

Design and Evaluation of Normal Mode Double-Spiral Parallel Dipole Antenna for Ultra-High Frequency RFID Tag Thread

Shiying Bao , Jinghong Yu, Jiyong Hu*

¹Collge of Textiles, Donghua University, *North Renming Road, Songjiang, Shanghai, 201620, China*

*Presenter's email: hujy@dhu.edu.cn

ABSTRACT

Radio frequency sensing technology demonstrates significant advantages in addressing wiring challenges and energy consumption limitations for wearable physiological monitoring devices. Although multiple textile-based flexible two-dimensional UHF or one-dimensional NFC sensor tags have been developed, existing solutions still exhibit limitations such as short sensing ranges, bulky dimensions and visibility issues. Focusing on passive UHF RFID tags, we employ a normal mode dual-helix parallel dipole antenna combined with impedance mismatch principles to develop a flexible stretchable UHF RFID multimodal sensor yarn. This innovative structure enables continuous roll-to-roll production of sensor yarn compatible with established textile and electronics manufacturing processes, featuring dual sensing capabilities for strain and humidity detection. Practical applications include garment embedding for limb movement monitoring and intelligent medical gauze management systems, with potential future expansion into digital product passports for textile apparel industries.