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Flexible Antennadesign for Wave Applications

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ABSTRACT
In this paper, a three-dimensional compact antenna is designed for the automotive industry is proposed. The Antenna is designed by using the flexible substrate that can fix on the top layer of the car. The antenna can be easily fabricated from a printed circuit board and a metal sheet with low-cost process and materials(polyimide).It helps us to cover the Long Term Evolution(LTE) and WAVE guidelines, just as with different administrations, for example, GPS, car to-car (C2C) AND remote keyless entry (RKE). The structure is design for reduced incorporated flexible reception antenna arrangement with adjusted planar monopole is proposed to cover the Wireless Access Vehicular Environment (WAVE) band (5.9 GHz) concerning vehicular applications.

KEYWORDS: *Vehicle Communication, Flexible antenna*

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I. INTRODUCTION

For a superior driving condition, future vehicles will be associated with one another and to a side of the road framework to share traffic data in the upcoming intelligent transportation frameworks and telematics. As of late, a few cellular and ad-hoc-based communication standards are introduced based on correspondence models are getting looked at for offering a protected, effective, and comfort with driving condition.

A Wireless Access in the Vehicular Environment (WAVE) convention, IEEE 802.11p standard at 5.9 GHz band, can be an extraordinary contender for vehicle-to-vehicle correspondence due to its ongoing activity when anti-collision messages and security data must be given to vehicles.

For cellular correspondence between the vehicles, Long Term Evolution (LTE) shows appropriateness for car applications because of high information rates and versatility. Right now, vehicles will be intensely incorporated with more specialized gadgets and frameworks. One of the principle challenges is the receiving signal mix should be fix in a compact structure ,for example, flexible case on the top of a vehicle and its multiband conduct between antenna components. Each firmly found reception apparatus component ought to be exceptionally confined inside a little volume for covering synchronous multiband tasks.

The structure of low-band LTE reception apparatus is particularly testing in light of the fact that the physical component of the radio signal is constrained by the accessible volume of the small substrate just as by other transmitting components in vicinity working at various frequencies. Numerous kinds of multiband signals for automotive applications outfitted with GPS, GSM, LTE and WAVE groups have been proposed.

In this study, a new design for minimized incorporated adaptable flexible antenna arranged with the changed planar monopole is proposed to cover the WAVE band of 5.9 GHz.

II. ANTENNA DESIGN

The structure of the Antenna in the low-recurrence band for LTE application is a more imposing test than the high-recurrence partner because of the physical size of the radiators. Great detachment and low Envelope Correlation Coefficient (ECC) between firmly dispersed Antenna must be tended to for LTE applications.

Monopole antennas printed on a two-dimensional (2-D) substrate for LTE low band have been successfully developed for automotive applications. Present it has many problems in implementing the antennas with good isolation characteristics due to limited height and width of the substrate. To use the available volume more efficiently, 3-D antenna solution have been introduced.

Shorted Monopole Antenna were used for LTE application. The antenna connection shows good isolation due to the orthogonal polarization, it is only effective at higher band. In lower band it is not much and the design of other antennas for different services can be limited by the available volume of the flexible case .The modified monopole antennas are designed for WAVE application.

The antennas have been designed by using the Computer Software Technology (CST).The antenna is designed on the 0.008 mm thick polyimide substrate with permittivity of 4.4 and loss tangent of 0.009. The vertically collinear reception apparatus cluster with a productive radiation procedure was utilized as monopole to get high-gain radiation design in azimuth plane and diminish side lobes in rise plane. The absolute length of the receiving antenna is around two and quarter wavelengths.

The stage inversion segments of the complete length were dropped by utilizing the stub and the by means of on the printed circuit board. The simulated surface current distribution at 5.9 GHz for the antenna sections. The flows of the stage inversion area are effectively smoothened by the proposed structures.

III. SIMULATION OF ANTENNA

The simulated and estimated S-parameters of the full antenna structure. Framework are investigated Each receiving signal was estimated while the others were ended at 50 Ω loads. A decent understanding between the recreation and the estimation is affirmed for the entire working groups with the exception of a little recurrence move of the WAVE groups, which is in all probability brought about by an off base portrayal of the polyimide permittivity.

The return loss of monopole antenna for WAVE band are better than 10dB. For antenna applications, the ECC(Envelop Correlation Coefficient) is generally used to calculate the channel capacity and cross-correlation performances. The calculated ECC of the antenna is always lower than the 0.5 for the whole LTE low band, which is practically accepted for the antenna diversity.

The adequate ECC estimation of the proposed reception antenna was effectively accomplished without extra separation methods.

Simulation results shows that the radiation efficiency of the monopole antenna is highly dependent on the mutual coupling and termination impedance of the other band antennas. Finally, gain patterns were measured in a field monitors using a far-field results and a vector network analyzer.

The proposed antenna was mounted on a 54mm × 47mm metallic plane to incorporate the car rooftop impact shows the simulated and measured gain patterns of the proposed antenna solution integrated on the finite ground plane.

The proposed MIMO-LTE reception antenna have moderately low profile and smaller size inside restricted volume, and accomplish great separation qualities from other integrated antennas compared with past examinations for vehicular applications.

IV. FLEXIBLE SUBSTRATE

Flexible electronics can presently be viewed as a settled innovation that has arrived at a specific level of development in meeting the necessities of firmly assembled electronic packages, providing reliable electrical connections where the assembly is required to flex during its typical use or where board thickness, weight, or space imperatives are driving elements.

In this context, flexible substrate antennas (FSAs) assume a key job in the combination and packing of wire-less communication gadgets and sensor systems.

In this chapter Flexible printed monopole antenna based on Kapton Polyimide substrate. Polyimide film was chosen as the antenna substrate in due to its good balance of physical, chemical, and electrical properties with a low loss factor over a wide frequency range (tan δ=0.002). Furthermore, Polyimide offers a very low profile (50.8 μm) yet very robust with a tensile strength of 165 MPa at 73°F, a dielectric strength of 3500-7000 volts/mil, and a temperature rating of -65 to 150°C [10]. Other Polymer based and synthesized flexible substrates have been also used in several designs.

In addition, the performance of the antenna is assessed under bending impacts in terms of impedance matching shift in resonant frequency. Finally, the characteristic of the antenna under investigation are contrasted with a few adaptable antennas.

V. MODULE FLOW

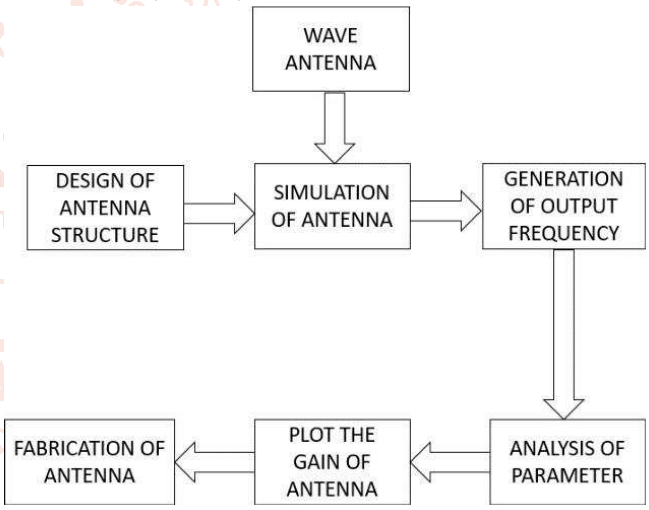

Fig.1

VI. SYSTEM ARCHITECTURE

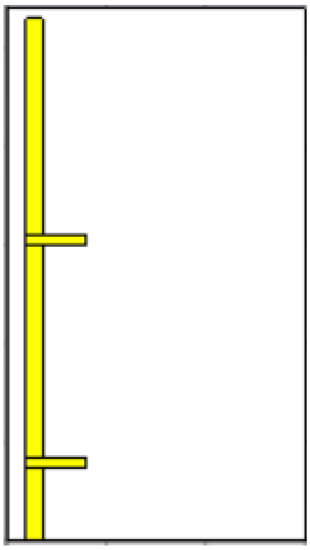

Fig.2.a Monopole Antenna

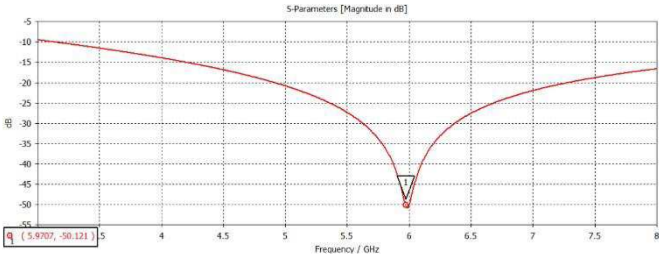

Fig 2.b WAVE frequency of Monopole antenna (5.9GHz)

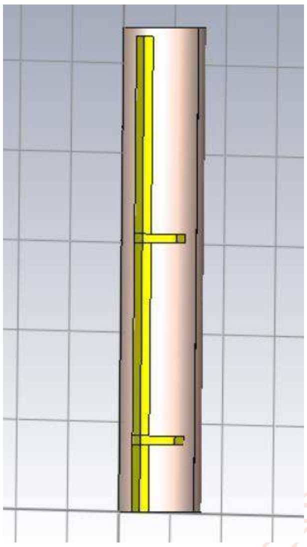

Fig 3.a Bending of flexible polyimide substrate

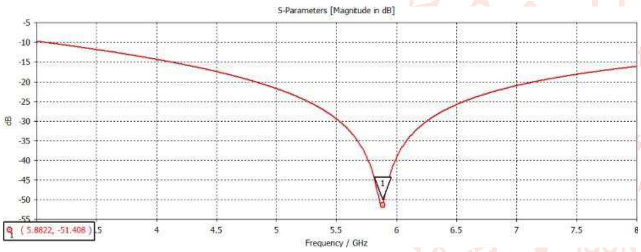

Fig 3.b WAVE frequency of Monopole antenna (radius=5)

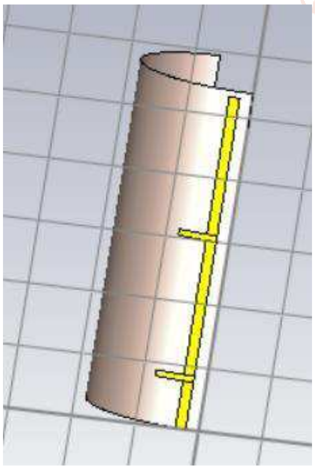

Fig 4.a Bending of flexible polyimide substrate

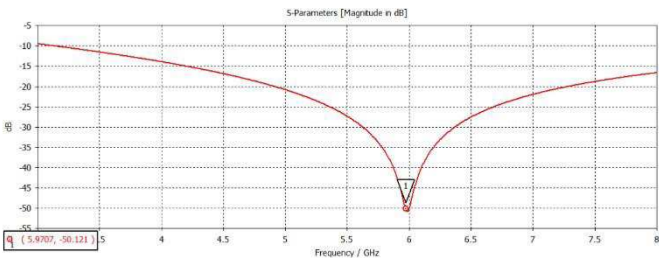

Fig 4.b WAVE frequency of Monopole antenna (radius=15)

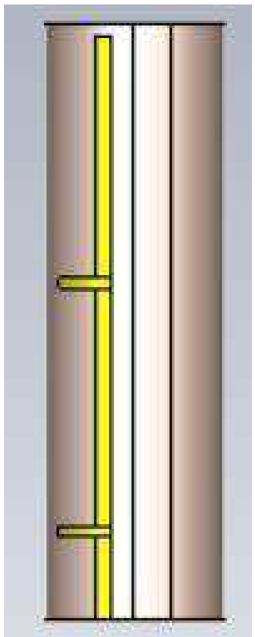

Fig5.a bending of flexible polyimide substrate

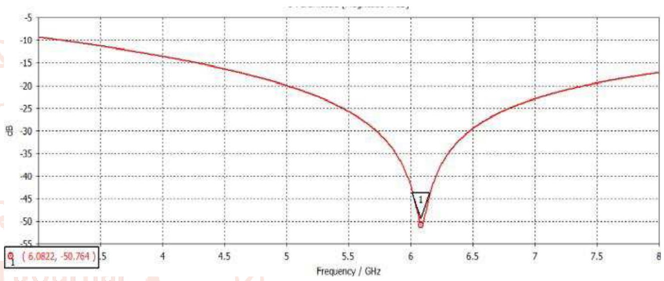

Fig 5.b WAVE frequency of Monopole antenna (radius=10)

The antenna with the polyimide substrate of radius=5 gives the frequency of 5.8GHz as shown in Fig3.b.substrate with the bending of radius=10 gives the output frequency of 6 GHz as shown in Fig 5.b .Flexible substrate with the radius=15 shows the WAVE frequency of automobile application 5.9 GHz as shown in Fig 4.b

VII. CONCLUSION

A new compact antenna solution covering LTE, for WAVE bands (5.9 GHz) that is fully integrated in the flexible polyimide substrate was proposed for automotive applications. The solution consists of a modified monopole, and a separate patch with easy and low-cost fabrication process. The solution is designed to fit in a roof of the car mounted on a finite ground plane. The simulation and the measurement results show that the antenna system exhibits good performances for return loss, radiation pattern, and isolation characteristics without matching network or decoupling techniques.

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