TARANG

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IEEE Microwave Theory and Techniques Society (MTT-S)

RECAP OF PREVIOUS EVENT:

V-SAT MISSION OBJECTIVE COMPETITION -(17/07/2019-19/07/2019)

IEEE MTT-S Vardhaman Student Chapter conducted its third event on Vardhaman Student Satellite Mission Objective Competition as a part of the Student Satellite Project. It is conducted for 3 days. The program Schedule is attached. The chief guest of the event is Prof. Krishnaswamy, Retired Outstanding ISRO scientist, Former Program Director, IRS & SSS, ISRO, Bangalore. The guest of honors are Prof. V. Seshagiri Rao, Retired ISRO Scientist, Mr. Rakesh Kachauliya, Scientist DRDO, Mr. Pradeep Kumar, Scientist, DRDO.

DAY 1:

GUEST LECTURE ON NANO SATELLITES AND APPLICATION AREAS

Prof. Krishnaswamy delivered guest lecture on Nano Satellite technology, and applications to work on to decide payload of V-SAT.

DAY 2:

V-SAT MISSION OBJECTIVE COMPETITION

DAY 3:

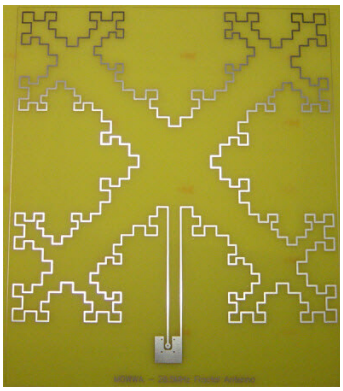
JUDGES DECISION ON V-SAT MISSION OBJECTIVE COMPETITION AND CERTIFICATE, PRIZE DISTRIBUTION

1 st Prize for : Marine Monitoring-Data of percentage of Acidification in Oceans.

2 nd Prize for : Satellite Informer

3 rd Prize for : Aircraft Monitoring IC Sat

Fractal Antennas



A "fractal element antenna" is a radiative element shaped using fractal geometry. The inherent qualities of fractals enable the production of high performance antennas that are typically 50 to 75 percent smaller than traditional ones. Typical advantages play out in increased Bandwidth and gain in addition to smaller size. Additionally, fractal antennas are more reliable and lower cost than traditional antennas because antenna performance is attained through the geometry of the conductor, rather than with the accumulation of separate components or separate elements that inevitably increase complexity and potential points of failure and cost. The result is one fractal antenna which is able to replace many traditional antennas. In addition, fractal antennas afford unique

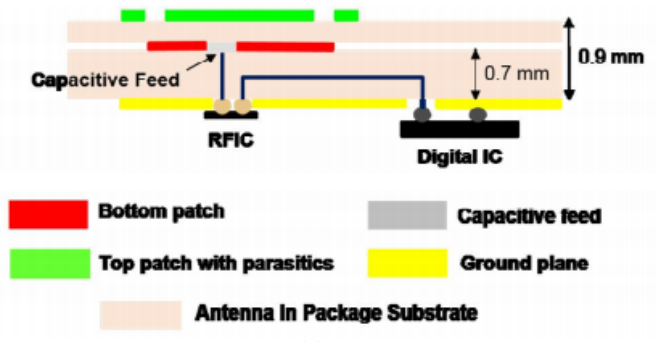
improvements to antenna arrays. These benefits include: increasing their bandwidth, allowing multiband capabilities, decreasing size load, and enabling optimum smart antenna technology. Fractal antennas are modified to achieve omni-directional radiation patterns with high efficiency and good gain. Fractal antenna are used in Building Communication applications, Wireless Networks: MIMO, WiMax, Mobile Devices,

Telemetric, RFID (Radio frequency identification) The fractals field is still in stages of development and getting advance. Fractal antennas plays an important role in present day communications such as Fractal's New Antenna Solution Enables 5G in Stadiums, Fractal applies its proprietary technology to wearables to enable "smart clothing" and Fractals Brighten Radar Reflections for Driverless Cars, Satellites etc.

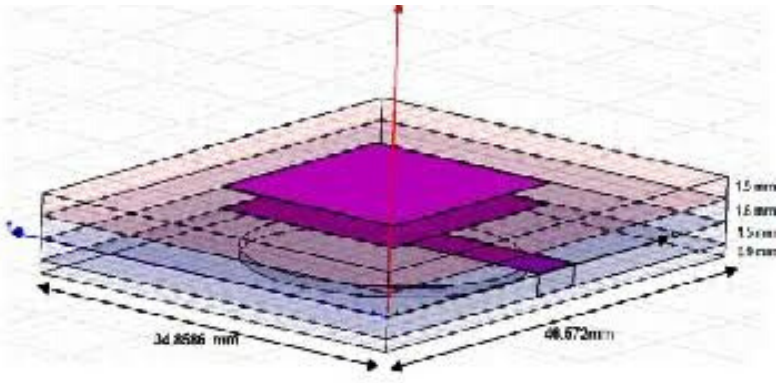
- Priyanka Sappidi

DUAL BAND MILLIMETER WAVE ANTENNA

As the wireless communication is becoming crucial day by day, we need a system to meet our requirements. The present 4G network which uses microwave or UHF frequency ranges are not sufficient for the data we are going to use in the future. For example, in self driving cars, we need to process the data so fast to avoid accidents. Millimeter waves are used in 5G network, which ranges from 30-300GHz



will achieve the requirements. Though mm-waves has wide range of frequencies, we cannot use broadband mm wave antennas for all applications. Broadband transmission may cause interference between the signals. So the multi band antennas are introduced. They can be dual band, triple band, and quad band antennas. It eliminates the interference problem and also reduces the overall cost of the design.



Dual band antennas resonating at 28GHz and 38GHz are appropriate for the 5G mobile communication. Because these frequency bands are strong and suitable for high data rate. By increasing the number of radiators at both transmitter and receiver sides, we can improve the data rate and channel capacity. The dual band antennas maybe MIMO antennas or dual polarized antennas. The existing dual polarized antennas are all suitable for 4G. To overcome this problem a new architecture for mmwave 5G antenna based on Antenna in Package (AiP) is introduced. It is implemented using stack patch antenna configuration with the bottom patch designed for LB operation at 28 GHz and top patch designed for HB operation at 39 GHz. Two feeds are used for dual-polarization capability.

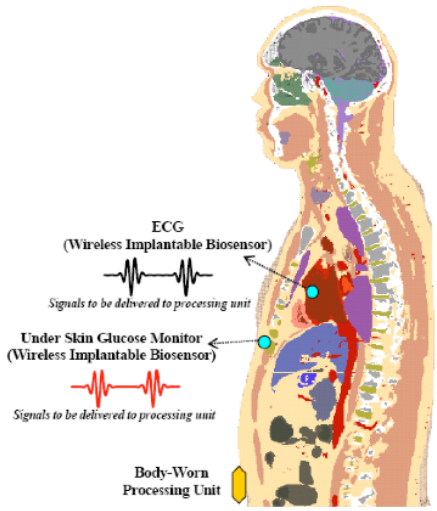
- Dontha Pavani

Wearables vs Implantables.

Have you ever wondered if we can have antennas inside or on our body? Well, if you have, the answer is yes! In this day and age, with the rapid advancement of wireless technologies, we can see applications of wireless communication in every aspect of human life. This communication maybe on-body or in-body. On body means communication between wearable devices. In-body can be seen as communication to an implantable device or sensor. Implantable antennas for in-body communications have more challenges due to the complex environment of our body.

Implantable medical devices (IMDs) have capability to communicate with wireless external devices. These operations can be performed at RF frequency range. Implantable antennas provide challenges in terms of design, fabrication and testing and is attracting a large number of researchers which holds a great future ahead in this field. These antennas must be miniaturized to a great extent and should not harm the body in any case. Medically, there is a great scope of new inventions as we can know more about the complex nature of of our body's internal functioning

Wearable antennas are a simpler kind of antennas which can be worn around as if it were a part of our clothing/accessories. There are a wide number of applications which are using antennas which can be worn on our body. The most common usage of wearable antennas is the smart watch, these watches have Bluetooth integrated antennas. These also possess a few challenges like the need to be safe for the human body. Subsequently, the human body also somewhat degrades the performance of the antenna as the body obstructs about half of the field of view for the antenna. A GPS system providing the real time position of the person is one good application of the wearable antenna.



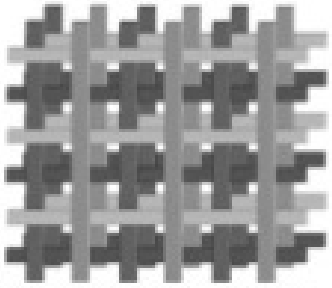
I want to conclude by saying that there is a huge scope of advancement in technology related to these types of antennas because miniaturization is one of the main challenges and at the same time the VLSI industry is taking large steps towards the same. These antennas therefore will bring new technologies in the fields of communication, medicine, biology, body sciences, gaming, and many more.

- Anish A.V.

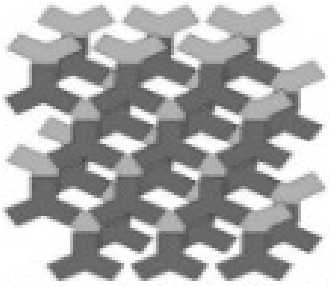
Does your antenna have low gain, low radiation efficiency?? Try EBG

The structures having periodic arrangement of dielectric or magnetic materials that result in the formation of stop bands in the microwave frequency region are called Microwave band gap structures. In general, these structures are called Electromagnetic band gap (EBG) structures or Photonic band gap (PBG) structures. Earlier EBGs have been investigated for improving performances of numerous RF and microwave devices utilizing the surface wave suppression and the artificial magnetic conductor (AMC) properties of these special type metamaterial. EBGS are applied to reduce the mutual coupling between the antenna elements. It is usually realized by the periodic arrangements of the metallic and material conductors. In general, they can be categorized as 3-D Volumetric structures, 2-D Planar surfaces and 1-D Transmission lines.

There are different methods to analyse the features of the EBGS, Lumped element model, Periodic transmission lines and Full-wave numerical method. The applications of EBG are in Antenna substrates for surface wave suppressions, low profile wire antennas with good radiation efficiency and EBG structures are also applied in designing antennas with a high gain around or above 20 dBi.

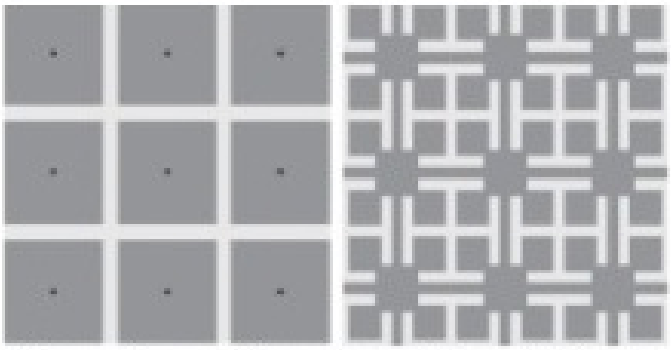


(a) a woodpile dielectric structure



(b) A multi-layer metallic tripod array.

Among the various designs, the uniplanar type EBG configurations are very attractive, easier to fabricate, and suitable for integration with a wide range of planar devices. However, compactness is an issue in designing EBG structures at desired frequencies, since the periodicity should be a half-wavelength at the center frequency.



(a) a mushroom-like surface (b) a uni-planar surface

A few EBG structures are found of having band gaps at lower frequencies but those designs were not investigated with other microwave devices. Antenna-EBG combinations, attempts have been taken in diverse ways to improve antenna element performances and to reduce the mutual coupling of microstrip antenna array. This literature study will hopefully set a basis about the current state-of-the-art of EBG research and will be held.

- NAOMI.S

----------Committee----------