

ABSTRACT

Wearable antenna is a vital component in the Wireless Body Area Network (WBAN) on-body communication. This research focuses on characterizing traditional Indonesian batik fabric's Material Under Test (MUT) using chen's method and Complementary Split-Ring Resonator (CSRR) extraction techniques. Both methods achieved over 90% accuracy in tests using FR-4 material, enabling further batik material measurements. However, Chen's method didn't align with textile characteristics. On the other hand, the CSRR method got six candidate permittivity and loss tangent at various resonance frequencies that matched the material characteristics, making it the chosen method for this study.

Simulations and measurements were conducted at 2.4 GHz frequency. The antenna closest to 2.4 GHz in simulation and measurement was selected for relative permittivity and loss tangent determination. CSRR measurements showed a relative permittivity of 2.083 and loss tangent of 0.144 with 99.167% accuracy.

The proposed wearable antenna was validated for real-time heart rate data transmission using Heartpulse sensor and ESP32 microcontroller to Thingspeak website for visualization. This development enables accurate wireless heart rate monitoring, showcasing wearable antennas' potential in transmitting relevant medical data for health monitoring applications.

Keywords: Wearable antenna, material characterization extraction, Wireless Body Area Network (WBAN), (CSRR), Material Under Test.