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COMPARATIVE STUDY OF RADIATION PATTERN OF SQUARE SPIRAL ANTENNA

Physics

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ABSTRACT

Frequency- independent antennas are used in applications that require grater bandwidths. Bi- conical spiral antennas and log-periodic antennas are often classified as independent of frequency, since the spiral antennas can be built as planers structures in accordance with the principle. Aluminium Nitride has been used as antenna substrate of thickness 2mm relative permittivity 8.2 and tangent loss (tanδ) 0.002. Measured loss in 1.9dB at 8GHz Width of the strip spiral have been taken d1 = 1 mm d2 = 2 mm and the spiral spacing 4mm. A strip is mounted at the center point. Various parameters are studied for the spiral antenna. The effect of feed gap, which is critical parameters for the performance of antenna, is studied for different frequencies

KEYWORDS

Spiral Antenna, Side Lobe And Front-lobe

1. INTRODUCTION:

Antenna and communication technologies are enhancing step by step; today we require wide bandwidth, littler antenna and wide coverage. Particularly mobile communication system, need of these types of antennas is expanding quickly. At earlier, interfacing was a critical issue in communication technology, because of primitive solid state technology.

This limitation prompted smaller bandwidth, and diverse polarizations. After research, ponders drove examination of solid state gadgets like semiconductor transistors, limitations like interfacing began not to be essential in communication and related themes. Increment of request on across the board gadgets and devices, raised the need of low cost, compact devices, wideband, unidirectional and low power antennas.

As of late, a lot of enthusiasm from both scholastic and industry in the field of adaptable gadgets due their light weight, minimal effort producing, simple in creation, and the accessibility of reasonable adaptable substrates (papers, textile, and plastics) make adaptable hardware an essential contender for the up and coming age of consumer electronics hardware (Nathan, 2005). Besides, ongoing improvements in scaled down and adaptable vitality and flexible energy storage and self-powered wireless components paved the road for the commercialization of such systems (Yongan, 2011).

Because of requests of expanded frequency band and shorter waves, a thin-wire quarter wave antenna investigated the market with their financial preferences and better execution. Particularly, for TV reception apparatuses, much intrigue was centred on the capacity of dealing with more extensive bandwidth because of expanded video signals. In 1939, the bi-conical shaped antenna and the tapered were re-examined to make wideband antenna. Carter was the first who make the key stride of fusing a broadband change between a feed-line and transmitting components. This was one of the key strides towards the outline of broadband antenna.

Optical antennas have fascinated scientists because of their ability to manipulate light beyond the diffraction limit (Novotny 2011). Such an accomplishment has empowered researchers to beat innovative boundaries and improve the properties antenna close field imaging (Hartschuh, 2003), solar cells (Atwater 2010), nanolithography (Wang, 2008), optical information stockpiling (Peng, 2009), warm helped attractive chronicle (Sendur, 2005), light producing gadgets (Gu, 2011), spectroscopy (Willets, 2007), medicinal applications (Gobin, 2007), and bio-compound sensors (Liu, 2011). Optical antenna with unidirectional far-zone radiation designs assume an imperative part for photovoltaic gadgets, in which reception apparatuses have been used to enhance the vitality transformation proficiency (Kotter, 2010). One important factor that needs to be addressed to improve the performance efficiency is the mismatch between the directionality of the incident. Therefore, in this paper a systematic study of radiation pattern of different type spiral antennas are compared and presented.

2. EXPERIMENTAL DISCRIPTIONS

In most cases the measured pattern is good enough to give the user of the antenna an idea of the coverage. Therefore we have used ATS-B antenna system for measurements. For studying the characteristics of an antenna we need two sections namely, transmitting section and receiving section the schematic representation of setup is shown in figure1.

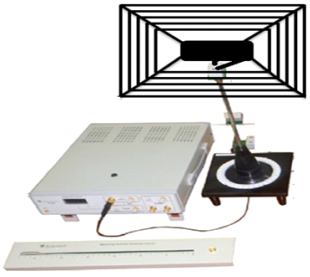

Figure 1. Schematic representation of experimental setup.

Antenna for next generation wireless communication requires high gain, high efficiency, and multi antenna design. A high gain antenna can be made using a relatively large antenna aperture, but a beam scanning mechanism is needed for mobile communication. In this method ATS – B Antenna System trainer is utilized. ATS – B transmitter / receiver. The receiver is used for the measurement of RF signal level with a high accuracy and repeatability. Facility is provided for obtaining the Polar Diagram of the Antennas provided at 800 MHz. Frequency from 750 MHz to 850 MHz can be measured. For obtaining the polar Diagram, the Receiving Antenna is rotated by 5 degrees and the readings are stored in the memory of the unit. A transmitting source to drive the transmitting signal to the transmitting antenna works between 750 MHz to 850 MHz variable source with a nominal output of > 105 dBμ V at 75ohms, to obtain the Polar Plot of the antenna under test.

Aluminium Nitride has been used as antenna substrate of thickness 2mm relative permittivity 8.2 and tangent loss (tanδ) 0.002. Measured loss in 1.9dB at 8GHz Width of the strip spiral have been taken d_1 = 1 mm d_2 = 2 mm and the spiral spacing 4mm.

3. RESULTS & DISCUSSION

As we rotate the antenna around on two orthogonal axes we measure the intensity of the radiated field. There is going to be an area of the pattern where most of the radiation is directed. That is the main lobe. To the sides of the main lobe we may find areas where the radiation is higher than the adjacent areas. As we turn the antenna around on two orthogonal axes we measure the power of the emanated field. There will be a zone of the example where the greater part of the radiation is coordinated. That is the main lob. To the sides of the fundamental projection we may discover regions where the radiation is higher than the adjoining regions. These are side lobes. The side lobes are usually separated by areas of little radiation called nulls. There is usually a side lobe in the direction opposite the main lobe. This special side lobe is known as the back lobe. Figure 2 shows a typical plot between magnitudes of radiation from an antenna versus direction of (a) Log

periodic spiral antenna (b) Archimedean slot antenna (c) square spiral antenna.

From figure 2(a, b, c), unmistakably the radiation pattern of log periodic antenna taken in same conditions are looks similar each other.

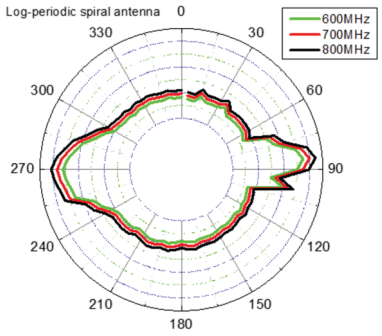

Figure 2(a). Radiation pattern of log periodic spiral antenna at different frequencies.

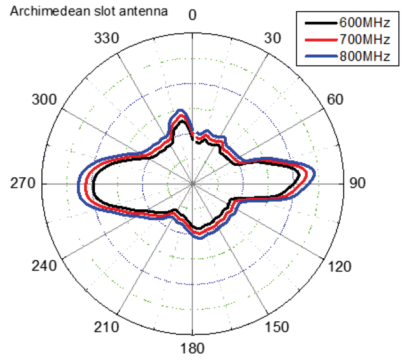

Figure 2 (b). Radiation pattern of Archimedean slot antenna

It likewise has been seen that in Antenna the radiation pattern is high than other two antenna. The pinnacle estimation of radiation for log spiral antenna is regularly 63.2 dB μA at 950 while that quality for other antenna is about 56.6 dB μA to 60.14 dB μA at 750. It is clear from radiation pattern fig 2 (c) it covers wider area than others. The radiation pattern of square spiral antenna is less dependent on frequency.All the three antennas show similar directional property along at an angle 750 of 3600 space. There is very low variation in radiation pattern for in Archimedean and square spiral antenna along 3600.

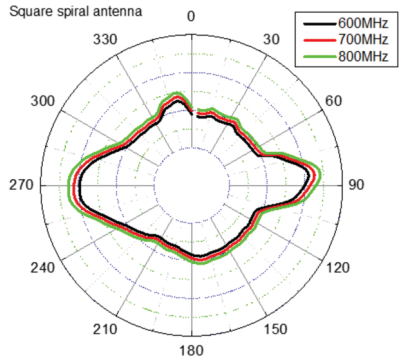

Figure 2(c). Radiation pattern of Square spiral antenna.

4. CONCLUSION:

Antenna for next generation wireless communication requires high gain, high efficiency, and multi antenna design. A high gain antenna can be made using a relatively large antenna aperture, but a beam scanning mechanism is needed for mobile communication. It is clear that the radiation patterns of three antennas in same conditions are very close to each other. It also has been observed that in antenna Square spiral, the radiation value is very high than other two antennas. The peak value of radiation for log periodic spiral antenna is typically 63.2 dB μA at 800 whereas that values for Archimedean antenna is 56.6 dB μA at 750 and for square spiral antenna it is about 60.14 dB μA at 750. It is also observed that the radiation patterns and axial ratio patterns become noisier with increasing frequency, which may be due to current limitations of the measurement facility.

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