

Compact Antenna for Microwave Imaging Applications

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Microwave imaging is attracting significant attention in medical applications, particularly for non-invasive diagnostic techniques such as stroke detection, due to its ability to penetrate biological tissues, provide rapid diagnoses, and reduce costs. This paper presents a compact microstrip patch antenna with a full-ground plane, designed specifically for microwave imaging applications. The antenna operates within the frequency range of 0.95 GHz to 1.7 GHz. It consists of four radiating patches connected in series and twisted around a parasitic element that includes an H-shaped slot and two vias, as shown in Fig. 1(a-c). This optimized configuration minimizes the overall size of the antenna while significantly enhancing the bandwidth. The antenna is designed on a 3 mm-thick RF substrate with overall dimensions of 34 mm × 39 mm × 3 mm, making it suitable for integration into compact, portable medical imaging systems. The design is optimized in close proximity to a homogeneous human body model with average dielectric properties to ensure optimal impedance matching and enhance signal coupling into biological tissues. The simulated S11 results, shown in Fig. 1(a), demonstrate good impedance matching over the 0.95–1.7 GHz frequency band, achieving a bandwidth of 750 MHz. Furthermore, the antenna exhibits unidirectional near-field radiation, as illustrated by the normalized E-field distributions at 1 GHz in Fig. 1(e), which facilitates improved signal penetration into human tissues. The simulation results highlight the potential of the proposed antenna for compact, lightweight microwave imaging systems, offering promising capabilities for medical diagnostics.

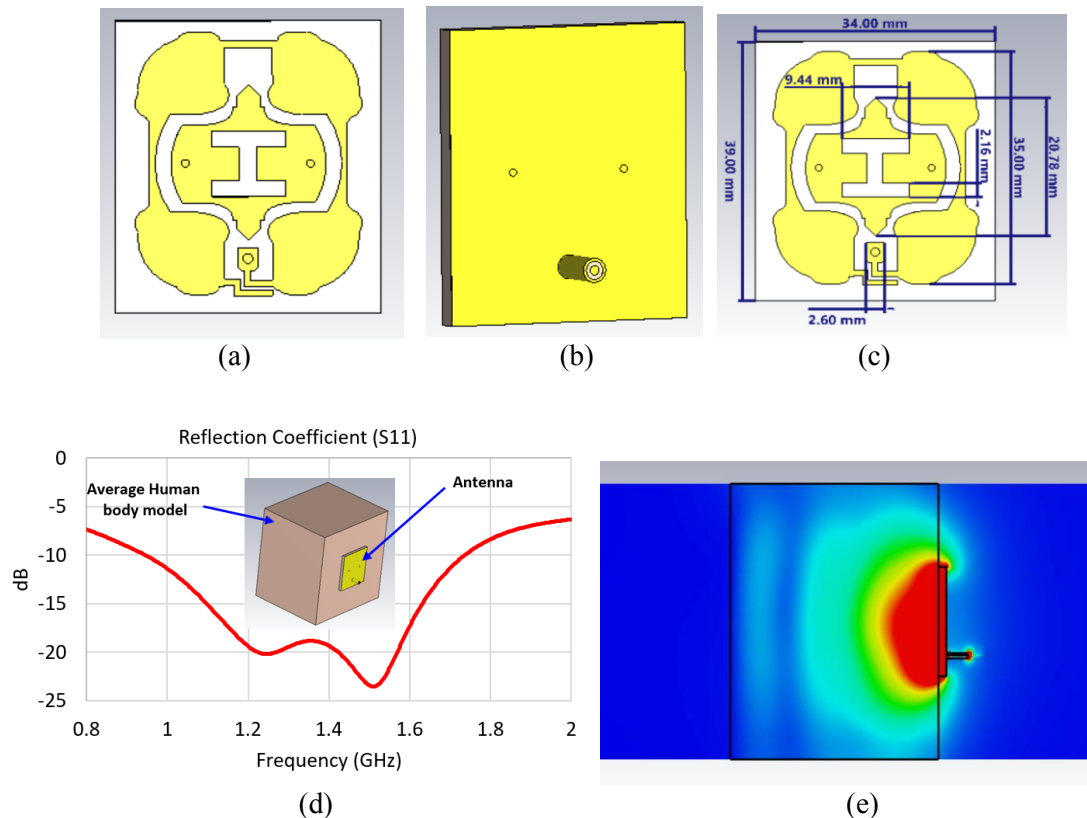


Fig. 1 Geometry of the proposed antenna and simulated results, (a) front view, (b) backside view, (c) front view with dimensions, (d) simulated S11, and (e) normalized E-field distributions at 1 GHz.