Efficacy of a wideband flexible antenna on a multilayer polymeric nanocomposites Fe3O4-PDMS substrate for wearable applications

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ABSTRACT

The recently introduced polymeric nanocomposites substrate layer technology is used in the design of a flexible antenna array for wearable applications. This new technology allows a considerable widening of the bandwidth of classical microstrip topologies. This means that a relatively wide band can be combined with a full ground plane in a very simple structure, which is an ideal combination in wearable applications. The wideband and flexible features enabled the antenna to mitigate body-detuning effects. The proposed antenna prototype consists of a 2×2 array of rectangular patch elements with dimensions of $70 \times 70 \times 4.2\ mm^3$. The measurements are performed in free space, and on-body under bent conditions. The antenna working within the frequency band of 5 GHz–8.2 GHz, with a fractional impedance (FBW) bandwidth of 50.34%. The antenna demonstrates a maximum radiation efficiency of 60%, and 9.8 dB of realized gain. Since this antenna is intended for on body-centric wireless communication application, the specific absorption rate is evaluated when the antenna is placed on the right arm of a realistic human phantom. The performances and features of the proposed antenna paved the way for off-body connections in a WBAN and wearable applications including WiFi, telemedicine and Vehicle-to-Everything (V2X).

KEYWORDS

Nanocomposite polymer substrate; Wearable antenna; On-body measurement; Specific absorption rate

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