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A Gain-Enhanced multiband frequency and pattern reconfigurable antenna for Wi-Fi 6E and 5G new radio wireless standards

Abstract

In this paper, a multiband hybrid reconfigurable antenna with enhanced gain is reported to support Wi-Fi 6E, indoor WLAN, and 5G new radio (NR) wireless standards. The reported structure consists of a half-hexagonal-shaped radiating element along with two symmetrical rectangular single-split resonators interconnected via two PIN diodes to achieve multiband frequency and pattern reconfigurability of the proposed antenna and a single-layer frequency selective surface (FSS) to enhance the gain. By configuring these PIN diodes in three distinct modes, the reported antenna allows for independent reconfigurability to support multipurpose sub-6GHz and Wi-Fi 6E (3.3, 3.5, 5.1, 5.3, and 6.5 GHz) wireless standards, respectively. The results also showed that the antenna is capable of maintaining a frequency of 6.5 GHz in all modes while reconfiguring its radiation pattern in three different directions, namely, 265°, 13°, and 337° on the xz plane. The gain of the proposed hybrid reconfigurable antenna is enhanced by an FSS-based reflector placed below the radiating structure at a distance of (Formula presented.) to the lowest operating frequency (3.3 GHz), and the gain is enhanced by 2–4 dBi as compared without FSS. The reported hybrid reconfigurable antenna is implemented on an FR-4 substrate with a depth of 1.6 mm and a relative permittivity of 4.4. For validation of the proposed structure, the experimental results are compared with the simulated results.

Keywords

5G new radio; frequency selective surface (FSS); gain enhancement; multiband reconfigurable antenna; Wi-Fi 6E