International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
doi : https://doi.org/10.32628/IJSRST229566

Helix Directional Antenna for Low Power Wireless Communication

Prajjwal Tripathi, Nikhil Prakash, Himanshu Pandey, Ms. Priyanka Rahi
Department of Electronics and Communication Engineering, Galgotias College of Engineering and Technology, Greater Noida, Uttar Pradesh, India

Article Info
Volume 9, Issue 5
Page Number : 401-405

Publication Issue
September-October-2022

Article History
Accepted : 02 Oct 2022
Published : 14 Oct 2022

ABSTRACT

In wireless communication, there`s useless Communication executed in a route that doesn`t factor to the recipient. Omni-directional antennas ship the identical quantity of strength similarly in all directions perpendicular to an axis i.e., Azimuthal directions. This waste of strength reduces the lifespan of the battery devices inflicting extra traffic collisions than necessary. One manner to lessen this wasted strength and traffic collisions is to apply the opposite form of antenna called "Smart antenna". These antennas can use selectable radiation styles relying at the state of affairs and for this reason drastically lessen useless strength waste. Smart antennas offer the capacity to apprehend the route of the incoming indicators that the bodily format is conducive to mapping together with orientation.

Keywords: MIMO, Azimuthal direction, Phase array antenna, Radiation Pattern.

I. INTRODUCTION

Communication is a vital aspect of life that humans are unmatched in. Evolution has provided us with the tools and the knowledge to improve our lives. Through technology, we can now see the world from a different perspective. Due to the increasing popularity of wireless communication, many new technologies have been introduced to allow people to reach the rest of the world. One of these is the use of antenna technology. An antenna that allows communication in a specific direction is known as a directional antenna.

This feature allows the antenna to receive and transmit signals in a given direction, which is very useful for long-term and energy-efficient communication. There are also more advanced variants of directional antennas, such as smart antennas. These are capable of changing the direction of communication without the need for any physical change.

Although directional antennas have been around for a long time, their practical and theoretical ideas are still undiscovered. This is because they are not subjected to experiments. The most widely used techniques for testing the effectiveness of directional antennas are simulations.

This report presents an experimental study of the behaviour of a smart antenna design. The experiment was carried out to study the behaviour of a smart antenna and it is built using a software called "MATLAB".

Hence The results of the study were compared to those of a paper presented at a conference held at Meraka Institute Council for Scientific and Industrial Research Pretoria, South Africa.

II. PROPOSED WORK

The overall performance of wireless networks and the variety of programs are often limited by self-interference, variety, reliability, and cost. New application technologies that provide a high level of intelligence and hence advanced functionality known as a smart world are often highly dependent on these factors. Self-jamming occurs at more than one node. They are transmitted simultaneously and interfere with each other. It sends a signal and often cause retransmission. this often leads to significant reductions in throughput (i.e., slow uploads and downloads), increased latency (most damaging for latency-sensitive multimedia telecommunications), and increased power consumption. The communication range is effectively determined by the ability of a signal-to-noise ratio of and captures the minimum signal strength, what the receiver needs, that is, transmitter power, gain antenna, receiver sensitivity and back noise.

The overall stability of the network and thus intelligent application functionality is highly dependent on the technology. Each node handles the errors of other nodes in the network. Several advanced solutions have been introduced recently, such as MIMO (Multiple Input Multiple Output) technology. The speed of MIMO and the power of Weightless can be achieved by using low-cost, low-power parasitic array antennas.

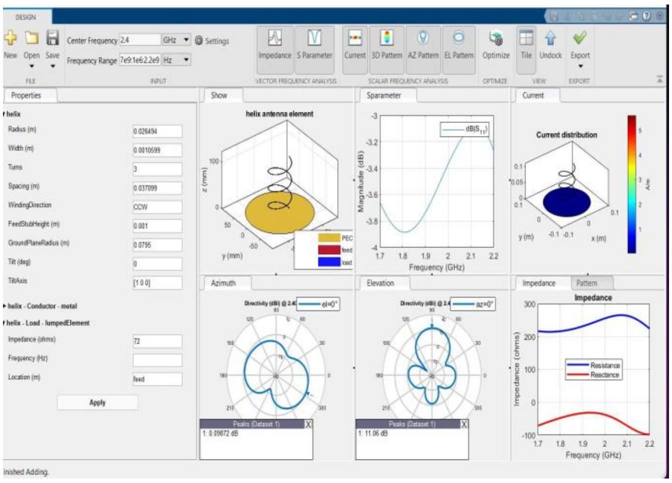

Figure 1: MATLAB Stimulation

In compare to a previous model proposed in paper at Meraka Institute Council for Scientific and Industrial Research Pretoria, South Africa by Albert A. Lysko and Mofolo Mofolo in which the author expressed an experimental method for getting more efficient output from the antenna and less noise by using parasitic array.

An Antenna with better throughput speeds up and reduction in the latency. An antenna to be designed to provide robust high-performance communications in a wireless mesh network operating at 2.4 GHz frequency. we proposed a system by using a software called MATLAB. We have stimulated various programs of smart antenna on under different Situation to get the desired output like-

A program is designed to simulate the smart antenna system on a BTS receiver (Uplink).

Receiving wire array of four elements operating on 2.4 Ghz with a separation distance 0.075 meters narrowband (uncorrelated or partially correlated) signals are assumed.

Another program is designed to stimulate Directional antenna system, this antenna operates on 2.4 Ghz The impedance of directional antenna is 72ohms.

III. SIMULATION AND RESULT

In this work we performed experimental evaluation for antenna. A directional antenna is stimulated for a frequency range of 2.4 Ghz.

Maximum gain values in directional antenna is of 11.1 dBi and its minimum value is of -22.8 dBi and also for the narrow band beam we have seen the difference in the maximum gain = 11.1 dBi and maximum gain span of 3 seconds.

Various graphs and patterns related to stimulation of desired antennas are shown below:

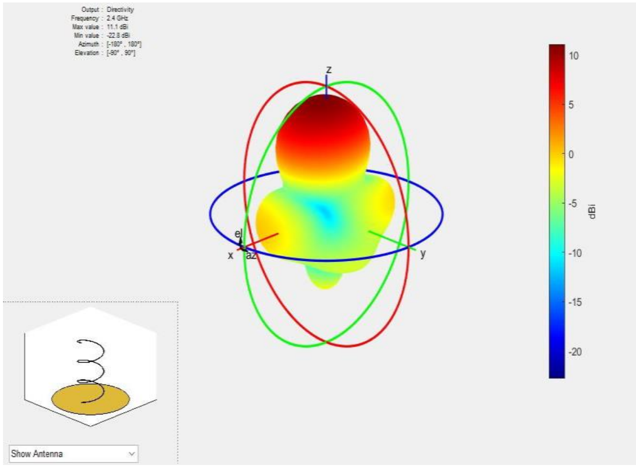

Figure 2: Directional antenna

This radiation pattern of the directional antenna shows directivity of antenna, the antenna has maximum and minimum gain of 11.1 dBi and -22.8 dBi respectively. Over a frequency of 2.4 Ghz having azimuthal [-180degree, 180 degrees] And elevation [-90-degree, 90 degrees] respectively.

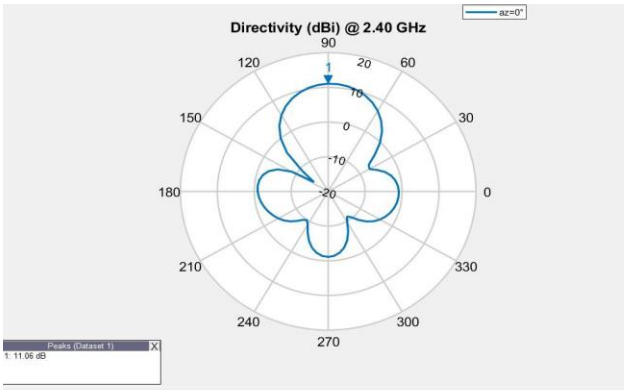

Figure 3: EL Pattern

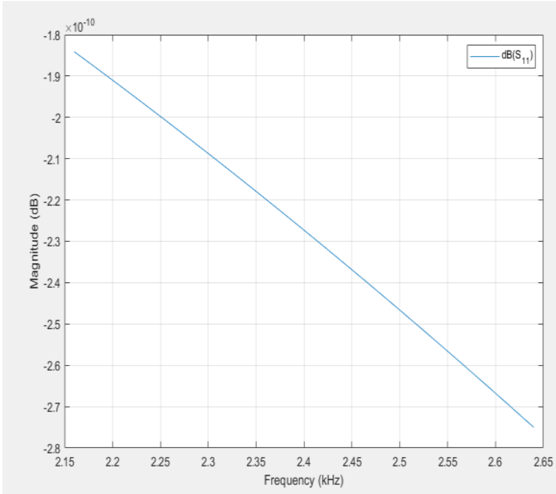

Figure 4: S-Parameter

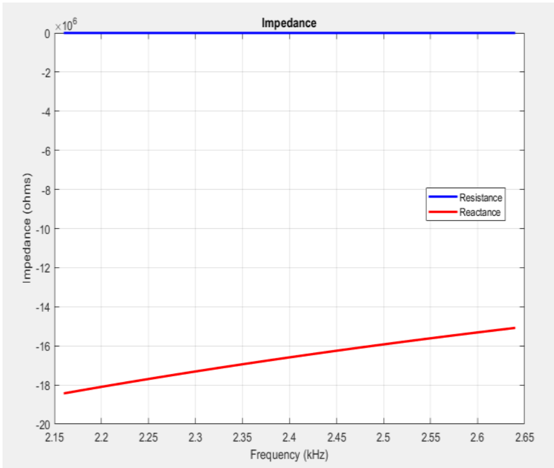

Figure 5: Impedance Graph

Graphs for various radiation beam forming pattern and transition period are listed below:

- The Radiation represent the emission or reception of wave front at the antenna, specifying its strength. In any illustration, sketch drawn to represent the radiation of an antenna is its radiation pattern.

- Graphically, radiation can be plotted as a function of angular position and radial distance from the antenna.
- This is a mathematical function of radiation properties of the antenna represented as a function of spherical co-ordinates, E (θ, Ø) and H (θ, Ø).

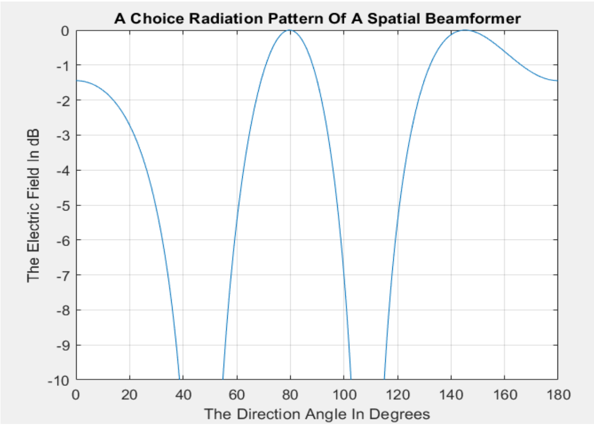

Figure 6: Radiation Pattern (a)

The above shown graph is plotted for Electric Field and Angular Position which gives radiation pattern for the antenna. Similarly, another graph for radiation pattern with different parameters is shown below.

This is also plotted against the electric field and angular position that gives the radiation pattern for the antenna. The graphs showing different peaks for electric field at different angular positions.

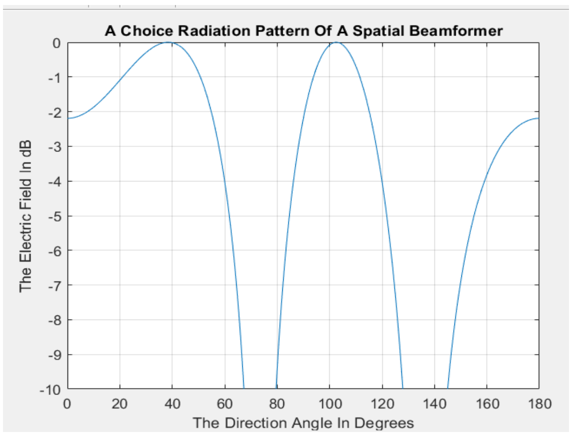

Figure 7 : Radiation Pattern (b)

IV. CONCLUSION

In this work, we studied different methods for wireless antenna communication. We successfully performed antenna building for a low-power wireless communication, which reduces the power consumption of the battery i.e., increases the life cycle of the battery. Moreover, this stimulation work is performed for an antenna of the frequency range of 2.4Ghz. The impedance and bandwidth of our antenna are much better in comparison to the antenna of the reference Paper (Base Paper) which we used as a guide for our Project. We successfully get better results for Maximum and minimum gain in narrow band and wide band.

V. REFERENCES

[1]. Albert A. Lysko & Mofolo Mofolo (2015, January). High-performance low- power smart antenna for smart world applications. In 2017 Meraka Institute Council for Scientific and Industrial Research Pretoria, South Africa (pp 1-5). ICUMT.

[2]. T. Gayatri & G. Srinivasu (2017, December). Research On Ultra-Wideband (UWB) Antennas for Wireless Communications. In 2017 National Conference on Engineering, Science, Technology in Industrial Application and Significance of Free Open-Source Software's, Hyderabad (1-7). IJCRT.

[3]. Ayodele S. Oluwole & Viranjay M. Srivastava (2018, January). Features and Futures of Smart Antennas for Wireless Communications: A Technical Review. In 2018 Journal of Engineering Science and Technology Review, South Africa, 2018 ,11(4) (2018) 8 – 24.

[4]. Ikechukwu H. Ezeh1 & Isaac A. Ezenugu (2020, August). Challenges of Bandwidth and Power Limitations in Cellular Communication: A

Review. In 2020 IOSR Journal of Mobile Computing & Application (IOSR-JMCA).

[5]. Angeliki Alexiou & Bell Laboratories (2004, September). Smart Antenna Technologies for Future Wireless Systems: Trends and Challenges. IEEE.

[6]. Mahmoud Shuker Mahmoud & Auday A.H. Mohamad (2016, January). A Study of Efficient Power Consumption Wireless Communication Techniques/ Modules for Internet of Things (IoT) Applications. (Pp 1-12).

[7]. Cheng-Xiang Wang, Min Zhang, James Warden & Huanhuan Gu (2013, March). Impact of Antenna and Propagation on Wireless Communication Technology: Terminal, Base Station, and Channel Modeling. In 2013 Hindawi Publishing Corporation International Journal of Antennas and Propagation. Volume 2013, Article ID 368457.

[8]. J. Lloret, M. Garcia, D. Bri, and S. Sendra, "A Wireless Sensor Network Deployment for Rural and Forest Fire Detection and Verification," Sensors, 9 (11), 2009, pp. 8722-8747.

[9]. M. Mofolo, Enhanced Beam Steering and Parameter Analysis for Switched Parasitic Arrays. Masters' dissertation, University of Johannesburg, 2011, 151 pages.

[10]. I. Makitla, A. Makan, and K. Roux, "Broadband provision to underprivileged rural communities." CSIR 3rd Biennial Conference 2010. Science Real and Relevant. CSIR International Convention Centre, Pretoria, South Africa, 30 August – 01 September 2010, pp 9.

[11]. Y.-B. Ko, V. Shankarkumar, and N.F. Vaidya, "Medium access control protocols using directional antennas in ad hoc networks.", Proc. Of INFOCOM 2000 (Nineteenth Annual Joint Conference of the IEEE Computer and Communications Societies). Vol.1, TelAviv, 26-30 Mar 2000, 2000, pp. 13-21.

[12]. E. Sazonov, K. Janoyan, and R. Jhac, "Wireless Intelligent Sensor Network for Autonomous Structural Health Monitoring", Smart Structures and Materials 2004: Smart Sensor Technology and Measurement Systems. Ed. by Udd, Eric; Inaudi, Daniele. Proceedings of the SPIE, Vol. 5384, 2004, pp. 305-314.

[13]. M.R.O. Mofolo, A.A. Lysko, W.A. Clarke, and T. Olwal, "Effects of variations in structural parameters on performance of switched parasitic arrays." Southern Africa Telecommunication Networks and Applications Conference (SATNAC 2011), East London, South Africa, 4-7 Sep 2011.

[14]. A.A. Lysko, and M. Mofolo, "Influence of a Realistic Loading on Characteristics and Design of ESPAR", Southern Africa Telecommunication Networks and Applications Conference (SATNAC 2011), East London, South Africa, 4-7 September 2011, 4 pages.

[15]. M. Mofolo, A.A. Lysko, and W. Clarke, "Method of electronic beam steering for circular switched parasitic dipole arrays". SATNAC, Spier Estate, Stellenbosch, South Africa, 5-8 Sep 2010, 6 p.

Cite this article as :

Prajjwal Tripathi, Nikhil Prakash, Himanshu Pandey, Ms. Priyanka Rahi, "Helix Directional Antenna for Low Power Wireless Communication", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 9 Issue 5, pp. 401-405, September-October 2022. Available at doi : https://doi.org/10.32628/IJSRST229566

Journal URL : https://ijsrst.com/IJSRST229566