Microstrip Patch Antennas For UWB Applications Other Than Open Air Data Communications: A Review

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Abstract: Micro strip patch antennas were already replaced several old generation antennas like wire antennas, half wave dipoles of hand held devices and various other portable long and short distance applications in all areas. The main advantage is their portability, low profile, cost of fabrication and several other parameters better than remaining designs. Most of the research is done on earth surface operated data communication antennas. This paper shows a clear picture of various methods that improved existing old methods of (unlike data communication in open air) patch micro strip antennas that used for UWB applications. The performance of the antenna related with its basic parameters.

I. Introduction:

In 2002, the Federal Communications Commission (FCC) allocated for any person or manufacturing company ,the spectrum between 3.1 and 10.6 GHz for which do not comes under licensed spectrum ultra-wideband (UWB) measurements and communication applications [6].

Many scientists are exploring the unlimited possibilities of this technology for solving many challenges and already solved in several cases like data rate ,simple integration within chip fabrication like monolithic microwave integrated circuits and printed circuit boards whith their ease of fabrication.

From past couple of decades, lot of research was done routinely in open air communication using these so called Micro Strip Patch antennas by changing its structures in all possible ways. There are very few interesting applications of micro strip patches discussed here in these papers which are used in exclusively other than regular data transmission.

II. LITERATURE SURVEY

Tarun Kumar[1] has explored the possibility of using Microstrip patch antennas as a DC (direct current) power generation element from incident microwave energy which is called RECTANNA. Tarun Kumar[1] introduced a circular shaped wideband Microstrip antenna along with a low pass filter on same substrate. The generated power can be used to charge battery of low power devices. Results this paper[1] showing 13.4Ghz and 3dB radiation angular beam width of 100.1 degrees at 2.4 Ghz.The low pass filter is doing a job of elimination of unwanted high frequency components .This paper opens gate to a new way of using antennas instead of regular data communication devices.

Fig. 1. Micro strip low pass filter and its equivalent circuit

In his paper, Sourav Sinha[2] introduced a microstrip patch antenna that can be placed under human skin which is termed as Medical Implantable Communication System (MICS) operating around 402Mhz to 405Mhz .His[2] design is a rectangular patch with width 30 milli meters and length of 20 milli meters. It is claimed in this paper that as for the rules set by International telecommunication Union- Radio communication ,signal occupying frequencies between 402MHz and 405MHz does not require any legal licence for medical implantable communication devices.Both ground and patch are having 0.018 milli meters made of copper.An 8 milli meter thick silicon coating applied to antenna for biocompatibility.

It is observed a maximum specific absorption rate of 0.588 W/Kg in 10 gram tissue of human phantom , for this particular design .The measured values for this design are S11=-21.28dB, VSWR=1.1889 , Radiation efficiency=-45.71 dB , Total efficiency=-45.74 dB. These observations reveals the suitability of the design for human body implantation.Gold is another material which is showing better performance in the place of copper.

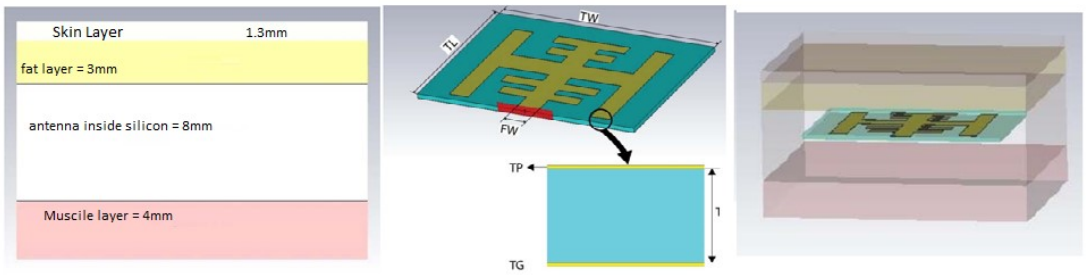


Fig.2. Sourav Sinha[2] proposed antenna structure under Layers of human body phantom

[3] *Hayat Errifi* has proposed a versatile antenna system where there is no need to move the antenna physically to change or streere the radiation beam .Changing beam angle require a stepper motor or servo motor which requires power and space. This design greatly reduces steerable antennas cheaper and effective. [3] *Hayat Errifi achieved* this through using phased arrays. The phase shifters are used to control the relative angle of the main-beam without any physical . By using switched line phase shifters , directive beam-steering phased array (DBS-PA) is constructed and simulated. Rogers RT-Durroid substrate is used which is having dielectric constant nearly 2.2 and proposed diameter is 8 x 3.5 cm. With this model a 15dBi

directivity is achieved with a direction switching between +30 degrees to -30 degrees with a 3dB beam width of 25 degrees.This antenna can be used in smart antennas where mobility and wear and tear are forbidden like military and space alpplications.

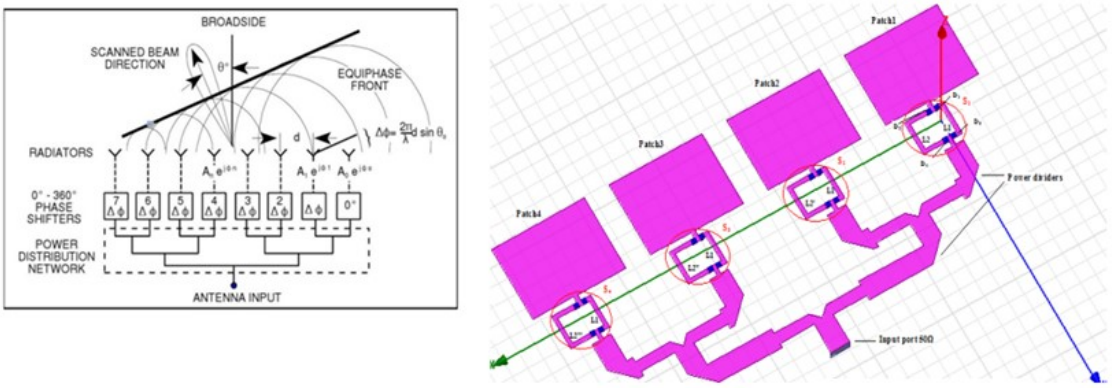


Fig.3. *Hayat Errifi* [3] *proposed* standard phased array antenna system and its simulated geometry.

Mohamed Zied Chaari [4] proposed a method to charge the battery of robot Crawlers which is doing inspection of welding defects inside circular pipe. This system a microwave generator is supplying power to the robot wirelessly and a “array rectangular micro-strip patch antenna(on FR4 substrate)” working as a power receiver. Schottky diodes are used to convert RF to direct current (DC) using the full wave rectifier circuit.A conversion efficiency of 39% is achieved for an input of 2.450Ghz ,46.02 dBm and separation of 5 meters from transmitter to receiver inside test pipeline.

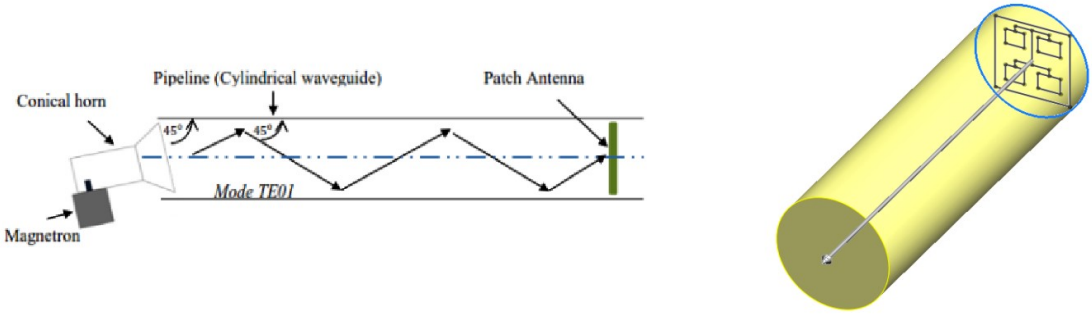
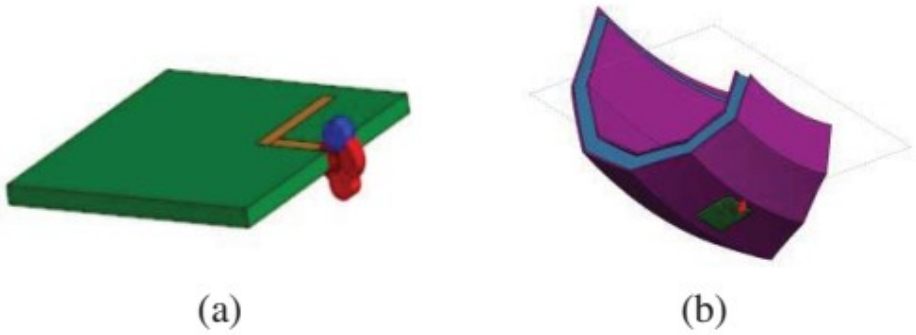


Fig.4. Mohamed Zied Chaari [4] proposed microwave transmitting antenna inside the cylindrical wave pipr(guide).

Manroop Singh Turna[5] proposed antenna that can detect a baby diaper condition by using dipole antenna which is a basic omni directional in nature.

In his[5] study, FR4 material is used to fabricate antenna with dimensions (5.6 cm X 5.6 cm X 0.16 cm) antenna is a lambda/2 with dimentions width is about 0.13 centi meters

And 3.2 centi meters .The antenna resonates at 5.7Ghz .Any liquid or solid that gets contact with antenna will eventually change the impedance of the antenna .



(a) (b)

Fig.5.CAD models for use in simulation model of Manroop Singh Turna[5] proposed antenna (a) dipole antenna & (b)antenna with diaper.

III .Conclusion

It is observed that micro strip patch antennas have several other applications apart from UWB data transmission .Mainly its uses advocated in sensing material depositions, change of beam angle without physically moving antenna and power generation by the antenna itself to cater power needs of system. It is estimated that this technology can replace several sensors effectively to improve existing technologies.

IV References

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