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Flexible Dual-Band Patch Antenna with Rubber Substrate for RF Energy Harvesting

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Abstract

This study investigates the design and performance of a dual-band microstrip patch antenna utilizing a rubber substrate for RF energy harvesting applications. The antenna is designed to operate at 2.45 GHz and 5.8 GHz, catering to wireless communication and Internet of Things (IoT) systems. A slotintegrated structure was incorporated to enable dual-band operation while enhancing the reflection coefficient bandwidth and gain. Simulation results, conducted using CST Microwave Studio, demonstrated that the optimized design achieved reflection coefficient values below -10 dB at both frequency bands, with corresponding gain values of 3.41 dBi and 3.00 dBi, respectively. The use of a rubber substrate underscored the design's potential for flexibility, indicating its suitability for wearable and stretchable applications without significant loss in efficiency. These results contribute

to the advancement of sustainable, flexible antenna solutions for next-generation communication technologies. © 2025 IEEE.

Indexed keywords

Engineering controlled terms

Bandwidth; Energy harvesting; Internet of things; Microwave antennas; Reflection; Slot antennas; Substrates

Engineering uncontrolled terms

Dual Band; Dual-band operations; Dual-band patch antenna; Micro-strip patch antennas; Microstrip-patch antenna; Performance; RF energy harvesting; Rubber substrates; Wireless communications; Wireless internet

Engineering main heading

Microstrip antennas

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