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Gains Improvement by Micro strip Patch Antenna Array

G Venkataramana[1], Y Apparao[2], A Naryana Murthy[3], I Srinu[4]

[1,4]Assistant Professor, Dept Of Ece,Vsm College Of Engineering, Ramachandra Puram, Ap, India,
[2,3]Associate Professors Vsm College Of Engineering, Ramachandra Puram, Ap, India,

Abstract
This paper presents a 3x3 rectangular topology antenna array designed for operation in Ku Band. The antenna is designed as a patch, where the number of elements, spacing and feed lines are optimized to meet the requirements of low side lobe level and good crosstalk. The operating frequency of the array is from 12 to 18 GHz. The antenna array is designed and simulated on FR4 Substrate with dielectric constant of 4.4. This paper presents the detailed design steps and simulation of rectangular patch antenna and wide rectangular patch antenna Array in Ku-band. The design is calculated by FEM based on HFSS14.0 in which return loss, 3Dpolarplot, Directivity, VSWR and Gain of the antenna are calculated. The results of the software simulation show that the designed antenna array provides good performance in terms of return loss, VSWR and Gain.

Keywords: Micro strip Antenna, Rectangular Patch Antenna, HFSS14.0, Return Loss, VSWR, 3DPolar Plot, Directivity, Gain;

Introduction

Array Antennas Also called array antennas, an array antenna is a number of antennas connected & arranged in an organized structure to form a single antenna. also phased array antenna (PAA) is a multiple antenna system, where, the radiation pattern can be amplified in a particular direction& suppressed in unwanted directions. The radiation direction of the staggered array can be directed electronically eliminating the need for mechanical rotation. These unique capabilities found that the phases served many applications since the early days of this advanced technology.

In modern communication systems, these antenna arrays play a crucial role in establishing a communication link. Micro strip Patch antennas are widely used in communication systems due to their light weight, low cost, compact design, low power consumption, and ease of integration and fabrication. They can be designed in various ways to obtain high gain and bandwidth. Micro strip patch antennas are a milestone in wireless communication system designs

A phased array antenna is traditionally used in military radar applications. Say sananey of important nayarin mangala na tata ed saray phased array et say automotive collision avoidance radar odino adaptive cruise control technology.

An advantageous Antenna Array;

- Increase expected profits.
- Identify the guards ed pandurumaan.
- Cancel any reservations in a specific direction.

- 3Guidance" so array pian more sensitive ed particular direction.
- Determine the direction of the signal.
- Signal to Interference Plus Noise Ratio (SINR).

Design of Proposed Antenna

In this paper, 3x3 Rectangular Micro strip Antenna Array is Design at 13GHz frequency is designed and simulated on Ku band.

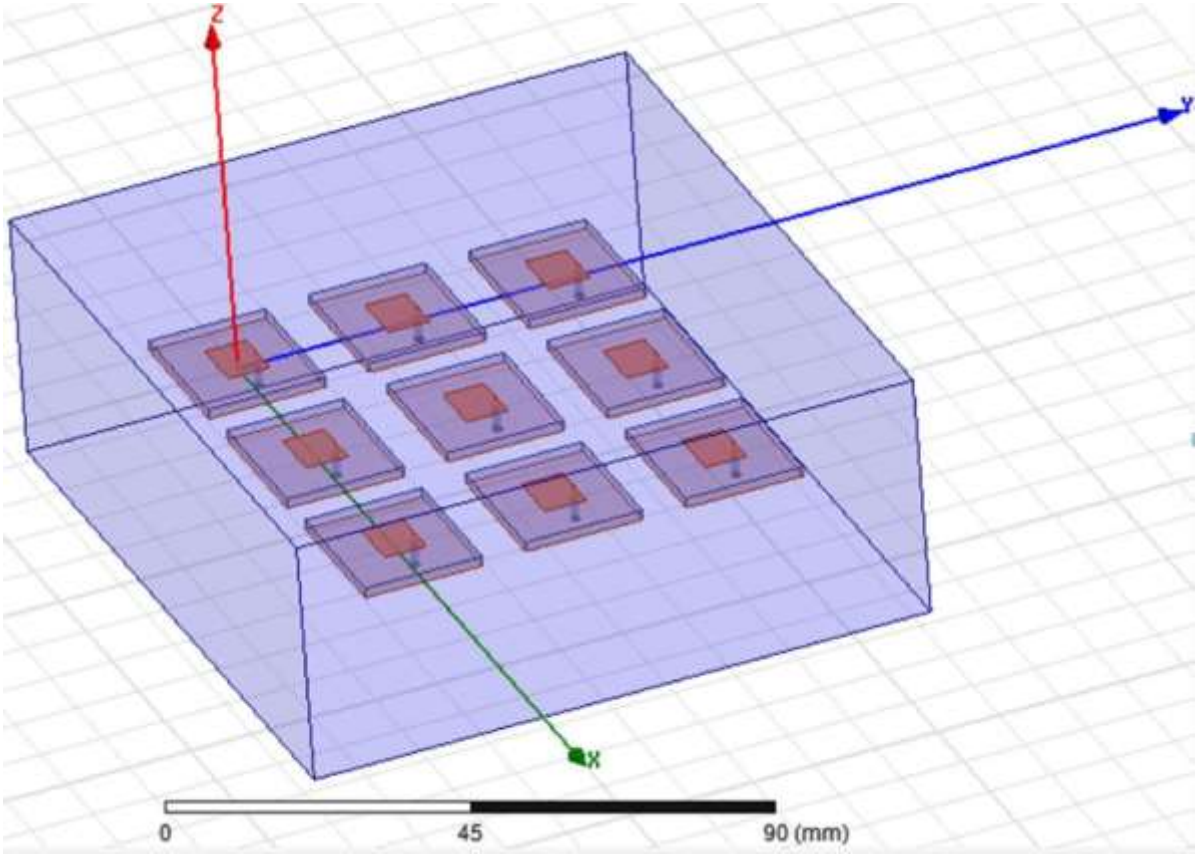


Fig.1 3x3 Rectangular Microstrip

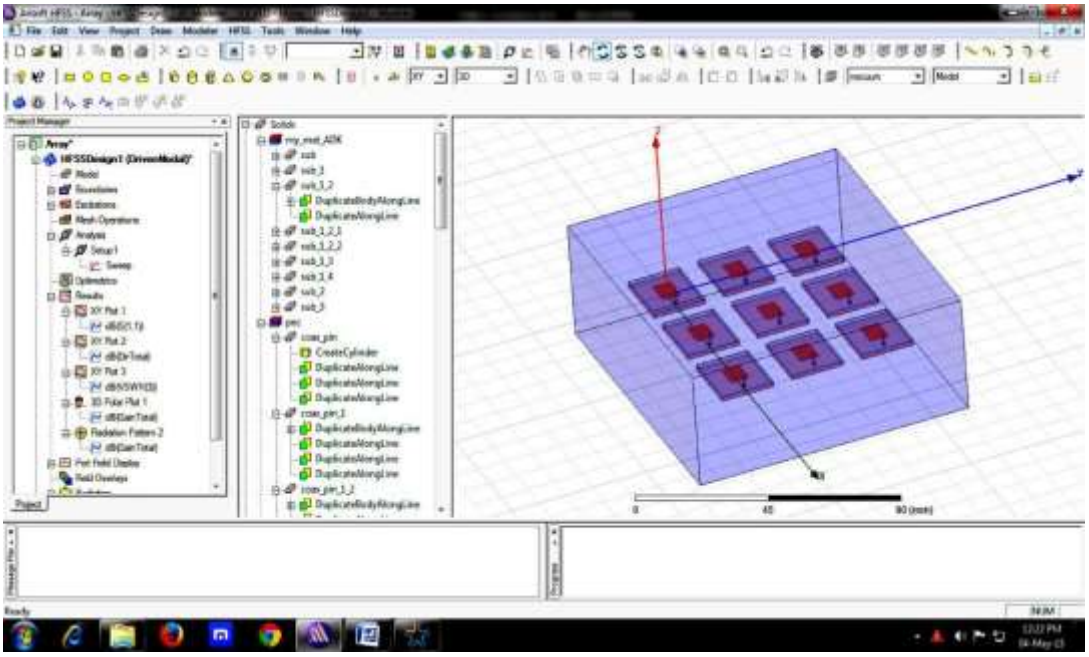


Fig:2 Patch Antenna Array Design (Cropped Image)

Fig.23x3 Rectangular Micro strip Patch Antenna Array Design(original ImagefromHFSS14.0)

The upper figures represent, 3x3 Micro strip Patch Antennae Array Design. Fig.1 imago antennae ordinatae obliquas represented. fig. 2 represented 3x3 Micro strip Rectangular is Patch Antennae Array original Image from HFSS14.0. For this design the Method used to analyze antenna is FEM (Finite Element Method)et Excitation Technique Usus Est Probe Pascens. Spatium inter antennae element is Z/4.

fig.3 and fig.4 can explain about the details of setup & sweep of proposed design.

Design Setup:

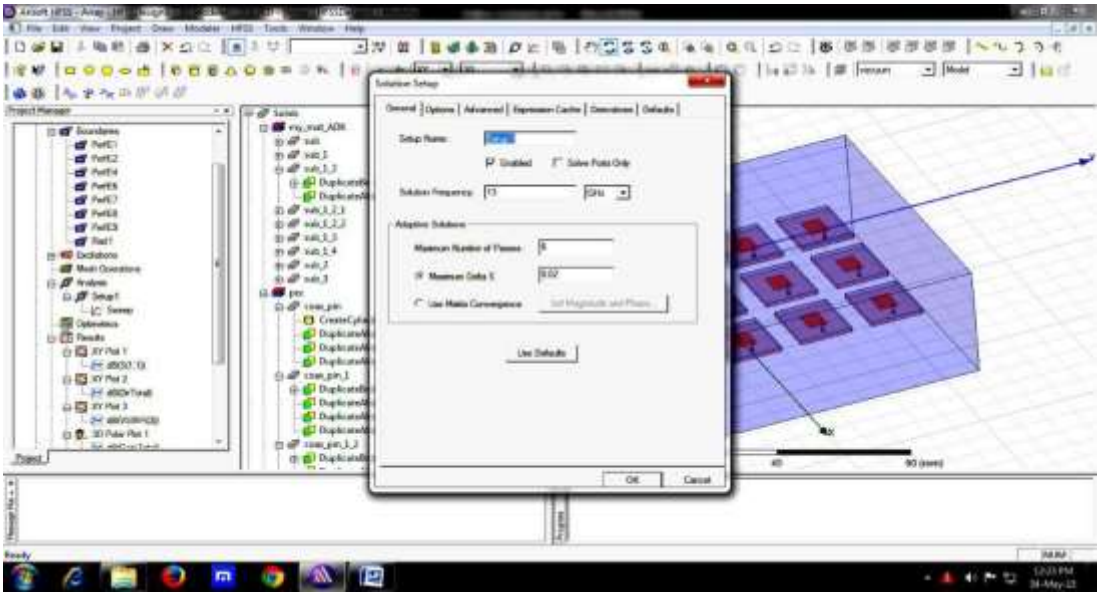


Fig.3Setup of3x3 Rectangular Microstrip Patch AntennaArray

Sweep:

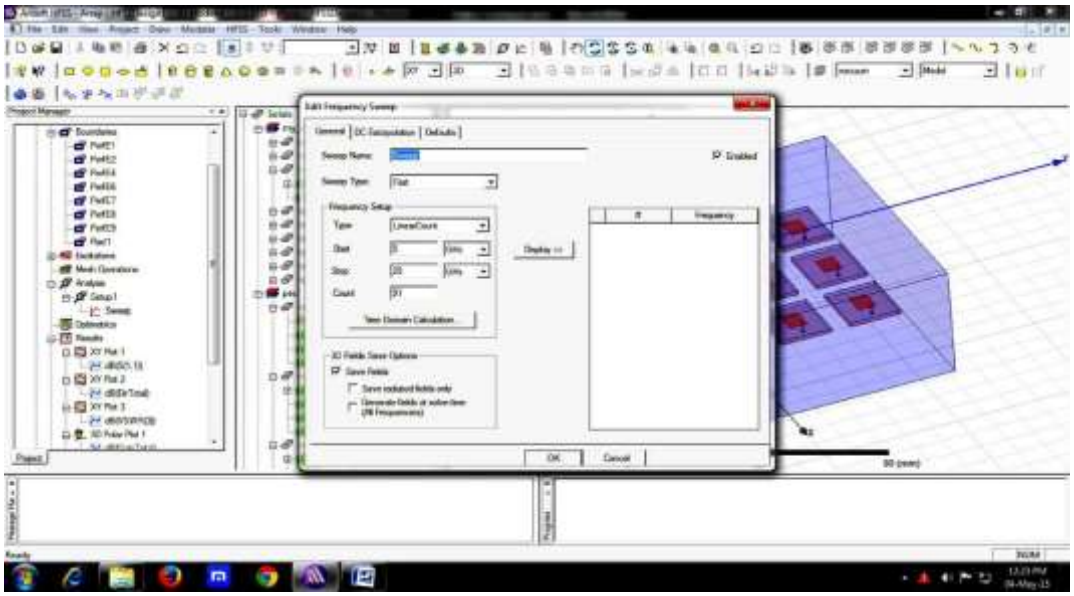


Fig.4 Sweep of 3x3 Rectangular Microstrip Patch Antenna Array the Antenna design considerations are also shown below:

Design Considerations:

Array Size*: 3X3*

Substrate material*: FR4*

Relative permititvity 2.2, losstangent 0.0009 Position "-subX/2 ,-subY/2 ,0cm" "-1.15cm,-0.95cm,0cm"

XSize subX 2.3cm
YSize subY 1.9cm
ZSize subH 62mil

Patch:

Position "-patchX/2,-patchY/2,subH""-0.455cm, -0.335cm , 62mil"
Axis Z
XSize patchX0.91cm YSize patchY0.67cm

The below table can give he corresponding values of Design Parameters.

Design Parameter	**Value**
Operating Frequency	13.333GHz
Dielectric Constant of the substrate	4.4
Height of the substrate	0.157cm
Length of substrate	3cm
Width of substrate	3cm
Height of coax pin	0.157cm
Radius of coax pin	0.2mm
Array Size(NxM)	3x3

TABLE: Design Parameters & Corresponding Values

Simulation Results using HFSS14.0

The below figures can represent the return losses, 3D polar plots, VSWR, Directivity, Radiation Pattern, E Field Radiation Pattern & H Field Radiation Pattern obtained using HFSS 14.0.

Return Loss:

Return loss is a measure of that, how well lines/devices are matched.

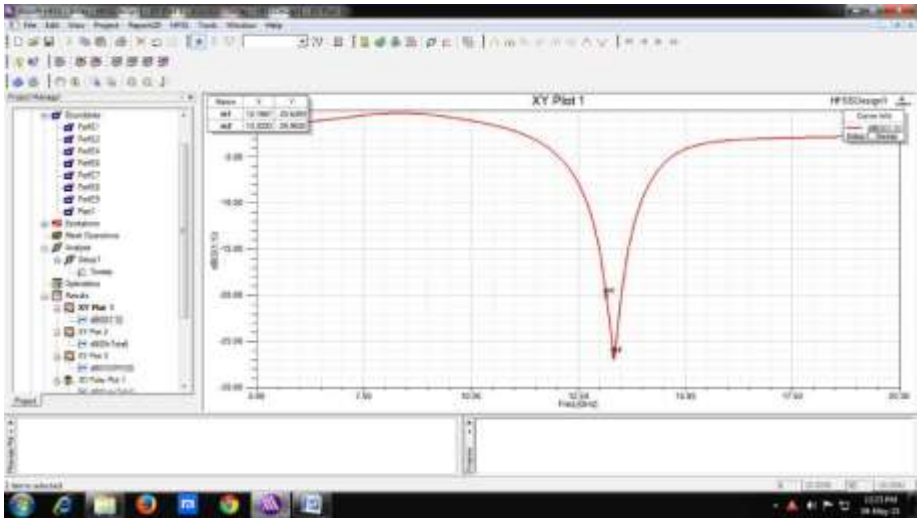


Fig.5ReturnLossfor3x3PatchAntennaArray

The above figure can represents the Return Loss of 3x3patch antenna Array have frequency at**13.33Hz.**

3DPolarPlot:

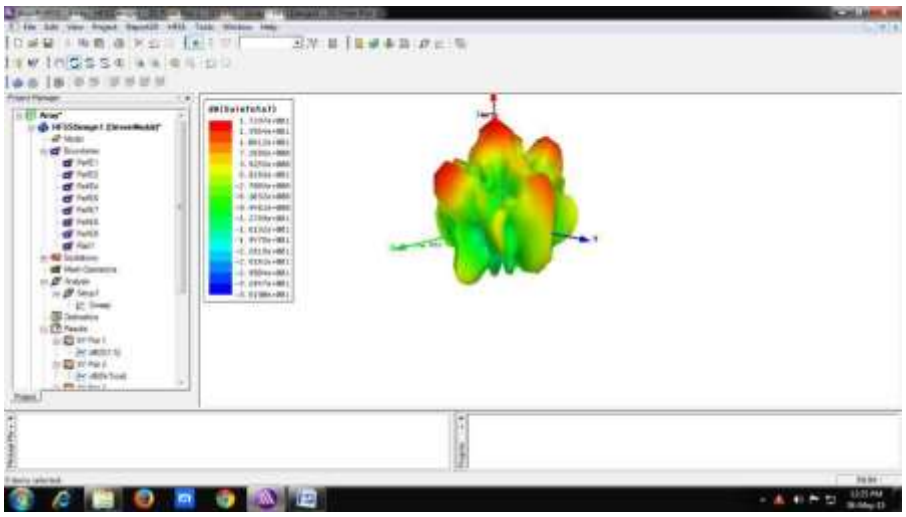


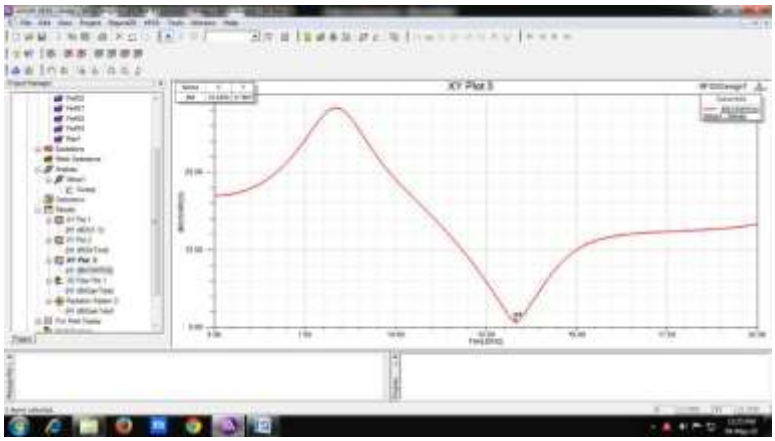
Fig.6 3D PolarPlotfor3x3PatchAntennaArray

The above figure can represents the3D polar plot of3x3 patch antenna Array have a gain at**17.29db**

VSWR:

Voltage standing wave ratio commonly known as VSWR is a way to measure transmission line imperfection. the figure at the bottom of this paper gets the VSWR as 0.7807 for a corresponding 13.33 Hz.

Fig.7 VSWR for 3x3 Patch Antenna Array



Directivity:

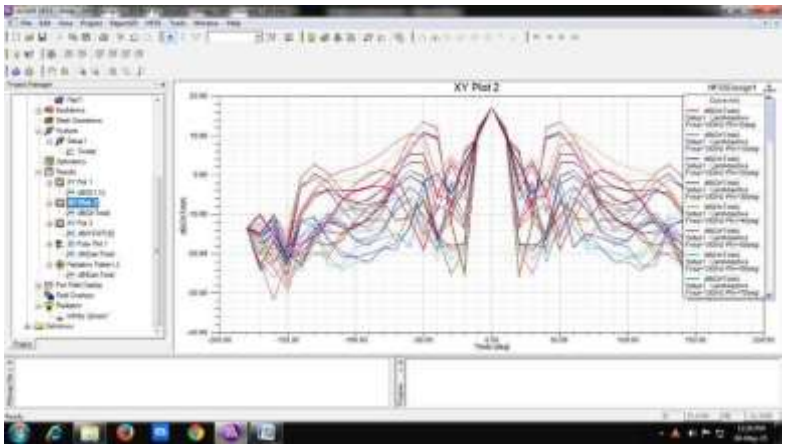


Fig.8 Directivity of 3x3Patch Antenna Array

Radiation Pattern:

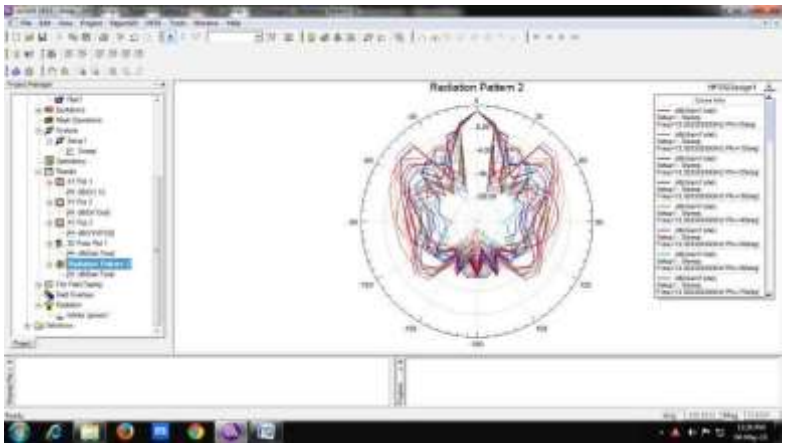


Fig.9 Radiation Pattern of 3x3 Patch Antenna Array

E-FieldRadiationpattern:

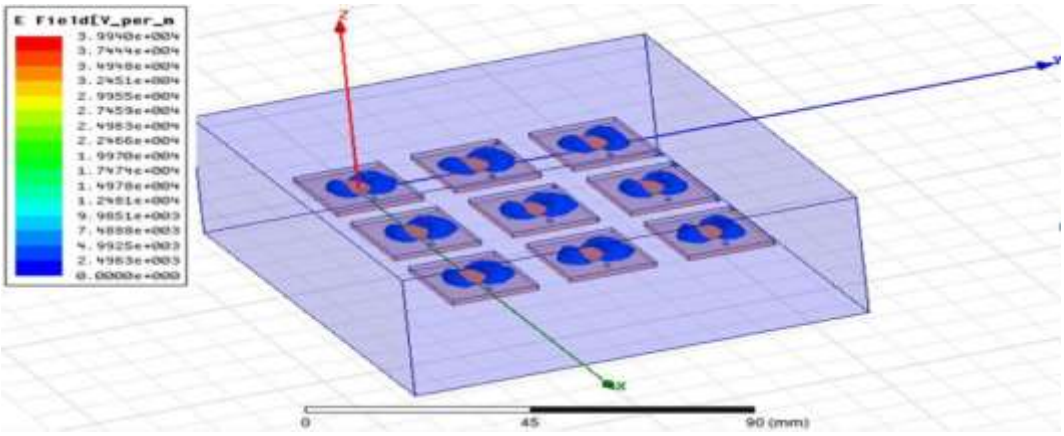


Fig.10 E-Field Radiation Pattern of 3x3 Patch Antenna Array

H-Field Radiation pattern

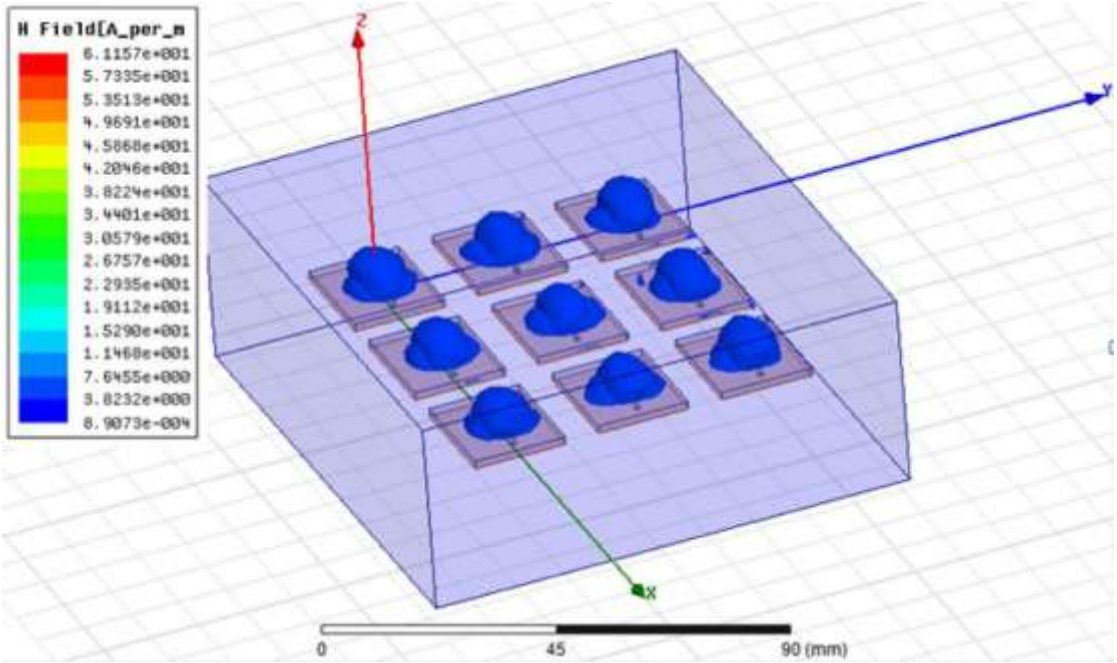


Fig.11H-FieldRadiationPatternof3x3PatchAntennaArray

The above figures can represent the Screenshots of Directivity, Radiation Pattern of E-Field& H-Fields.

Conclusions

The antenna array concept is used to improve the better amplification of different antennas by canceling side dives. This article explains 3x3 rectangular micro sheet patch antenna arrays using HFSS 14.0. For the deracinated design, this paper obtained a large gain of 17.29 db, a return loss at 13.33 hz, and a VSWR value of 0.7807 (value <2). By using antenna arrays, this paper obtains a large gain. In the future, this article focuses mainly on the production of the proposed design, and testing will be performed with a network analyzer.

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