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A survey of Intelligent Antenna Array and Overview of Antenna Reduction Techniques

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Abstract **-** The design of antenna collection in the wireless message system can be used to achieve high gain, steering capability and also to reduce the effect of fading. This antenna array is suitable for L-band applications such as military, global positioning system, digital audio means of communication and previous telecommunication areas. This paper presents a simple, low cost, low outline triangular micro narrow piece antenna array with circular polarization providing high gain by 4×1 array. There are three well-liked types of array antennas for 60GHz radios. They are patch array antenna and cavity array antenna as well as network array antenna. This paper information the designs of them in the same LTCC technology. It is shown that the grid collection antenna has the simplest arrangement, the highest radiation competence, and aperture competence. However, the gain-bandwidth of the grid collection antenna wants to be enhanced to cover the 60-GHz band.

Keywords **-** Antenna Array, Wireless Communication, gain-bandwidth, LTCC technology, patch array antenna

I. INTRODUCTION

An Antenna network is a communication [1,2] network which consists of several radio nodes systematized in a sensor topology. WSN sever so often comprises of sensor routers, sensor clients, along with gateways. The sensor clients are customarily mobile phones, laptops, or else a number of other kind of wireless senor equipment though the sensor routers direct traffic to and from the entryways that may, however need not, link to the Internet. The coverage zone of the broadcasting nodes working as a single network is known as sensor cloud. Accessing to this sensor cloud is reliant on the radio nodes functioning in synchronization with each other to develop some radio networks. A sensor network is dependable and propositions redundancy property. Once, a single node could possibly no longer functional, then at that time rest of the nodes could be able to still interconnect with each other, straightly or over one or more transitional nodes. Wireless sensor networks could be implemented with various wireless technology containing 802.11, cellular technologies, 802.15, 802.16, or combinations of more than one kind. antenna networking (topology) is a type of networking where every single node must not only capture and disseminate its own information, then again also assist as a relay intended for several other nodes, to be precise, it [3] is essential to work together to broadcast the data in the network.

An antenna network could be seen as a special type of wireless ad-hoc networks. Antenna network often has a more planned configuration, and may possibly be set up to make available dynamic in addition to cost effectual connectivity over a sure geographic area. An ad-ho networks, on the former hand, this network is prepared ad-hoc as soon as the specific wireless devices come within communication range of each other [4]. The sensor routers possibly be mobile, and could be stimulated as stated by precise demands arising in the network [6].Often the sensor routers are not incomplete in terms of capital compared to other nodes in the network and thus exploited to do more resource concentrated functions. In this method, the antenna network differs from an ad-hoc network. Meantime these specific nodes are often controlled by resources. Wireless sensor architecture is a first step towards as long asgainful and lively high-bandwidth networks over aexact coverage zone. Sensor architecture sustains signal strength by breaking long distances into a series of smaller hops. Intermediary nodes does not simply just increase the signal, however they take progressing decisions based on their knowledge of the system, i.e. to execute routing task. Such kind of architecture may with careful design provide economic advantage, high bandwidth, as well as spectral efficiency, over the coverage area.

APPLICATION OF ARRAY ANTENNAS

Below, given are the few applications of array antenna:

- Ground based multi-function radar for military use [5].
- Airborne radar for surveillance (RBE2).
- Space borne SAR and communications for remote sensing.

It is recently utilized for radio astronomy.

II. MULTIPLE INPUT MULTIPLE OUTPUT

Multiple-input and multiple-output, or **MIMO**, is an antenna skill for wireless infrastructure in which multiple antennas are utilized at both [6] the transmitter and the receiver. The antennas at every end of the communications circuit are united to minimize errors as well as to optimize data speed. It is one of several sorts of smart antenna technology, the others being MISO (manifold inputs, solitary output) and SIMO (solitary input, manifold

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outputs).Note that the terms input in addition to output denote to the radio channel transporting the signal, but not to the remote devices that is having antennas. MIMO technology has drawn consideration [10] in wireless communications, because it offers significant increase in data throughput and link variety without extra bandwidth or greater than before transmit power. And also because of its several applications i.e. in metropolitan area networks (MANs), digital television (DTV), wireless local area networks (WLANs), as well as mobile communications.

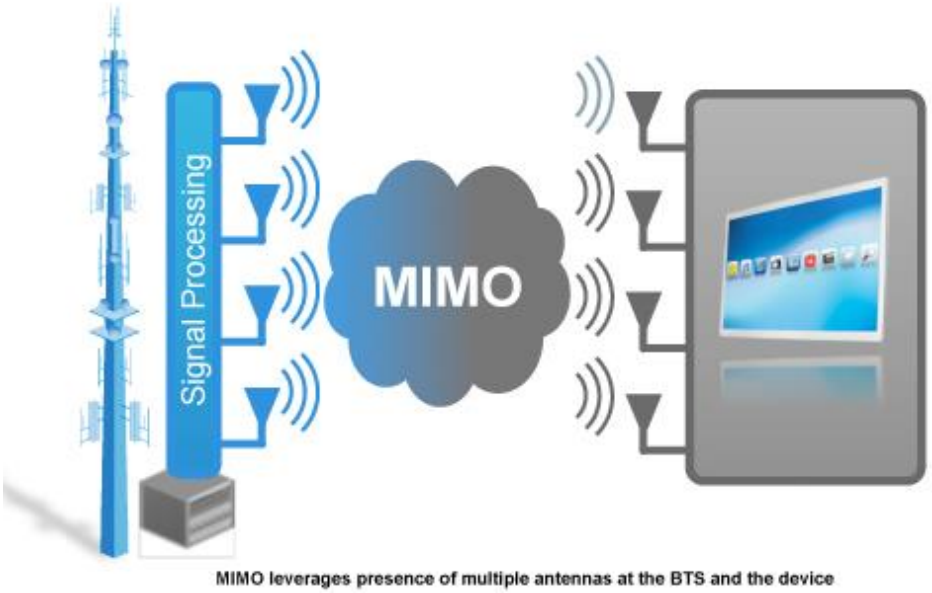

Fig.2: MIMO Architecture

IV.MULTI-ANTENNA TYPES

Multi-antenna MIMO technology has been established and implemented in some standards

- SISO/SIMO/MISO are special cases of MIMO [7]
- Multiple-input and single-output (MISO) is a special case when the receiver has a single antenna.
- Single-input and multiple-output (SIMO) is a special case when the transmitter has a single antenna.
- Single-input single-output (SISO) is a conventional radio system where neither the transmitter nor receiver has multiple antennas [9].

V.Related Work

Author Name	Year	Title Name	Description
Richard C. Reinhart et al.,	2003 [1]	Phased array antenna-based system degradation at wide scan angles.	Talked the degenerative system effects between high-rate moderated data and signal timing delays caused by antenna beam directing at wide scan angles. Conservative phase shifters used in MMIC-based phased array antennas are physically incomplete to 360' of phase shift. Often, dependent on the size of the array and/or specified beam angle, the required phase shift of some elements may exceed 360".
Nasser Ghassemi et.al.[2]	2012	Low-cost and high-efficient W-band substrate integrated waveguide antenna array made of printed circuit board process	Established using substrate-integrated waveguide technology for the enterprise of its feed network and longitudinal slots in the SIW top metallic surface to drive the array antenna essentials. Dielectric cubes of low-permittivity material are placed on top of each 1 4 antenna array to increase the gain of the rounded patch antenna elements. This new design is associated to a second 4 4 antenna array which, instead of dielectric cubes, uses precipitously stacked Yagi-like parasitic director elements to increase the gain. Slowimpedance bandwidths of the two 4 4 antenna ranges are about 7.5 GHz at 18 1 dB gain level, with radiation decorations and gains of the two arrays outstanding nearly constant over this bandwidth.
Dianjun Yang et al.	**2012[3]**	A composite circularly polarized dielectric complex waveguide slot antenna array with enhanced bandwidth	Collected of a circular separation grid, a slot micro strip line, a groove guide and serving network. The slot micro strip line is shaped by a metal clad dielectric substrate and slots imprinted in the metal. This antenna array not only maintains the compensations of the traditional waveguide slot antenna array, but also has the features of wide bandwidth. The capacities show that the radiating efficiency of the CPDCWS antenna array is 80%, which is almost the same as the out-dated waveguide slot antenna array, and the bandwidth of the

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			CP-DCWS antenna array is 700 MHz, which is 200 MHz wider than the out-dated waveguide slot array projection.

VI. TECHNIQUES OF ANTENNA

- ***Micro strip Antenna***

Single equilateral triangular patch antenna is designedand simulated for resonant frequency 1.29 GHz on a finite ground plane. The microstrip feed line technique has [8] beenused, as it is more reliable in p antenna is shown in Fig. 1 [4].The triangular patch has the side length ' ' and thesubstrate has relative permittivity 'ε_r'and substrate height is'h'.

A. Resonant Frequency

The resonant frequency of triangular patch corresponding to various modes is given as :

many applications such asouter space and requires no transition. The geometry of anequilateral triangle micro strip

$f_{mn} = Ckmn/2\pi\sqrt{\varepsilon_r} = 2C/\sqrt{\varepsilon_r}\sqrt{m^2+mn+n^2}$ ……(i)

Where, c is the velocity of the light and K_{mn} is the wavenumber.

The expression for fundamental mode resonant frequency is given by,

$F_{10} = 2C / 3a\sqrt{\varepsilon_r}$ ……(2)

In this relation, the effect of fringing field is not considered. In the above equation for better accuracy, ' 'and 'ε_r' are replaced by effective dielectric constant.

- ***Linear Antenna Array***

A linear array is one consisting of a group of indistinguishableelements placed in one dimension along a given direction.Linear arrays may have equidistant or non-equidistant element spacing. They are used in the analysis of thedirectional properties of arrays in antenna theory [2] and as building blocks for forming an array of arrays.

III. SIDE LOBE LEVEL REDUCTION TECHNIQUES IN ANTENNA

Reduction Technique	Description
Standard Particle Swarm Optimization	1. The PSO was inspired from social behaviour of bird flocking. 2. It uses an amount of particles which fly around in the search space to find best solution.
Standard Gravitational Search Algorithm	1. An optimization method and the undeveloped physical theory which GSA is stimulated from is the Newton's theory that states: Each particle in the creation attracts every other particle with a force that is directly comparative to the product of their masses and inversely proportional to the square of the distance between them. 2. GSA can be measured as a collection of agents whose have masses proportional to their value of fitness function. Through generations, all masses attract each other by the importance forces between them. A heavier mass has the bigger attraction force.
Hybrid PSOGSA Algorithm	1. Hybridize PSO with GSA using low-level co evolutionary heterogeneous hybrid. Themixture is low-level because we combine the functionality of both algorithms. **2.** Basic idea of PSOGSA is to associationthe ability of social thinking in PSO with the resident search capability of GSA.

IV. CONCLUSION

In this paper, triangular patch antenna arrays with several elements, specifically, single element, 2x1 and 4x1 were designed. These designed antennas are very simple, suitable for L-band applications, thereby providing circular polarizations. The optimum design limitations i.e. operating frequency, dielectric material, and height of the substrate are used to achieve the compact dimensions and high radiation efficiency. The operating frequency of all designed antenna is about 1.29 GHz which is apposite for Lband submissions. Array technique provides good enhancement in both gain and directivity as summarized. An antenna arrays are used in various applications when it is either imposed by the shape of the surface, or required by the radiation pattern conditions. One mainly interesting shape of a conformal array is the truncated cone.

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