# RESEARCH ON RECTANGULAR PATCH ANTENNA WITH SELECTED SUBSTRATE IN APPLICATION OF ESTABLISHMENT OF SATELLITE ROBOT ROVER OVER MARS OPERATING IN THE FREQUENCY 3.3-4GHZ IN A PARTICULAR BASE STATION TO DETECT PERCHLORATES (RADIATING DISEASE)

**MARIA MELANI[a1] AND J. AROCKIA PRINCE[b]**

[a]Electronics and Communication Engineering, Rajas Engineering College, Tamil Nadu, India
[b]Master in Communication System (Satellite)

## ABSTRACT

**This article describes about the installation of n*n array in the robot rover in the mars. Here the antenna is highly advanced based designed based on the results from the previous algorithm results in high gain and directivity. Also describes about the radiation pattern in which it supports the long range IEEE 802.11 std applications by considering the changes in the E-M field in the Mars. It shows about the detection of perchlorates (a radiating disease in MARS) by the E-M field of our designed antenna .It also shows about the maximum power radiated in the omni- direction. This can work in the spectral range of 3.3-4 GHz. The design is implemented with the help of software ADS-2009**

**KEYWORDS**: 1*1 Microstrip Patch Array, ADS

An antenna is a transducer designed to transmit or receive electromagnetic waves. A microstrip patch antenna comprised of a radiating patch on one side of dielectric substrate while has a ground plane on the parallel of other side. Rectangular patch antennas are becoming increasingly useful because they can be printed directly onto a PCB board. Rectangular Patch antennas are low cost, have a low profile and good efficiency and are easily fabricated..

Good terms of the merits of rectangular patch antenna are low profile, light weight, low volume, low cost and can easily be integrated with the microwave integrated circuits or in the printed circuit boards. The most commonly employed microstrip antenna is a rectangular square patch which looks like a truncated microstrip transmission line. It is accurately one-eighth wavelength long. As the antenna is loaded with a dielectric as its substrate, the length of the antenna decreases as the relative dielectric constant of the substrate of our defined one increases abruptly. The resonant length of the antenna is slightly shorter because of the extended electric "slit fields" which makes the abrupt change in electrical length of the antenna. The dielectric constant is the ratio of the permittivity of a substance to the permittivity of free space. It is an relative extent to which a material concentrates magnetic flux, and is the electrical equivalent of relative magnetic permeability. As the dielectric constant increases, the electric flux density increases proportionally and the magnetic field in the inverse, if all other factors remain unchanged. This enables particles of a given size, such as sets of metal plates, to hold their electric charge for long periods of time and is used for the detection of perchlorates, and/or to hold large quantities of charge. . This relationship did not immediately follow when using the transmission line model of the antenna, but is apparent when using the software ADS (Adavnced Design System).All the above specified are installed in the robot rover ranging in the MARS (martian planet) meant for the research and establishment of advanced innovative things in mars

## MICROSTRIP PATCH ANTENNAS

A microstrip or square patch antenna of n*n is a low- profile having considerable weight, inexpensive. The thicker substrate of Vaseline increases the gain to abrupt extent.Square geometries are separable in nature and their analysis is also simple. Microstrip patch antennas are increasing in use of wireless sensor applications and is mainly for the new innovative disease causing perchlorates in the upcoming birth generation in MARS due to their low-profile structure. Another area where they have been used successfully is in Satellite to Satellite communication. Low fabrication cost of this type of antennas and hence can be manufactured in large quantities..Also it supports both, linear as well as circular polarization. Can be easily integrated with microwave integrated circuits (MICs).of rectangular and circular waveguide. Capable of dual and triple frequency operations.

[1]Corresponding author

## FEEDING METHODS

There are many methods of feeding a microstrip antenna. In this type of feed technique, a conducting strip is connected directly to the edge with the coupling of coupling factor 2, of the multi-dimensional rectangular microstrip patch The most popular methods are: 1. Microstrip Line. 2. Coaxial Probe (coplanar feed). 3. Aperture Coupling. The Coaxial feed or probe feed is a very common technique used our feeding multi-dimensional rectangular microstrip patch antennas. The coupling aperture is equally or in alternatively spaced under the patch, leading to lower cross polarization due to symmetry of the configuration. The amount of coupling from the feed line to the patch is determined by the shape, size and location of the aperture. Because of the antenna is radiating from both side of the substrate in an omnidirectional way, so it is easy to feed it from the exterior side **(**the ground plane), or from the side of the element. The most important thing to be considered is the maximum or consistent transfer of power (matching of the feed line with the input impedance of the antenna). Many good designs have been discarded because of their bad feeding. The designer can build this type of n*n antenna with good characteristics and good radiation parameter and high efficiency but when in all the unfortunate, the total efficiency could be reduced to a low level which makes the whole system to be rejected.

## METHODS OF ANALYSIS

The transmission line method in general of passive components in higher values in Mars environment is the easiest way to study the microstrip antenna. In this method the transmission line model represents the rectangular patch antenna by n number of slots, separated by a low- impedance transmission line of length L. Results we get are the best accurate to be considered for the detection when compared with other methods but it is good enough to design the antenna.

## MATERIALS AND METHODS

The dielectric material that is used in this design of the Rectangular Patch Antenna is R04003C from Rogers corps with εr = 4.5. The selection of substrate depends on the type of circuit in the transmission line, operating frequency of operation and the amount of dissipation from the circuit. The properties of substrate materials should be high dielectric constant, low dissipation factor, high purity high resistivity, high stability, surface smoothness and thermal conductivity. The size of the antenna array is depend on the dielectric constant and is sure for detecting the perchlorates. The bandwidth is directly proportional to the substrate thickness or height and directly proportional to the εr.

The parameter that are decided by the default in order to continue to the design process are

Dielectric substrate εr = 4.5 Velocity of light=$3x10^8$ m/s Loss tangent=0.00028

Operating frequency (f) =3.3GHz

Conductivity=$5.8x10^7$(copper) Height of substrate (h) =1.00ml Thickness of ground plane=140mm

Feeding method=-microstrip square n*n (inset feed) Polarization = linear

Name of Substrate metal=Vaseline

## RADIATION PATTERN

The radiation field of the microstrip antenna may be determined using either an “electric current model” or a “magnetic current model” or in E-M model. But these two are disagree each other regards the co-incidence as they are neither parallel nor perpendicular in space or somewhat tangent in neighbouring planet as the gravity,pressure is very low when compared to earth .In the electric current model, the current is used directly to find the omni directional radiation pattern.. If the substrate of vaseline accounted for and is assumed of finite aperture of 5.16m,. The slots are typically taken to have a dimension of n*n with four apertures equal in impedance width (length according to the y- axis) of the patch and a width approximate to the substrate height. This results in a total gain of 10.65dB will show the characteristic or the impedance of the mars rover or future robot explorer to communicate with the rover of another base station to reflected back for sensitivity of perchlorates. The n*n rectangular patch of the substrate Vaseline excited in its aperture mode has a maximum directivity with respect to the gain in omni direction. .

## ANTENNA GAIN

Antenna gain in the mars environment can be defined as antenna directivity times

a factor representing the radiation efficiency. This efficiency is defined as the ratio of the radiateds power (Pr) in omni direction to the input power (Pi) in the thermal form. The input power is transformed into radiated power and surface wave of EM waves of Mars of considerable power and because of Vaseline substrate with high gain in db can be used to transfer to reflecting agent to have the sensitivity about the perchlorates. Surface waves as because of $(1/3)^{rd}$ gravity materials with lower dielectric constantsand/or thicker materials are used. Antenna gain can also be specified using the total efficiency, power radiated. In mars as due to the change of velocity of light, permeability and permittivity of air. This total efficiency is a combination of the radiation efficiency and efficiency linked to that of impedance matching of the antenna.

## BANDWIDTH

Another important parameter of any antenna is the bandwidth it covers. In mars the expected spectrum allocation for a robot rover is approximately 6-8.3 GHz. Only impedance bandwidth radiated from 1*1 rectangular patch antenna is specified most of the time. However, it is important to realize that several definitions of bandwidth exist – impedance bandwidth, directivity bandwidth, polarization bandwidth, and efficiency bandwidth. Directivity and efficiency are often combined with respect to high frequency of enormous gain bandwidth. Since the rover is partially operating at the partially Ka band ,the bandwidth allocated for wireless communication is compatible for all application of IEEE 802.11 .This is the frequency range wherein the structure has a usable bandwidth compared to a certain impedance. The impedance bandwidth depends on a large number of parameters related to the patch antenna element itself (e.g., quality factor) and the type of feed used. The plot below shows the return loss of a patch antenna and indicates the return loss bandwidth at the desired S11/VSWR (S11 wanted/VSWR wanted). The discrepancies regards the power radiation is said to be negligible from the research records.

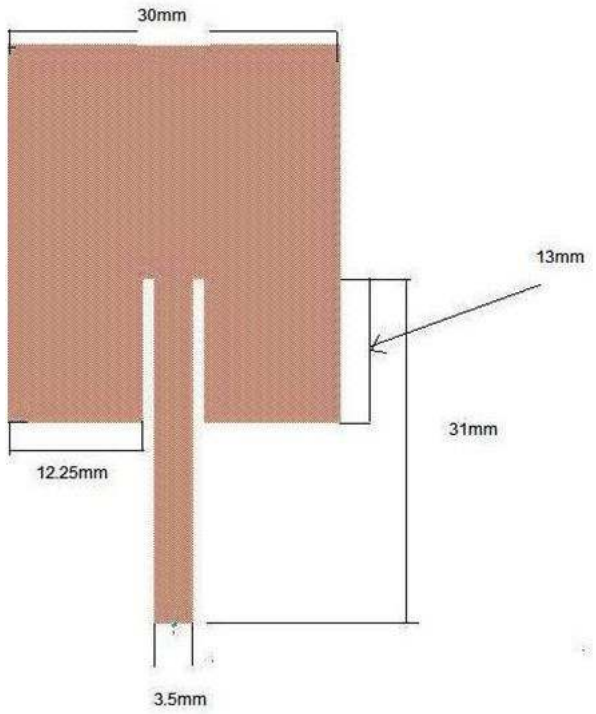



**Figure 1: Single microstrip rectangular patch antenna**

The polarization of an antenna is the polarization of the wave radiated from the antenna. A receiving antenna in some other base station is not in a stationary position can't get a line of sight from the transmitter in the different polarization as the transmitting antenna otherwise with the resonant frequency exactly of the transmitter. Polarization is a property of the electromagnetic wave of some other deflections of assumption of far field radiation of electrons; it describes the magnitude and direction of the electric field vector as a partial function of time, with other words "the orientation of the electric field for a given position in space". A simple straight path denotes the area has one polarization when pointing vertically, Circular polarization antenna radiates power in all planes in the direction of propagation (vertical, horizontal, and between them).Also in the cell based on the handoff strategy the hexagonal cell shape is considered.

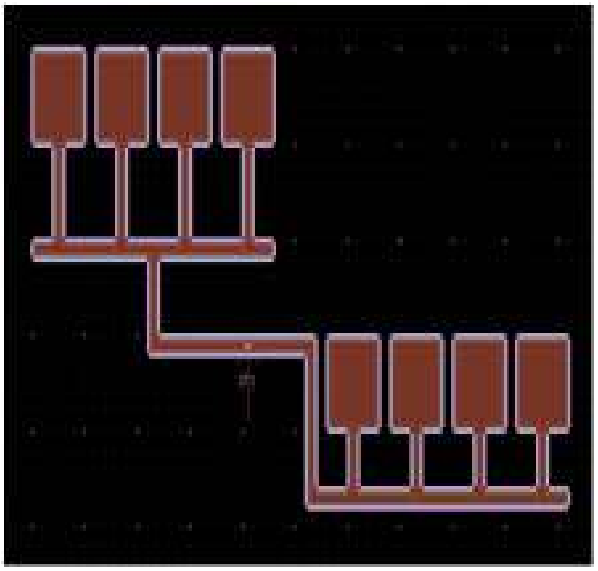


**Figure 2: 4*4 Model of rectangular patch array**

## MULTI-MICROSTRIP PATCH ANTENNAS

The LTE standard defines what are known as antenna ports. These antenna of the square patch ports do not correspond to physical antennas, but rather are logical entities distinguished by their reference signal sequences. Single antenna port signals can be transmitted on a multiple transmit antenna (C-RS port 0 and UE-RS port 5, for example). The voice communication strategy is meant by the RS-232 Correspondingly data transfer can be done in between through the robots, a single antenna port can be spread across multiple transmit antennas (UE-RS port 5, for example).

Let us consider antenna ports used for PDSCH allocations since they probably have the most variations. Initially, the 89600 VSA's LTE demodulator supported only analysis of PDSCH transmitted on Antenna Ports 0, (0 and 1), (0, 1, 2), or

(0, 1, 2, 3). These ports are considered C-RS antenna ports, and each port has a different arrangement of C- RS resource elements. Various configurations are defined that use these C-RS antenna ports, including 2- or 4-port Tx Diversity and 2-, 3-, or 4-port Spatial Multiplexing.

Then beamforming support was added and single- layer PDSCH allocations transmitted on Port default could be analyzed. The LTE demodulator has since been enhanced to support the LTE Release 9 which added Transmission Mode 8--Dual-Layer Beamforming (i.e. beamforming + spatial multiplexing)--where PDSCH is transmitted on Antenna Ports 7 and 8 (note that single-layer beamforming in Rel 9 can also use port 7 or port 8 in addition to port 5). In Rel 10 of the standard, the new transmission mode 9 (TM9) added up to 8-layer transmissions using Ports 7-14. TM9 is supported by the LTE-Advanced demodulator.

As Ports 0-3 are indicated by the existence of C-RS, so Ports 5 and 7-14 are indicated by the UE-specific Reference Signal (UE-RS). The following is a table that summarizes the various PDSCH mappings that can be used along with the corresponding reference signal and antenna ports.

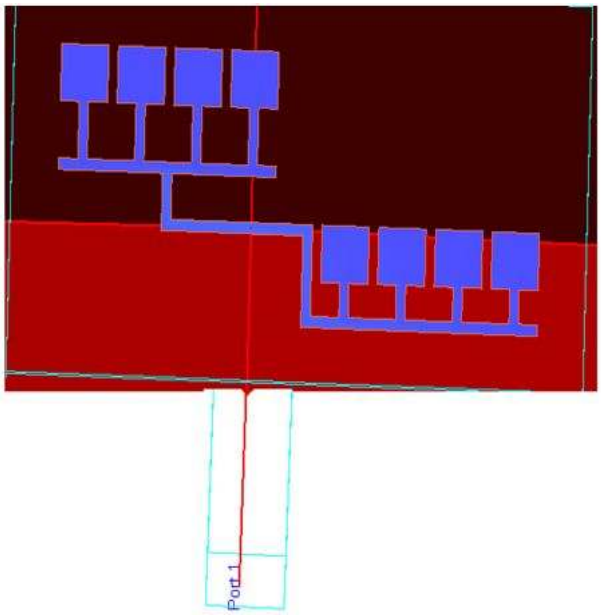



**Figure 3: Antenna with multi ports**

## SMITH CHART

The Smith chart is one of the most useful graphical tools for high frequency of X-band circuit applications. The chart provides a clever way to visualize complex functions and it continues to endure popularity decades after its original conception. From a mathematical point of view, the Smith chart is simply a representation of all possible complex impedances with respect to coordinates defined by the reflection coefficient. After finding the polar plot response of the 1*1 Rectangular patch antennas the output response is follows

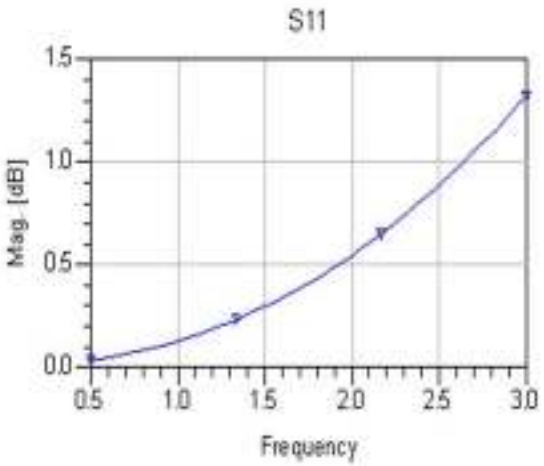



**Figure 4: S11 parameter in phase and magnitude**

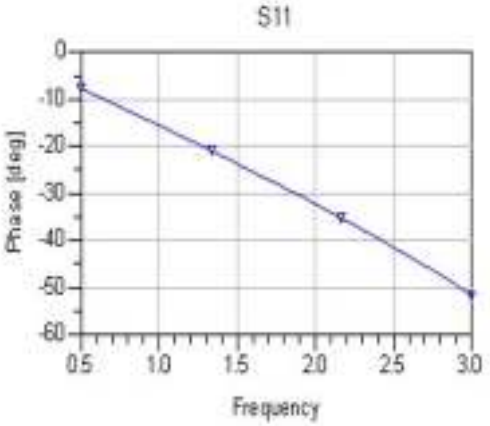
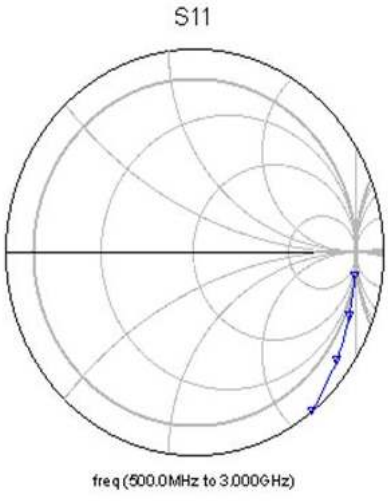



**Figure 5: Output radiation pattern**



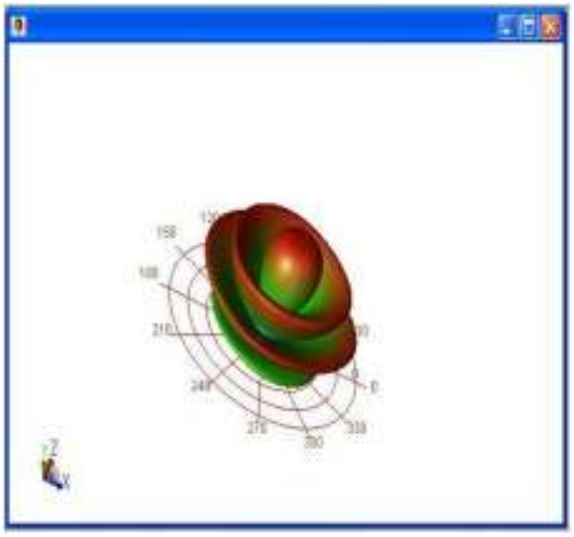



**Figure 9: Inference about the radiation pattern**

Devices connected for investigation geologically in the robot rover in mars can be compatible with the IEEE 802.11g,n std. Such an access point to detect the atom of perchlorates (or hotspot) has a range of about 17.778km(11 miles) Depiction of a device sending information wirelessly to another device, both connected to the local network, in order to print a document.

For secure reasons we may give the SSL encryption with the 256 bits with the OSI model supports for the wireless std IEEE for in network built for the data reception from the adjacent rover placed in a different base station and the radiation pattern described from above will also have the same unique direction in the transmission of data under the variation of magnetic flux with respect to time an d gravity

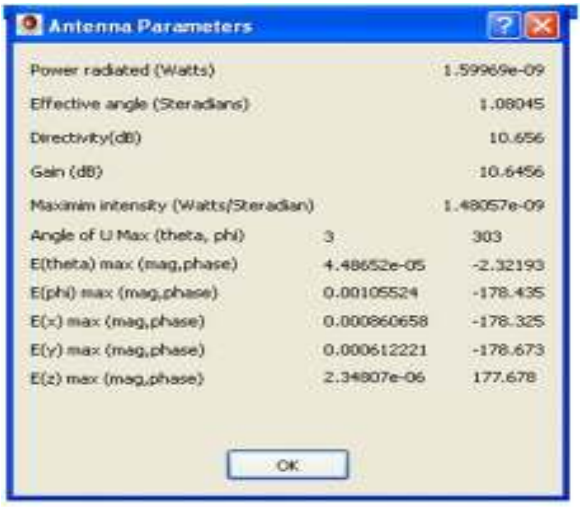



**Figure 10: Simulation Results**

## CONCLUSION

Thus from experimental results of n*n microstrip rectangular patch antenna arrays operating at 4.3GHz. Simulation result shows that10.6456 dB gain can achieved at frequency 4.3GHz. We assures for the good simulation about the perchlorated in the robot rover and this algorithm continues for the upcoming geospatial research.

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