iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** II **Month of publication:** February

DOI: http://doi.org/10.22214/ijraset.2019.2170

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue II, Feb 2019- Available at www.ijraset.com

Review Paper on Microstrip Slot Antenna using SIW Structure

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***Abstract:** Today's advanced communication industry micro-strip patch antenna is most important component due to its features bandwidth, Return loss , Polarization gain to obtain optimum results that fulfil the requirements and compatibility of suitable antenna hence suited for mobile market , pagers and wireless communication. Objectives of this paper to overview of proximity fed techniques by using Substrate integrated wave (SIW) technology The SIW structure is the process where cylinders forms to connecting top and bottom plates for their radiation, this structure is type of conventional waveguide which using dielectric substrate. For antenna design using full wave EM solver software.*
***Keywords:** Microstrip patch antenna, SIW(Substrate Integrated Waveguide), Proximity feed, EM solver software.*

I. INTRODUCTION

In modern world communication, the advancment in wireless millimetre wave field different techniques used for performance enhancement and miniaturization of antenna become a challenging work. The proposed paper work to study for provide multi-band features; the frequencies and return loss , bandwidth. Microstrip patch antenna is provide very reasonable manufacturing cost and great flexibility and easily fabricated on PCB. In microstrip patch antenna formed by conducting plate on top of dielectric substrate and ground on bottom side. Conducting plate generally made up of copper or gold and take any type of shape is not restricted because performance of antenna is depend upon the radiation not shape or dimension of patch [2]. Microstrip patch antenna radiates due to fringing fields(Fig.1.2) that produced between patch and ground plane.

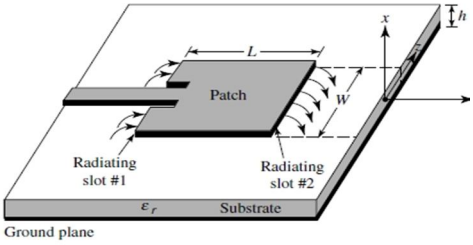

Fig.1.1: Microstrip Antenna

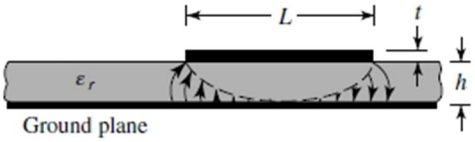

Fig.1.2: fringing Field

A. Designing & Simulation Tool

It is a EM solver (solving 3D geometry) and design different RF and Microwave application. Software used FEM(finite element method)for designing ,in this method it breaks big shape of antenna design into small tetrahedron shapes and then they are applied analysis for further result and finally combined all results for final outcome.

B. Feeding Techniques

Comparing the different feed methods[11]

Parameters	Microstrip line feed	Coaxial feed	Aperture Coupled feed	Proximity coupled feed
Spurious feed radiation	More	More	Less	Less
Reliability	Better	Poor due to soldering	Good	Good
Ease of fabrication	Easy	Soldring and Drilling needed	Alignment required	Alignment required
Impedance matching	Easy	Easy	Easy	Easy
Bandwidth	2-5%	2-5%	2-5%	13%

II. LITERATURE REVIEW

"Bandwidth-Enlargement of a Low-Profile Open Ring Slot Antenna Based on SIW Structure" proposed by Ayman Ayad R. Saad and Hesham A. Mohamed, in 2017. In this paper antenna design based SIW structure where using Proximity Feeding for bandwidth enlargement where antenna impedance bandwidth around 20GHz to cover KU-band frequency band. The antenna structure is open ring slot antenna ,,made up from a rectangular slot with annular ring slot placed lower side of substrate and SIW structure loaded into substrate that connected patch and feed line [1].

"Review of Substrate-Integrated waveguide circuits and antennas" proposed by M. Bozzi A.Georgiadis K.Wu,in 2011. In this paper about SIW technology that offers low fabrication cost at microwave and millimeter wave development platform. In Substrate Integrated waveguide generally form a metal cylinders that placed between patch and ground for connect them [3].

"Comparative study of microstrip patch antenna feed network" proposed by Behman Jamali and Tony Cook in 2013.In this paper presents comparative study between feeds network and their advantages, disadvantages and techniques which are used to obtained better performance. Structure and design topologies of proposed multiband slot antenna presented in this section. Preliminary the HFSS (High Frequency Structure Simulator) software version 14 used for designing Antenna. This is standard tool software used for designing and simulating 3D full wave electromagnetic field and there has option to select the solver as per simulation requirement [5].

III. PROBLEM IDENTIFICATION

It is already studied about microstrip antenna designs. In this context briefly discussed their problems and techniques to improve their performance to obtain desirable results.

Narrow bandwidth is main disadvantages of patch antenna because we need high data rate over short distance , Primarily the patch shape and feeding schemes, substrate height affect the bandwidth. to achieve wide bandwidth round edges and round shape patches with slot play an key role.

Gain of the antenna shows power deliver efficiency , gain will be achieved by different dielectric material with same or different height with low permittivity or small thickness and using electromagnetic gap structure improved the gain.

IV. PROPOSED METHODOLOGY

A. SIW Structure

The majority of data rate problems reducing by proximity feeding method[5].SIW(substrate integrated waveguide) technology is nothing but a combination of conventional waveguide and microstrip patch antenna . One attraction to SIW is that the amount of metal that holds signal is far greater than it would be microstrip line and provide reasonable fabrication cost[1] , SIW also called post wall waveguide[6].In the structure using small metallic cylinders forms and placed in substrate to connected upper plate(patch) and lower edge of substrate[3].

This structure offers lower weight and low loss and complete shielding and high quality factor.

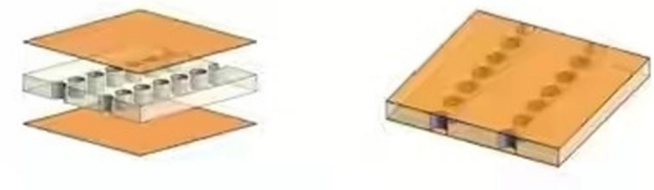

Fig. 4.1 3D representation of SIW structure

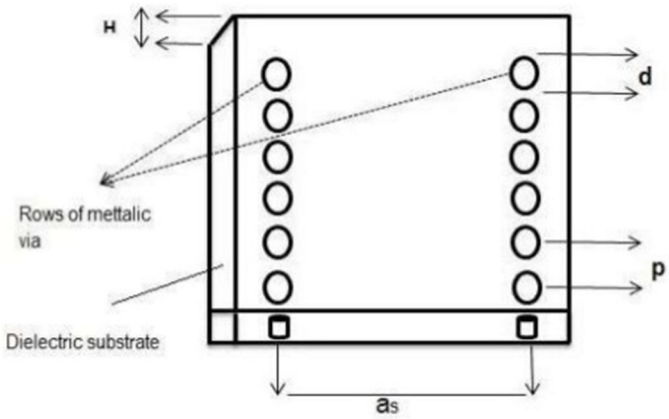

Fig. 4.2 Configuration of SIW

And structure having thickness 'h' or waveguide height is smaller than 'a_s'. Parameter 'a_s' is distance between two rows(width of the dielectric field metallic waveguide) and holes diameter 'd' and 'a' is center to center distance between via of both the rows and 'p' is pitch between two holes (cylinder) and 'p' set to minimize the radiation loss as well as return loss. SIW structured with an equivalent width to maintain radiation loss, the parameter are [7],

The metalized via hole diameter is $d < \lambda_g/2$

Pitch (spacing between two holes) $p < 2d$

Equivalent width of SIW can be $a = a_s - \frac{d^2}{0.95p}$

V. CONCLUSION

An Objective of this paper to find best performance using SIW (Substrate Integrated Waveguide) technology. In modern communication and systems requires best performance as well as miniaturization in antenna design and the paper presented to focus on SIW technology that provide so many extensive application and reducing some performance related issues.

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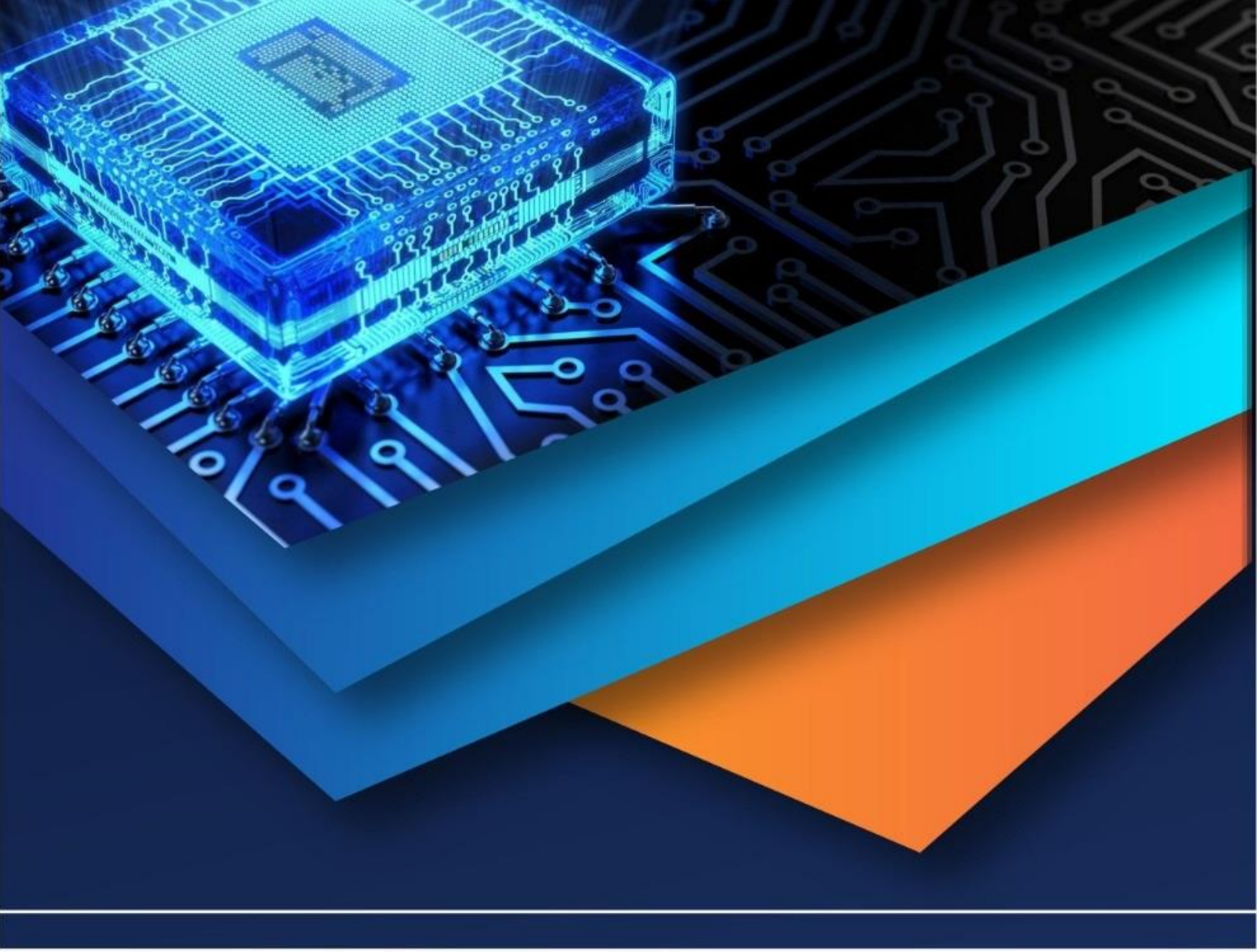

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