



## **7. Smart Antenna for Wireless Power Transfer Technology & Cellular Phone Systems**

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### **ABSTRACT:**

*Wireless systems are absolutely a critical part of present day society and are getting greater as we move towards the information society, demand get admission to greater facts, greater immediately and in more places. Concurrently, technological traits are making new applications feasible, establishing up new markets, and promising substantial financial advantages.*

*In all instances, spectrum is a critical fundamental aid which despite the fact that reusable, cannot be created to satisfy call for. It's miles therefore, increasingly crucial to enhance the performance with which use is fabricated from the spectrum. A novel method to recognize a smart antenna has been offered. The characteristics of smart antenna have additionally been defined. The performances of the simulated smart antenna has been studied. Smart antenna era provides range extension, expanded facts fee, higher network ability and better carrier exceptional.*

### **KEYWORDS:**

*Smart antenna, cellular phone, Wireless power transfer & Spectrum.*

### **Introduction:**

In wireless power transfer, a idea at the start conceived by Nikola tesla in 1890s, energy is transmitted from a power source to a destination over the wireless medium. The usage of Wi-Fi energy switch can avoid the costly technique of planning and putting in energy cables in buildings and infrastructure.

One of the challenges for imposing wireless power transfer is its low power transfer efficiency, as simplest a small fraction of the emitted energy can be harvested at the receiver due to intense course loss and the low efficiency of radio frequency (RF) - direct current (dc) conversion. Further, early digital gadgets, including first technology cell phones, had been cumbersome and suffered from excessive energy intake.[6]

The extensive kind of remote sensors utilized in its programs (loops, probe motors, radar, cameras, and so on.) is not as correct as a stationary analyzer transportation system [1]. Broadband wireless systems play an increasing number of crucial role in Intelligent Transportation Systems (ITS) by way of presenting high pace Wi-Fi hyperlinks between many its subsystems [2]. Smart antennas can significantly decorate the performance of wireless structures and fulfill the requirement of enhancing insurance variety, capacity, information price and quality of provider [3]. Duty lies with the its clothier to recognize the running of a specific smart antenna earlier than it's miles used for the intended working surroundings. Inside the following sections we will discuss kinds and working of smart antennas and the way they may be utilized in intelligent transportation structures and speciality of the application of smart antenna technology, and as well as cellular conversation structures.

### **Smart:**

A smart antenna is a digital Wi-Fi communications antenna machine that takes benefit of range effect on the supply (transmitter), the vacation spot (receiver), or each. Range impact includes the transmission and/or reception of a couple of radio frequency (RF) waves to increase records pace and decrease the mistake price. The concept of using a couple of antennas and innovative sign processing to serve cells extra intelligently has existed for many years. In fact, various levels of noticeably high priced clever antenna structures have already been implemented in defense systems. Until recent years, value boundaries have avoided their use in industrial systems.[4]

The advent of effective low-price virtual sign processors (DSPPS), trendy- reason processors (and ASICs), in addition to modern software program-based totally signal-processing techniques (algorithms) have made smart antennas sensible for mobile verbal exchange machine. Today, when spectrally green solutions are more and more a business vital, those structures are presenting more insurance place for every mobile website online, better rejection of interference, and sizable capability improvements.

### **What are Smart Antennas?**

Smart antennas (also referred to as adaptive array antennas, more than one antennas and, recently, MIMO) are antenna arrays with clever sign processing algorithms used to perceive spatial sign signature which includes the direction of arrival (DOA) of the sign, and use it to calculate beam forming vectors, to music and locate the antenna beam at the mobile/target. Smart antennas must now not be harassed with reconfigurable antennas, that have similar abilities however are single element antennas and not antenna arrays. Smart antenna techniques are used appreciably in acoustic sign processing, tune and experiment radar, radio astronomy and radio telescopes, and in general in mobile structures. In a mobile system the radio communication is among the consumer and a base station, which gives radio insurance within a certain vicinity, called a mobile. The base stations are Omni-directional or sectored.[5] The power radiated in other directions could be experienced as interference with the aid of different users. The ideas of clever antenna is to use base station antenna patters that aren't fixed, but adapt to the perfect radio situations. This can visualized because the antenna directing a beam closer to the communication partner simplest.

### **Basics Smart Antenna:**

The term smart antenna is used inside the wireless industry to symbolize many signal processing technology that use a couple of antennas on one or both ends of the wireless communication link. Smart antennas have advanced skills. It is able to also provide array to increase variety, range benefit to enhance performance below fading, and interference cancellation abilities to boom capability and to improve the excellent of the Wi-Fi link (3) smart antennas also can be used to growth facts rate, through shipping of higher SINR (signal to noise plus interference ratio) to the consumer or through spatial multiplexing.

The smart antenna which mixes the indicators from the couple of antennas to maximise SINR (signal to interference plus noise ratio). Completely adaptive array no longer simplest gets the maximum range advantage and array advantage, however also cancels the interferences due to extraordinary antenna factors. Because of its advanced interference cancellation capability, fully adaptive array can reduce the frequency reuse of cell wireless systems successfully increasing community capability [4]. With fully adaptive array, spatial channels (or greater users sharing the identical traditional channel), also acknowledged as spatial department multiple get admission to may be carried out in the identical cell, further increasing spectral efficiency.

### **Smart Antenna for Vehicle Communication:**

Road to vehicle communication system in ITS (Intelligent Transport Systems) are one of the important media, which can offer traffic safety and navigation information to drivers as well as entertainment information Fig (1) shows the schematic drawing of a road to vehicle communication scenario.[6]

To offer Internet access service or a download service for large volume data files, long range communication is required. While constructing this sort of long-variety conversation quarter (as an example: several km's period) the following factors should be taken into account:

Several services that have different communication systems of frequency bands will coexist in the same ITS communication network and new services will be introduced one after another.

- a. The amount of communication traffic will change according to the continuous change in transportation traffic. Especially, communication traffic will drastically increase during traffic jams.
- b. Frequent handover will occur between adjacent. Spot zones due to the high speed of vehicles.

Regarding to (i) above, the Radio on Fiber (ROF) communication system [5-7] Which conveys Radio Frequency (RF) signals through optical fibers, would be one of the key solutions to this. On the other hand, for (ii) and (iii) it is requested to construct an effective network that allows making efficient use of limited resources (frequency ha-lids) and creates smooth communication is a continuous Zone.

To meet these requirements, several technologies should be developed: that is, forecast of communication traffic according to transportation traffic, resource management technology, radio zone control technology and so on. In particular, to control a radio zone adaptively requires a roadside antenna to have too complex function of beam shaping and beam scanning. Therefore, it is important to develop such a smart antenna with a simple antenna configuration.

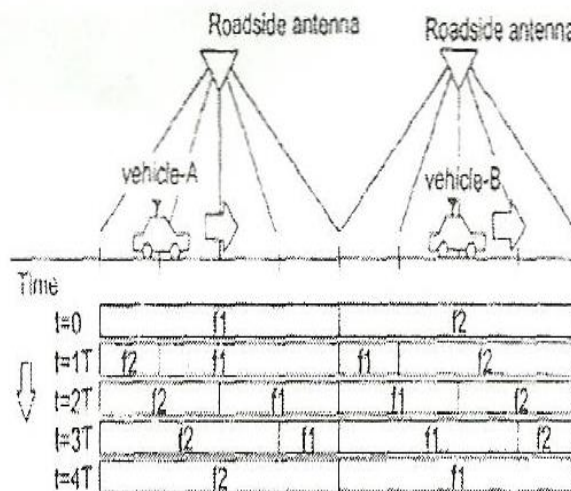
**Beam Control:**

The development of a beam control array antenna is the primary issue to realize the adaptive radio zone control. The required functions for our beam control array antenna would be:

- a. To configure the radiation patterns suitable for the desired radio zone.
- b. To configure the radiation patterns with low side-lobe characteristics.
- c. To make switching time as small as possible in order to minimize the effect on the communication quality, when the beam is switched.
- d. To have a simple interface with ROF access network. Parameters for the road to

Vehicle communication system shown in Table I, These functions are supposed to meet for designing a beam control array antenna. The most radio area duration assigned to a roadside antenna is 100m, considering the expected radio area for continuous road to vehicle communication structures.[2]

The maximum zone division number and the input/output port number were determined as a minimum figure, in order to evaluate characteristics of the zone division and zone shift functions experimentally. As the maximum radio zone division number was determined to be four, the required beam patterns for a beam control array antenna to realize both zone division and zone shift demonstration would be ten patterns. Fig (1)



**Fig.1: adaptive zone**

**Table-1: Parameters For Model Communication System**

ITEM	VALUES
FREQUENCY BAND	5.8 GHz BAND
MAXIMUM ZONE LENGTH	100m
MAXIMUM ZONE DIVISION	4
MAXIMUM ZONE LENGTH	25m
I/O PORT NUMBER	2
ANTENNA HEIGHT	8m (Roadside) 1.5 m(vehicle)
REQUIRED BEAM PATTERN	10

**Conclusion:**

Smart antennas can substantially enhance the overall performance of Wi-Fi communication structures utilized in its. Smart antenna era presents variety extension, increased data charge, higher community capability and higher carrier excellent. But, clever antenna represents many specific methods of the usage of a couple of antennas on one or both ends of the Wi-Fi link. Moreover, the paper suggests that the antenna can exchange the radiation sample, by way of adjusting simplest the load of detail beams used for street conversation, which leads to simplifying and dashing up the beam control procedure.

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