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Research Article

The Crossed-Dipole Antenna with Torang-shaped Parasitic Elements and Circular Polarization for GPS Application

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Abstract

This paper presents a circularly polarized (CP) printed crossed-dipole antenna for Global Positioning System (GPS) receptions in the L1 (1575 MHz) band. Its structure consists of two orthogonally printed dipoles, two integrated baluns to feed the dipoles, and a feed network connected to the baluns. The feeding network comprises a Branch-Line Coupler with two quadrature outputs. Accordingly, providing two orthogonal dipoles with a 90-degree phase difference leads to right-handed circular polarization (RHCP), a must for GPS applications. Four Torang-shaped parasitic elements have been used in the upper part of the dipole arms to improve the circular polarization of the antenna. Based on the practical results obtained with the technique, the antenna's Axial Ratio (AR) bandwidth is increased by about 21%. At the same time, the purity of the circular polarization can also be seen. The experimental results show that the proposed GPS antenna has an impedance bandwidth of 46.28% (from 1.327 to 2.126 GHz), an axial ratio bandwidth of 41.36% (from 1.329 to 2.022 GHz), and a maximum gain of 6.40 dB. The dimensions of the proposed antenna are compact, and this antenna has a stable radiation pattern. In the last step, the proposed GPS antenna is fabricated and tested in the antenna laboratory.

Keywords: Crossed Dipole Antenna, Parasitic Element, Circular Polarization, GPS.

Highlights

- In this research, a new design of orthogonal printed dipole antennas with circular polarization is presented.
- This antenna is useful for use in global positioning system receivers in the 1575 MHz band.
- In this design, four Torang-shaped parasitic elements are used to improve the circular polarization of the antenna.
- According to the practical results obtained with the used technique, the bandwidth of the axial ratio of the antenna has increased by about 21%.
- The purity of the circular polarization of the antenna has been significantly improved by using the Torang-shaped parasitic elements.

Citation: (in Persian).