-1.6347e+000
-3.0511e+000
-4.4674e+000
-5.8837e+000
-7.3000e+000
-8.7163e+000
-1.0133e+001
-1.1549e+001
-1.2965e+001
-1.4382e+001
-1.5798e+001
-1.7214e+001


Z
Theta
Phi
X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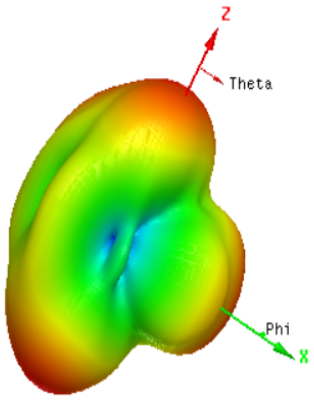
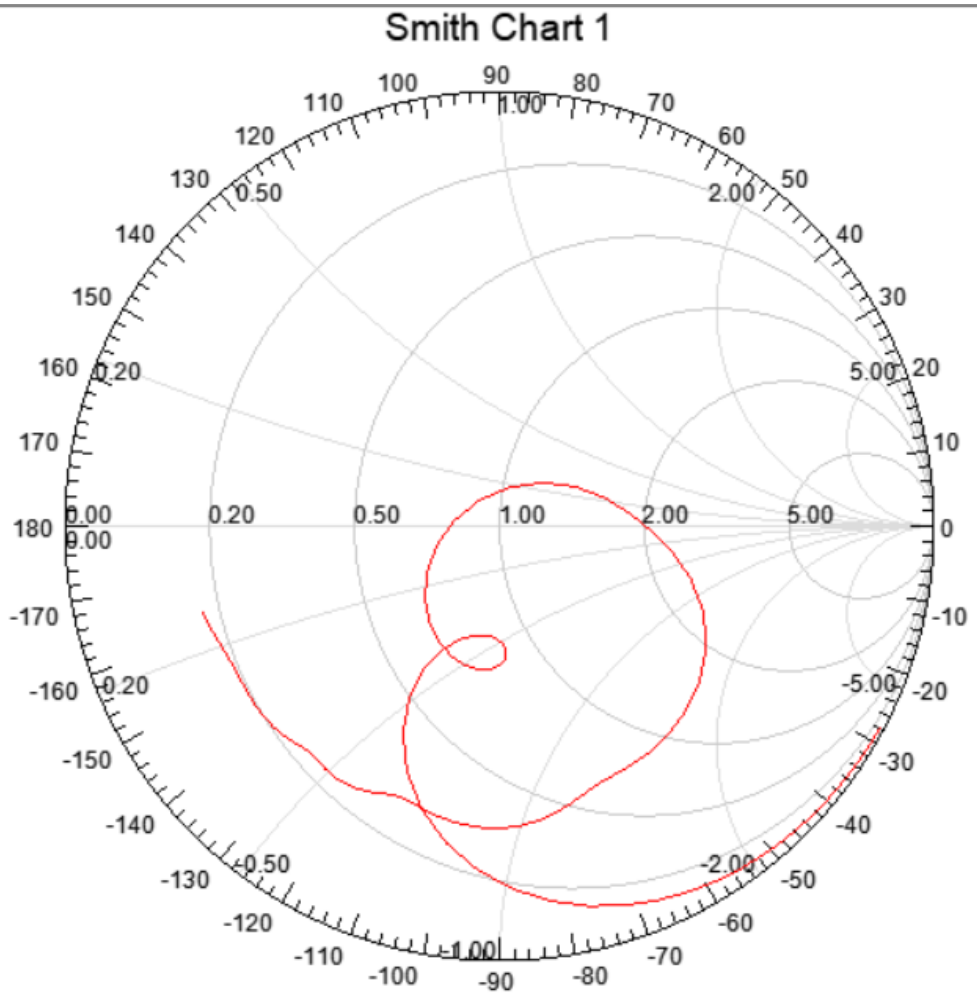
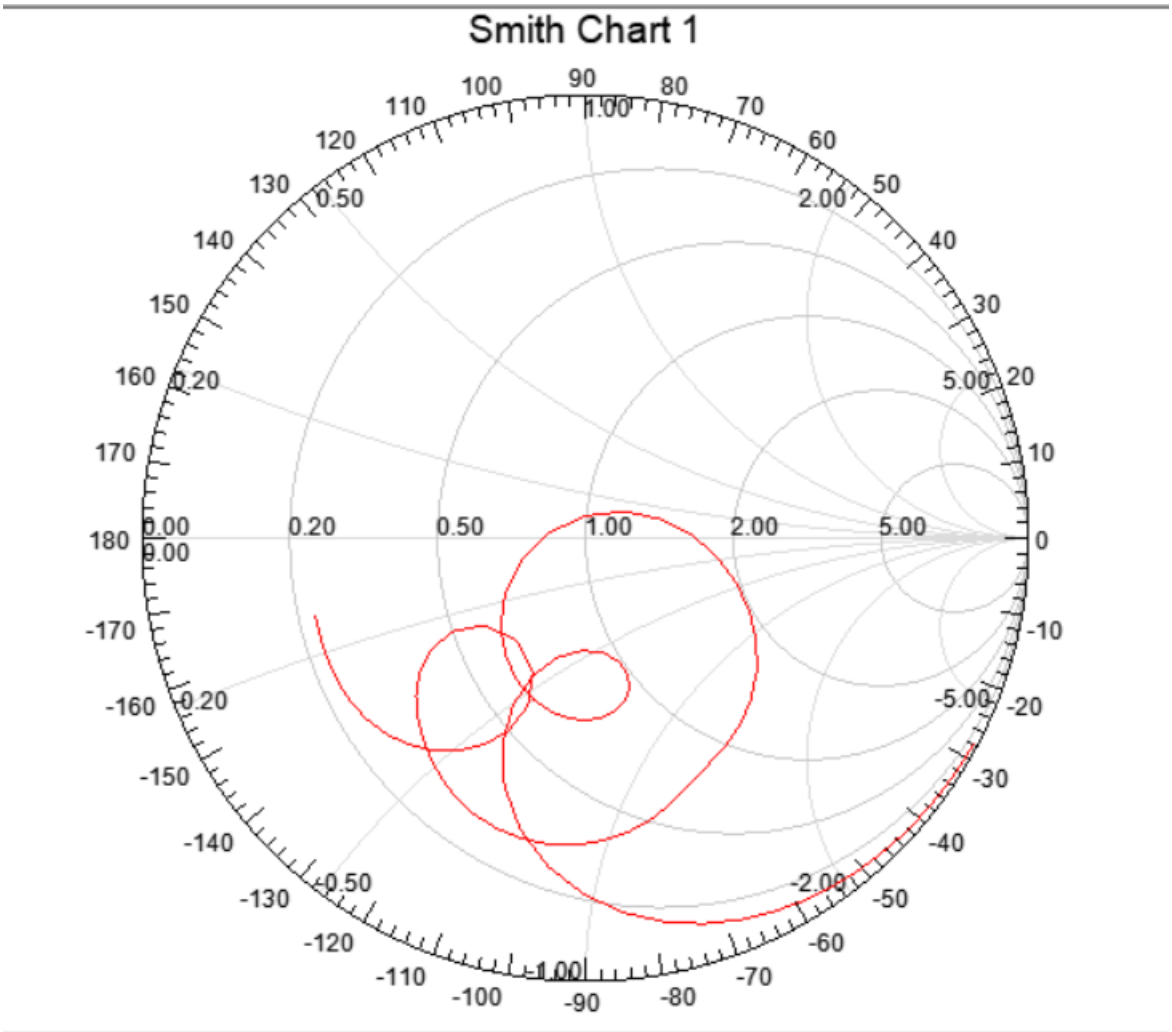

Z
Theta
Phi
X

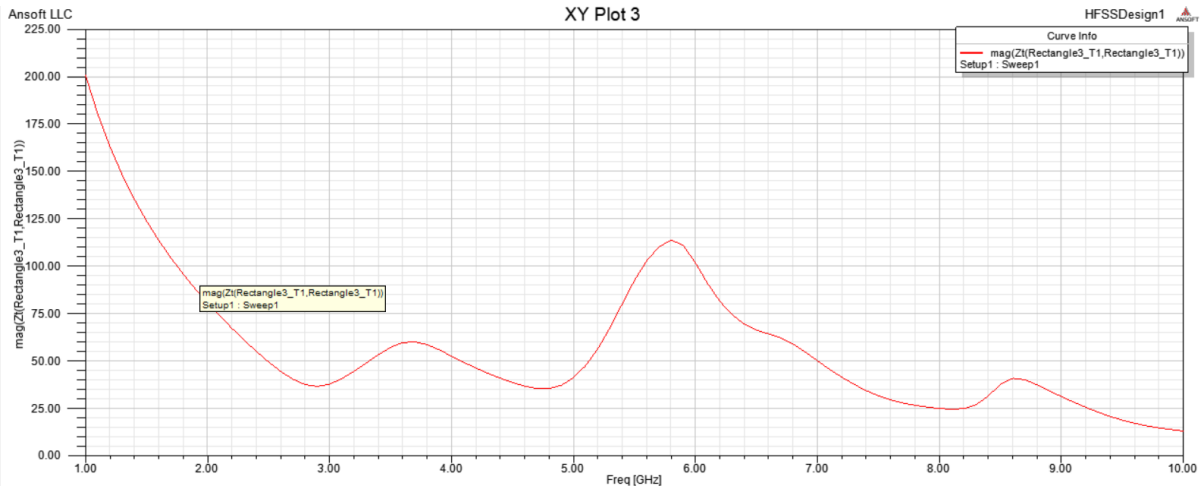
Smith chart



Smith chart for the modified antenna:



Impedance matching:



Conclusion

The proposed antenna design can operate in between the specific range of frequencies and provide significant gain of around 22.5

db as compared to 10 db of the previous antenna design.

Future scope

Further work is needed on improving the impedance matching of the feed transmission line and improvising the radiation pattern.

References:

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K. P. Ray SAMEER, IIT Campus, Hill Side, Powai, Mumbai 400076, India

Ultrawideband Performance of Dielectric Loaded T-Shaped Monopole Transmit and Receive Antenna/EMI Sensor
Saswati Ghosh, Member, IEEE, and Ajay Chakrabarty, Senior Member, IEEE

Broadband Omnidirectional Metal-Plate Monopole Antenna
Kin-Lu Wong, Saou-Wen Su, and Chia-Lun Tang

CPW-Fed Planar Printed Monopole Antenna With Impedance Bandwidth Enhanced
Chao Deng, Yong-jun Xie, and Ping Li

Integrated Monopole Slot and Monopole Strip for WWAN Handset Antenna
Po-Wei Lin∗ Department of Electrical Engineering National Sun Yat-Sen University Kaohsiung, Taiwan linpw@ema.ee nsysu.edu.tw Kin-Lu Wong Department of Electrical Engineering National Sun Yat-Sen University Kaohsiung, Taiwan wongkl@ema.ee.nsysu.edu.tw

Study On Dual-Frequency Planar Monopole Antennas
ZHENG Hui-li, TANG Mfing-xiang, SONG Shun-xian National Laboratory of Antennas and Microwave Technology

Monopole Antenna With Quasi-Fractal Slotted Ground Plane for Dual-Band Applications
Tao Hong, Student Member, IEEE, Shu-Xi Gong, Ying Liu, Member, IEEE, and Wen Jiang, Student Member, IEEE