Design, Simulation and Fabrication of an Implanted Antenna at ISM Band in Body Tissue

Majedeh Seydi

Razi University

Mohammad Sajjad Bayati (✉ s.bayati@gmail.com)

Razi University <https://orcid.org/0000-0002-5184-8840>

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Abstract

A rectangular meandering-microstrip patch antenna (RM-MPA) with shorting pin for implant antenna and biomedical applications at industrial, scientific, and medical (ISM) band is proposed. The rectangular patch has length of $l = 14$ mm and width of $w = 9.4$ mm. The substrate and superstrate are made of Rogers 3210 with dielectric constant equals 10.2. The RMMPA is placed between the substrate and superstrate dielectric layers whose same thickness equals 0.635 mm. The proposed antenna is fed by a 50-ohm coaxial probe, at the centre of the length and edge of the width of the patch. The input impedance of patch antenna varies with the patch geometry. Thus, the geometry of the patch changed to achieve impedance matching at ISM band. The rectangular patch divided to three sections along width for meandering. The resonance frequency is tuned by meandering each section. The proposed antenna is simulated in free space and skin phantom. Proposed antenna has efficiency of 90%, bandwidth 1.02%. Both radiation pattern and SAR are evaluated which SAR level is below the safety and satisfies SAR standards. Finally, the antenna is tested in minced meat and tissue liquid.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures

Figure 1

Rectangular patch a- top view b- side view

Figure 2

Four cases considered for patch design

Figure 3

Input impedance: a-real part, b-imaginary part

Figure 4

Reflection coefficient of considered cases

Figure 5

Geometry of the proposed antenna

Figure 6

Simulated radiation pattern of proposed antenna (Hplan & Eplan)

Figure 7

Simulated gain of proposed antenna

Figure 8

1-layer and 3-layered phantoms

Figure 9

Comparison of reflection coefficient of 1-layer and 3-layers phantoms

Figure 10

SAR as a function of distance

Figure 11

Fabricated antenna in free space

(a)

(b)

(c)

Figure 12

Measurement set up for antenna a) tissue liquid, b) minced meat and c) free space

Figure 13

Measured S_{11} in free space, minced meat and tissue liquid

Figure 14

Comparison between simulation and test result: a-in free space, b- in tissue liquid and minced meat

Radiation Pattern of Ant at $f=2.66\text{GHz}$

Figure 15

Radiation pattern of fabricated antenna