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Study of Dielectric Resonator Optical Antenna

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Abstract - Nanoantenna has various geometrical approaches to design broad visible at nano-scale spectrum range. The near field resonance of optical DRA antenna has greater Advantages in Telecommunication system which works on digital domain. Electromagnetic radiation of optical DRA operational nanostructures behave especially in infrared regim. The DRA radiation and localized source and interaction holds scientific communities which explore the model to realizing its efficient. We have investigated several aspect of optical dielectric resonator antenna (ODRA) .Microstripline of optical DRA antenna for satellite communication which typically used in metallic losses. RF antenna concentrate the radiation to confined sub-wavelength scale .The microstrip line has improved studied about transmitting optical nanostructures .The light matter interaction has playing very important role.

Keywords – Optical Antenna, Dielectric, ORDA, Nanoantenna.

I. INTRODUCTION

The optical DRA playing very important role in telecommunication system[1]. The light matter intraction such as cellular device which transfer electromagnetic spectrum .The microwave antenna theories establish optical frequency regime[2, 3]. The introduction of antenna concept for high level efficiency in photophysical detectors. Optical antenna design to convert free propagation to convert free propagation of optical radiation to localized energy and vice-versa[4, 5]. The development optical antenna which concentrate on surface planner which invented at nanoscale which define as device to device connection[6, 7]. Radiation propogation of optical DRA were developed for solution to a communication at microscopy at nano-scale analogous which define an optical antenna as a device which concentrate on external laser[8,9]. Optical particle can be used by Synge's method which particle which would convert surface as a receiver. In optical antenna strongly radio – frequency & Microwave properties and scaling behaviour[10,11]. Optical antenna transmite optical signal at nanoscale[12,13]. The frequency distribution of optical antenna has configure the radiation pattern which utilizing an antenna efficiency because low dissipation of low high radiation of antenna efficiency [14,15].The measurement of antenna materials has dependent on separating of conducting surface which aiming at maximizing dielectric polarization .The dipole moments is responsible for the microscopic dielectric properties of materials [16].The permanent moments of any molecules which allowed to other permanent dipole moment to explain it anomalous dielectric constant between ,the average orientation moments of far field resonance frequency of magnitude of dielectric constant [17] . The dielectric behaviour of material with variation along with temperature .The wireless communication technology have provides continuing receiving system which discover sophisticated devices to perform for improved its function size and weight to realize low loss temperature element which has playing fundamental operation of resonant frequency of DRA antenna which can be engineered to desired material temperature value to meet the requirement of antenna circuit designing without reduction in performance. Resonance phenomenon of dielectric resonator cavity permittivity at the resonance surface frequency of coefficient of dielectric constant .Electromagnetic field of dielectric resonator considerable description of hollow wave guide also have been investigated in this research article[18] .Cylindrical dielectric resonator antenna has applied perfect rectangular magnetic conductor which is well suitable for CAD application. The possible resonant of magnetic mode of hybrid electromagnetic field which cannot exist transverse magnetic fields. The magnetic dipole of electric dipole is rectangular in shapes which offer attractive feature for antenna elements[19]. The dielectric antenna size is very compact designing which support different modes with closely spaced resonant frequencies with high range of permittivity size compact rectangular with proper choice resonator dimensions has wide range of permittivity with different mode producing broadside radiation patterns for different absence of conductor losses and surface wave losses to high radiation efficiency[20]. The DRA antenna can be fully requirement for integeral to achieve strong coupling for microstrip lines to DRA antenna $\in \Gamma 3 / 2$ the causing which phenomenon is the high reduction rate between antenna components due to the high storage rate. Optical DRA antenna dimension has various geometric which tunable for cylindrical in shapes which makes optical DRA works on some limitation to pair to polarization is isolated optical DRA permittivity of dielectric material has both real and imaginary part which describe the energy loss signal through dielectric permittivity $\in_{\gamma}$ is called dielectric constant [21].The variety chemical or physical phenomena contribute polarization

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of low frequency material which is mainly caused by dipolar relaxation absorption of peak infrared region are identified in crystalline of high frequencies band electric charge of microwave field has high configurable radiation pattern to exhibit many problems like large size narrow, bandwidth low loss high permittivity[22,23] .The microwave frequencies RF antenna use low loss and high tunable devices which allow multiband component circuite can be used components for RF and microwave application is tunable pass band is able to varied at MHZ to THZ

II. ANTENNA RADIATION THEORIES

In advance generation wireless system provides various forms which travelling wave antenna used for different application, which compared to integration component for various antenna characteristics such as passive circuits with the radiating elements. The impedance value of antenna pattern is manufacturing process effect on temperature for commercial worlds of antenna find extensive use in field of biomedical accordingly to antenna designers' designs optenna that could maintain their performance to enhance antenna bandwidth with small size mobile terminal to acquiring great importantance yet to have prescribed performance of communication system simply treated as ground plane to provide high infinite description with very large number of complexity with multi scale homogeneous polarization of antenna gain .The advanced generation needs high level capable supporting speeds and multiband operation for modern communication system which need low cost solution with high profile impedence radiation has been developed to further enhancement of broadband performance of high speed wireless communication system. The aspects bandwidth of optical DRA antenna field continuously change notation frequently coordinate system. The bandwidth plays very important parameter of any antenna. Bandwidth makes it an interesting dielectric resonator which widely used to achieved

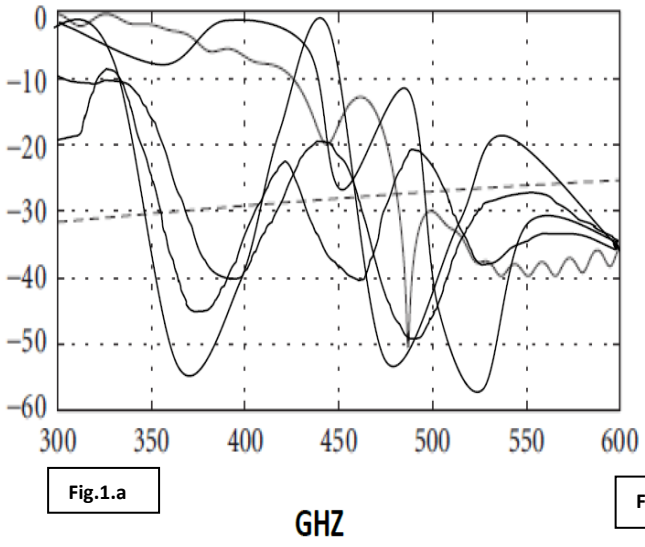

Fig.1.a

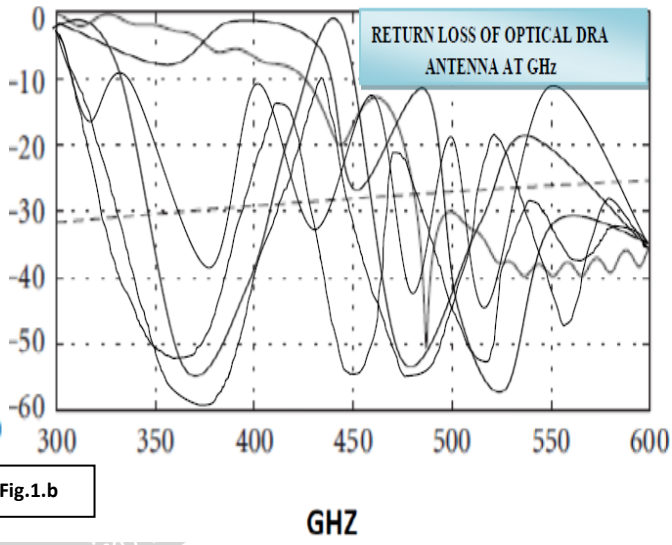

Fig.1.b

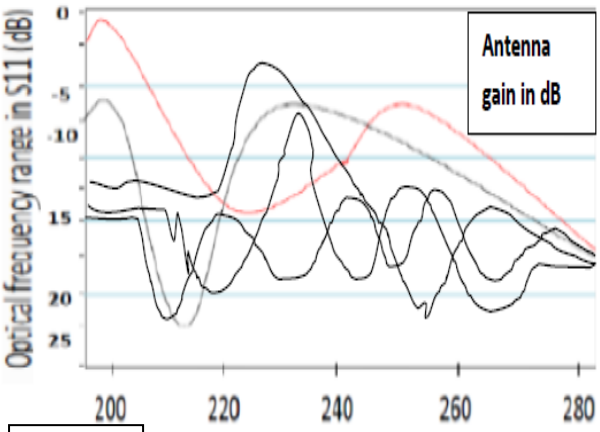

Fig.1.c

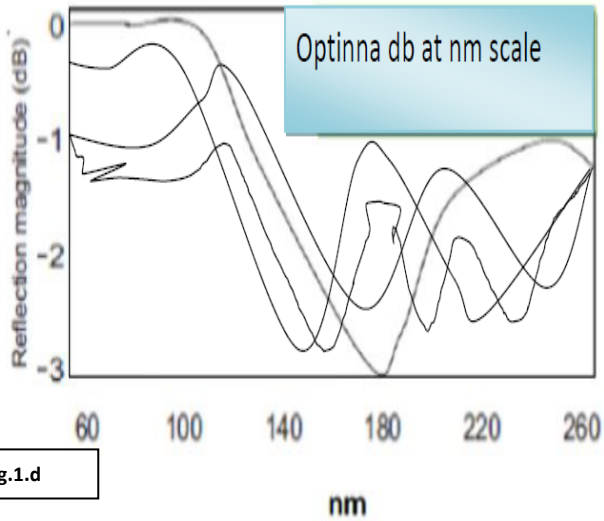

Fig.1.d

Figure 1. (a) Experimentally measured at GHZ and (b) numerically calculated at GHZ (c) antenna's directivity THZ (d) simulated near-field spectra

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III. CONCLUSIONS

In this paper we have studied as well as proposed new method to design dielectric Resonator optical Antenna which has enable to study this radiation distribution of THZ, GHZ range. This research work will very helpful to improve optical Antenna efficiency at nanoscale OR THZ. Simulations base approach work well with Dielectric Antenna. We have presented in this research article about communication antenna at nanoscales operation with high bandwidth application.The nanomaterial Antenna design has high impedance at nm frequency range. The near field resonance of optical DRA antenna has greater Advantages in Telecommunication system which works on digital domain. Operational nanostructures behave especially in infrared regim. The DRA radiation and localized source and interaction holds scientific communities which explore the model to realizing it's efficient. We have investigated several aspect of optical dielectric resonator antenna (ODRA) .Microstripline of optical DRA antenna for satellite communication which typically used in metallic losses.

AUTHOR DETAILS

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REFERENCES

[1]. Mohan, A., 2015. The advanced generation mobile broadband technology for wireless communication system and its applications. IJAR, 1(12), pp.383-385. www.allresearchjournal.com/archives/2015/vol1issue12/PartF/1-12-113.pdf

[2]. MOHAN, ANAND. "RADIATION CHARACTERISTIC OF METALLIC NANO-PARTICLE WITH APPLICATION TO NANO-ANTENNA." "An Experimental Study of Effect of Amalkirasayan and Amalkiswaras with Help of Electron Microscopy" 1-9 8, no. 5&6 (2014): 45.

[3].MOHAN,ANAND."SYNTHESIS OF BI-METALLIC NANOPARTICLES AND ANALYSIS OF THEIR PERFORMANCES." "An Experimental Study of Effect of Amalkirasayan and Amalkiswaras with Help of Electron Microscopy" 1-9 8, no. 5&6 (2014): 59.

[4]. Mohan, A. (2016). Study of Plasmonic Nano Antennas and Their Optimization., International Journal of Emerging Research in Management &Technology ISSN: 2278-9359 (Volume-5, Issue5) Special Issue on International Conference on Advances in Engineering (ICAE) -2016 Conference Held at Hotel Magaji Orchid, Sheshadripuram, Bengaluru, India.

[5]. Mohan Anand "ROLE OF NANOANTENNA SYSTEM IN TRANSFORMING THERMAL ENERGY, Airo International Research Journal ISSN: 2320-3714 Volume: 7 June 2016

 DOI : 10.18231/2454-9150.2019.0117

[6]. Mohan Anand "IOT: A BIG REVOLUTION FOR NANOSCIENCE" 7th virtual NanotechnologyPosterConference http://www.nanopaprika.eu/group/nanoposter/page/p17-21

[7]. Sachchida Nand Singh; Ashok Kumar: Anand Mohan: Study of nanoantennas for enhanced Optical emission, Proceedings of International Conference on Advances in Light Technologies and Spectroscopy of Materials (ICALTSM - 2016), page. no. 256, January16-18, 2016.

[8]. Akyildiz IF, Jornet JM, Han C. Terahertz band: Next frontier for wireless communications. Physics Communications. 2014; 12:16–32. DOI: 10.1016/j.phycom. 2014.01.006

[9]. Anand Mohan,Cylindrical dielectric resonator antennas (CDRA) & its applications for human life, ISCA, Souvenir of 4th International Virtual Congress IVC-2017, ISBN: 978-93- 84659-68-4, 2017

[10]. Nagatsuma T, Ducournau G, Renaud CC. Advances in terahertz communications accelerated by photonics. Nature Photonics. 2016;10(6):371–379

[11]. Anand Mohan, Ashok Kumar, Uses of Optical Nanoantenna in ICT and its Ability, Souvenir of 3rd International Virtual Congress, 3rd International Virtual Congress IVC-2016, ISBN: ISBN: 978-93-84648-78-7, 2016

[12].Anand Mohan, Study of Plasmonic Nano-Materials for Surface enhanced Localized Surface Plasmon Resonance Spectroscopy (LSPR) &Their Applications for OpticalAntennas, Indian Journal of Agriculture and Allied Sciences, ISSN 2395-1109 Volume: 1, No.: 4, Year: 2015,

[13]. Anand Mohan, "*Cylindrical Dielectric Resonator Optical Antenna (CDROA) & its Applications for Convenient Technology*", International Journal of Computer Sciences and Engineering, Vol.7, Issue.1, pp.283-286, 2019. https://doi.org/10.26438/ijcse/v7i1.806809

[14]. Anand Mohan, "*Optical Antenna: A Key Enabling Arial For Device To Device Communication*", International Journal of Computer Sciences and Engineering, Vol.6, Issue.8, pp.306-309, 2018. https://doi.org/10.26438/ijcse/v6i8.306309

[15]. Stutzman,W.L.; Thiele, G.A. Antenna Theory and Design;John Wiley & Sons: New York, 2012.

[16] S. Hranilovic and F. Kschischang, "Short-range wireless optical communication using pixelated transmitters and imaging receivers," in Proc. of the IEEE International Conference on Communications, Paris, France, Jun. 20–24, 2004, pp. 891–895.

[17] T. Fath, M. Di Renzo, and H. Haas, "On the Performance of Space Shift Keying for Optical Wireless Communications," in Proc. of the IEEE Global Communications Conference - Workshop on Optical Wireless Communications, Miami, Florida, USA, Dec. 10, 2010, pp. 990–994.

[18] Anand Mohan ," Study of Optical -nanoantennas and their Application ".Ph.D Thesis (Physics).2018

[19] Anand Mohan, "Optical Dielectric Antenna and Enhance its Bandwidth with Minimum Energy Loss", International Journal of Emerging Technologies and Innovative Research (www.jetir.org), ISSN:2349-5162, Vol.6, Issue 1, page no.597-601, January-2019, Available :http://www.jetir.org/papers/JETIR1901A75.pdf

[20]. H. Elgala, R. Mesleh, and H. Haas, "Non-linearity Effects and Predistortion in Optical OFDM Wireless Transmission Using LEDs," Inderscience International Journal of Ultra Wideband Communications and Systems, vol. 1, no. 2, pp. 143–150, 2009.

[21]. A. Behravan and T. Eriksson, "PAPR and Other Measures for OFDM Systems with Nonlinearity," in Proc. of the 5th International Symposium on Wireless Personal Multimedia Communications, Honolulu, Hawaii, USA, Oct. 27–30, 2002, pp. 149–153.

[22]. OSRAM Opto Semiconductors GmbH, "Datasheet: SFH 4501, SFH 4502, SFH 4503 High Power Infrared Emitter," Jan. 2008, retrieved Jun. 20, 2012 from http://catalog.osram-os.com.

[23]. Lufthansa, "Lufthansa FlyNet: limitless communication on long-haul flights," 2013,retrieved Oct. 27, 2013from http://www.lufthansa.com /online /portal/lh/de/info andservices/on board?nodeid=3108158&l= en&cid=18002.

 DOI : 10.18231/2454-9150.2019.0117