Design and Fabrication of Compact Dual SIW Cavity Antenna for Multiband Operations

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***Abstract*:- (SIW)Substrate Integrated Waveguide designed , presented fabrication for multiband operations.The antenna designed for leading rectangular SIW for multiband operaion . The frequency for substrate integrated waveguide, is (3.8GHZ,5.9). Microstrip feedline designed antenna fields multiband to resonant slots. Metalized (via-holes) or hybrid mode obtained by coupling cavity modes. The dimension for the fabrication for patched antenna measured by the dimension 30 *30 *1.6mm . The designed substrate integrated waveguide or patch antenna verified by simulated counterparts the dielectric provided with low cost . The measured and scaling 2.10-2.25 GHZ followed by hybrid mode 2.18GHZ 8.4% (3.35-3.64GHZ) with the given mode 3.45GHZ precentage given 10.8% (5.04-5.61GHZ) in the TE120 the suitable far-field patternis 5.26GHZ mode.**

Keywords: Substrate integrated waveguide,low cost,cavity modes.

INTRODUCTION

The development of better platforms for achieving planar microwave systems has been ongoing. Micro strip and coplanar waveguide technologies are currently the most popular.Planar systems are made from a variety of materials. It is, nonetheless, It has been noticed that as the frequency of these events increases, Transmission and radiation losses are issues with platforms.This necessitates the use of several implementation methods. Technology that is based on planes.[1] SIW (substrate integrated waveguide) is a planar waveguide structure that has low profile, is easy to fabricate, has minimal insertion loss, and is compatible with other planar circuits.Because of their potential applications in aircraft, missiles, and radar systems, SIW end-fire antennas have sparked widespread interest.[2]. The substrate integrated waveguide (SIW) technology, which belongs to the family of substrate integrated circuits, is a prospective contender for a variety of circuits and components working in the microwave, millimeter-wave, and terahertz regions (SICs). SIWs are integrated waveguide-like structures made by connecting two parallel metal plates with two rows of conducting cylinders and slots implanted in a dielectric substrate.[3]. The substrate integrated waveguide (SIW) was conceived and proven in various ways in the early 2000s , which merely offered a class of specific planar and non-planar substrate integration scenarios. Actually, the advancement of substrate integration technology suggests that any non-planar structure can be synthesised in a planar form within a substrate design space, allowing it to be seamlessly integrated with other planar transmission lines if necessary, using planar integrated circuits' well-established processing technologies.

A substrate integrated rectangular waveguide can be created by conducting through via hole arrays that resemble metallic walls to achieve a planar synthesis of a nonplanar device.[4] . In general, the SIW structure is created by spacing the vias on the substrate at a specific interval. Because these vias act as electrical barriers, they can be utilised to create waveguide structures in a variety of applications, including filters, oscillators, and antennas. Furthermore, the SIW structure can be implemented using a half-mode structure, which reduces the waveguide size by half.[5]. Patch antennas are useful in today's technology because of its low-profile structure and ease of fabrication and modification.without having to replace the entire antenna Patch antennas come in a variety of shapes and sizes.a wide range of applications ranging from GPS devices to medical devices RFID uses, for example.With the rapid evolution of the telecom business, new handheld devices are being developed.Because devices are part of the human body, they must be treated with care designed in accordance with different substrates.

A wearable material is used in this paper.A (polyester) with a permittivity of 1.44 is employed as a foundation The 2.4 GHz frequency range is where theISM has built a wearable microstrip patch antenna.Configured for all-day use for wireless LAN, Bluetooth, and near-field communication.Other wireless computer networks and field communication[6].For any wireless system antennas are the most important components[7,8].The EM waves are transmitted and received by the device called antenna.Microwave Integrated circuits with low profile and cost yields wireless communication applications[9].Enormous methods are available for resonating multiband operations.They are fractal[10],metamaterial[11],finally different slots[12].In this paper different slots are integrated and achieved 2.4GHz which is ISM band applications simulated in CST Microwave studio software.

I. EXPERIMENTAL

2.1 Antenna Design

Communication its aact of talking to someone or otherwise we have someone near to us main function is act of exchanging inforation but it is one on one communication if we wanted to communicate to someone or sending information to others where far distance from us. This proces is know as large range communicationfollowed by these when we taken ceratain issues or problems. We definitely try to transmit signals of low frequency the objective is to transmit signal.

The techniques frequently known as bruning the two properties are called bendable and unbendable properties for the design of patch antenna or dual band antenna we use the bendable properties for the designing and simulation. The fabrication antenna has the rectyangular strips witn holes around it thinny things copper used for polymide substrate with the given different measurement for the microstrip patch antenna for the simulation we added the following s1,s2,s3,s4,s5,s6.......s12 followed by these we given different measurement or caculation for the result and holes for microstip patch antenna A)FBG layer is the structure for the dual land b)straight strip line is given for every calculation the size is very small. The middle of radiation having multinodes in the dual band antenna . the size of the antenna is M. Each and every antenna simulation different waveguide is use for process. Where dual band antenna done by coplanar waveguide (CPW) and the transmission line the rectangular strip of the antenna has two rectangular patch with the help of ground position. The measurement are polymide to **um** dielectric comstant is **e1=3.5** target f = 0.027 hence W1, Gand L1 are allowed with different dimension are to be notted carefully.

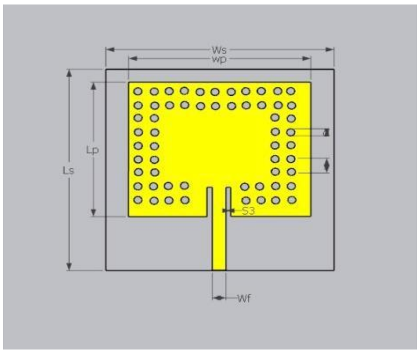

Fig.1. Proposed Antenna Structure

During Stir casting is two-step mixing process was carried out. Aluminium alloy was melted at a temperature of 800°C by keeping it in a crucible, the graphite (avg. size 75 µm) was preheated to 400°C in an electric furnace for 30 minutes and magnesium oxide also preheated to 400°C for 30 minutes. As the metal reaches its molten state, both the preheated reinforcement is added into the matrix. For uniform dispersion and thorough mixing, mechanical stirring was done for 7 minutes with a stirrer speed of 420 rpm. The mould into which the molten metal is to be poured was preheated to 300°C. Samples with AA2219, 1% graphite and 0.5, 1, 1.5% Magnesium oxide were separately prepared and removed from the mould allowing it to cool in the room temperature.

PARAMETER	DIMENSIONS (mm)
Ws	30
Ls	30
Lp	20
Wp	24
Wf	3.5
Lsl	7
S1	1
S2	2
S3	0.5
D	2

Table 1.Antenna Dimensions

II. RESULTS AND DISCUSSION

The rectangular straped microstrip patcha antenna designed with four or more. The substrate is flexible in the following substrate the frequency range for the electromagnetic waves are 1GHZ TO 10GHZ for the results for simulated process return loss but this simulated of current element

RETURN LOSS

The return loss of Microsoft patch antenna can be calculated by dB. The dB can be the percentage of emitted energy from dual band antenna with substratre. The systematically S1,S2,S3......S11 array four in given antenna with four substrate. The materials allocated with four materials. FAPT has with frequency and dB measurement is the dB value is about -28dB and -12dB with the frequency range

7.48 where FAPM is done .The substrate involved in return loss of the dual band antenna in polyser. Polyser substrtate used for return loss the resonant frequency compared to other substrate with the amount of 4.8GHZ and 7.8GHZ reequency range. The substrate with perform better analysis with amount of lower return loss in the given frequency range 8.49GHZ the substrate known as teflon substrate. The final proposed array in dual band antenna have better impedance batter bandwisth range with comparison of the cost of low amount with non flexible FR4 substrate.

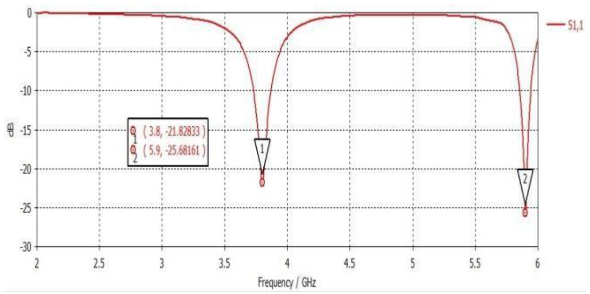

Fig.2. Return Loss

IMPEDANCE MATCHING AND POWER HANDLING

The antenna impedance deals with or involves the input impedance at end of the feedline to the feedline of the Antenna to the characteristics of feedline impedance. The circurits used in antenna impedance is filter circuits the input and output of given impedance which lave maximum power transmission help of radio frequency antenna the main progrem is to avoid loss the loss is return less in design parameters. The contact it occues mismatching between two point. The antenna used in biomedical application or medical application technical parameter the most wanted parameter to increase or improve the efficency. Where are to reflection lass. The ohm value is 50, the substrate materriacs between frequency of 2.287 GHZ to 2.502 GHZ. The values described or derived by 46 to 52 ohm. Verification of impedance matching when input port of power accehed by and outgoing power at other ports the CST software in power of input spectrum averaged in time domain for period at given frequency range by feed point with 0.5 watt copper and polyster is used.

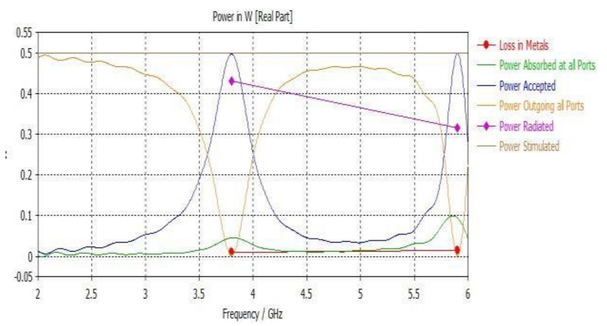

Fig.3Power accepted and Outgoing

RADIATION PATTERN

Using the above equations, a square microstrip patch antenna with a resonant frequency of 3.8 GHz is designed. The patch's length, width, and length (L) are 30 mm at a resonant 3.8 ghz frequency, with a feeding offset position of 7 mm. The substrate has a height of 3 mm. The length of the ground plane (Lg) and the ground plane's width (Wg) is calculated to be 30mm (Lg= Wg because the patch is square).The coaxial probe feeding method with offset feeding position is used to feed the microstrip patch antenna as 7 mm. The simulation is carried out using the CST Microwave Studio software. the antenna's gain pattern in the farfield. The maximum gain of the antenna is above the patch.

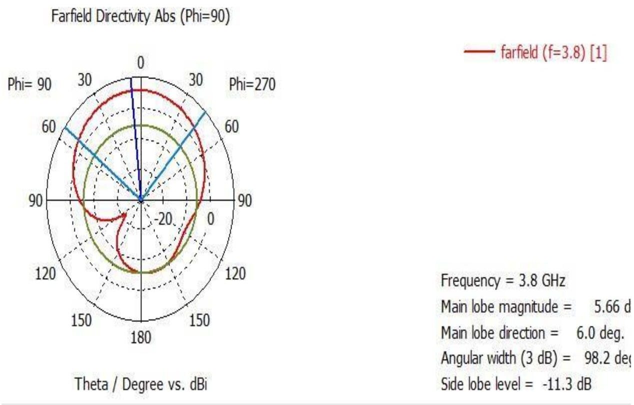

Fig.4. Radiation Pattern E-plane

Using the above-mentioned equations, a square microstrip patch antenna with a resonant frequency of 5.9 GHz is designed. The patch's length, width, and length (L) at a resonant frequency of 5.9 GHz are 30 mm, with a feeding offset position of 7 mm. The height of the substrate is 1.6 mm. The length (Lg) and width (Wg) of the ground plane are calculated to be 30 mm (Lg= Wg because the patch is square).The coaxial probe feeding method is used to feed the microstrip patch antenna, with an offset feeding position of 7mm. CST Microwave Studio software is used for the simulation. the gain pattern of the antenna in the farfield. The antenna's maximum gain is above the patch (i.e., in the direction of theta), while minor lobes are on the opposite side.

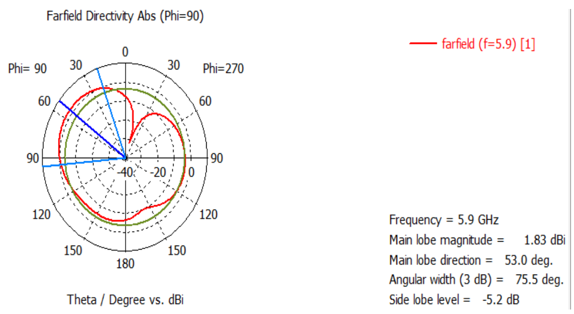

Fig.4. Radiation Pattern H-plane

III. CONCLUSION

The SIW based microstrip patch antenna array with dual band slot is designed and it is simulated in CST microwave studio. . The frequency for substrate integrated waveguide, is (3.8GHZ,5.9). Microstrip feedline designed antenna fields multiband to resonant slots. Metalized (via-holes) or hybrid mode obtained by coupling cavity modes. The future low frequency dual band flexible material array can be used for study of Wimax and Wifi applications.The future work can be carried out through increasing the slot size for multiband applications.

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