Compact bidirectional circularly polarized dedicated short range communication antenna for on-board unit vehicle-to-everything applications

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ABSTRACT

This article presents a newly circularly polarized (CP) antenna for V2X's dedicated short range communications applications. Its CP characteristic is enabled by a 70 Ω sequential phase feeding network and sequential rotation technique designed on top of the substrate. It has features of ≈90° phase difference in sequence between ports of S_{21} = 2.4°, S_{31} = −87°, S_{41} = −180°, and S_{51} = −276°, resulting in a 2.19 dB axial ratio centered at 5.9 GHz. The length of the SP feeding network to each ports designed in the different form of meander lines are the key to control the generated phase at the center frequency It also contributes to the smaller final size of $0.59\lambda \times 0.59\lambda$. The proposed antenna operated from 5.850 to 5.925 GHz with a gain between 4 and 6 dBi. The gains are radiated in bidirectional mode due to the presence of the complimentary dipoles located on the opposite side of the substrate. These features indicate the suitability of the proposed antenna in compliance to the ITS-G5 OBU V2X standard.

KEYWORDS

Bidirectional; Circularly polarized; DSRC; Sequential phase; Sequential rotation; V2X

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