UWB nanocellulose coconut coir fibre inspired antenna for 5G applications

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ABSTRACT

This paper intended to design an Ultra-Wideband (UWB) Antenna for IoT applications that operates within 5G operating frequencies. One of the IoT-based devices architecture is Wireless Body Area Networks (WBAN). WBAN allows computer device to communicate with human body signal by trading digital information such as electrical conductivity. 5G is the state-of-the-art generation mobile communication. A higher data speed it offers will improve data communication efficiency in WBAN system. Two biggest challenge foreseen for the wearable UWB antenna are the physical flexibility and the antenna bandwidth. Since it is a wearable device, the selection of the material is crucial in order to ensure high flexibility and mechanical robustness. The next challenge is to warrant a wideband performance throughout the operating frequency and a trade-off with a high-dielectric in proposed substrate is essential. This paper presents a design and parametric analysis of an antenna using Nanocellulose Fiber Coir substrate with wider bandwidth as compared to 5G frequencies, 10.125 to 10.225 GHz. This paper also exhibits bandwidth improvement with the presence of artificial magnetic conductor (AMC) as a metasurface. A typical UWB patch antenna was initially designed before being integrated with AMC through a parametric sweep analysis. This paper analyzes the frequency, gain, directivity, antenna efficiency before and after optimization. This paper successfully demonstrates a Y-shaped antenna design with coplanar waveguide (CPW) using a thin film Nanocellulose Coconut Fibre Coir as a substrate and the bandwidth improvement by 16.12% with the AMC as a metasurface.

KEYWORDS

UWB; Wearable; Bandwidth; 5G; Nanocellulose Fiber Coir; AMC

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