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Design and Optimization of a Conformal 433 MHz Helmet-Mounted Antenna for Tactical Application

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Abstract

This study investigates the design and simulation of a conformal antenna operating at 433 MHz for integration onto a military helmet. The antenna is optimized to follow the curved surface of the helmet, enabling low-profile deployment for soldier-worn communication systems. Full-wave electromagnetic simulations were conducted using CST Studio Suite to evaluate key performance parameters, including the reflection coefficient (S_{11}), radiation pattern, and antenna gain. The results demonstrate good impedance matching at the target frequency, with a stable radiation pattern and acceptable gain despite the curvature and proximity to the human head. These findings indicate that the proposed helmet-mounted conformal antenna is a promising candidate for reliable tactical communication at 433 MHz, with potential for further improvement and real-world deployment.

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Author keywords

conformal antenna; monopole antenna; specific absorption rate (SAR)

Indexed keywords

Engineering controlled terms

Accident prevention; Aviators; Avionics; Directional patterns (antenna); Electromagnetic simulation; Electromagnets; Military communications; Pattern matching; Safety devices; Wearable antennas

Engineering uncontrolled terms

Communications systems; Conformal antennas; Curved surfaces; Design and optimization; Design and simulation; Full-wave electromagnetic simulation; Low-profile; Specific absorption rate; Tacticals

Engineering main heading

Monopole antennas

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