Wideband LTE/5G antenna for Automotive

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The demand of wideband cellular antennas for LTE/5G communication systems is continuously increasing in smartphones and vehicular applications. In particular, in automotive industry the number of wireless services is increasing, which consequently leads to a higher number of radiating elements. Typically, automotive on-board and roof-top antennas are used in order to fulfill these demands. It is required to integrate antennas at different positions on a vehicle for different services requirement in broadcasting and telematics. Various wideband and multiband printed antennas were reported to cover different cellular services. 2D printed antennas have relatively low gain and low radiation efficiency. On the other hand, 3D antennas were proposed to overcome this issue of low gain and low radiation efficiency. Specifically, 3D antennas efficiently utilize the limited available volume (under shark-fin cover, for example) of the device with an improved performance. A 3D Nefer antenna operating in the range from 698 MHz to 960 MHz and from 1470 MHz to 2700 MHz has been reported [1]. A low-profile wideband monopolar antenna integrated for vehicles and helmets in the operating range of 800-2300 MHz was reported in [2]. Also, in [3], a compact 3D antenna operating at LTE, GSM and UMTS frequency bands (790-2690 MHz) is proposed for vehicular applications. New wireless standards such as 4G Long Term Evolution (LTE) and 5G sub-6GHz increase the demand of wide bandwidth to accommodate more wireless channels.

A novel wideband 3D automotive antenna for Long Term Evolution (LTE) and 5G applications is presented here. It operates from 617 MHz up to 5 GHz and it is designed to be integrated under a shark-fin cover on a roof of a vehicle. Antenna geometry is shown in Figure 1. Antenna is made by cutting metal sheet and folded in such a way that it covers a wide frequency range. A small stub connected to the ground plane provides mechanical stability to the structure and achieves resonance at lower frequencies. The proposed design is compact, low profile and wideband, and it is well suited to cover various cellular services of modern wireless communication systems.

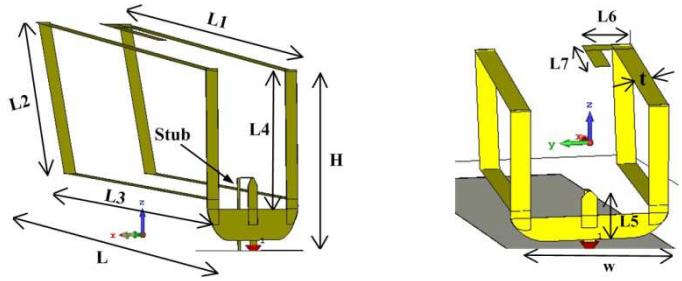

Figure 1. Proposed wideband LTE/5G antenna designed to be integrated under shark-fin cover on a vehicle roof. Dimensions: H = 35, L = 40, L1 = 35.8, L2 = 29.1, L3 = 35, L4 = 27, L5 = 12, L6 = 12.5, L7 = 9.65, W = 40, t = 5; all units are in mm.

References

[1] I. Goncharova, and S. Lindenmeier, “A High Efficient 3D Nefer Antenna for LTE Communication on a Car,” 8th European Conference on Antenna and Propagation (EuCAP), 2014, 3273-3277.

[2] N. Nguyen-Trong, A. Piotrowski, T. Kaufmann and C. Fumeaux, "Low-Profile Wideband Monopolar UHF Antennas for Integration Onto Vehicles and Helmets," IEEE Transa. Antennas Propag., vol. 64, no. 6, pp. 2562-2568, June 2016.

[3] V. Franchina et al., "A 3D LTE antenna for vehicular applications," 2017 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting, San Diego, CA, 2017, pp. 637-638.