A Very Small Triangular Shaped Printed Monopole Antenna For Bluetooth/WLAN and UWB Applications

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Abstract: - In this paper, a compact (12 x 20 mm²) triangular shaped microstrip antenna with dual band characteristics is presented for Bluetooth/WLAN and ultrawideband (UWB) applications. The proposed structure consists of a simple triangular shaped radiating patch for achieving UWB characteristics and quarter wavelength inverted L shaped strip for achieving 2.45 GHz Bluetooth applications. The first operating band characteristics can be controlled by changing the electrical length of the strip along with coupling gap between the patch and strip. To enhance the impedance bandwidth of second operating band, an equilateral triangular shaped cut has been introduced in the patch. The results demonstrate that the proposed antenna exhibit dual frequency operation from 2.4 to 2.52 GHz and from 3.6 to 10.6 GHz. The antenna has omnidirectional radiation patterns in H-plane, bidirectional patterns in E-plane and acceptable peak gains and radiation efficiencies.

Keywords: - monopole antenna, dual-band antenna, bluetooth, UWB antenna and wireless local area network (WLAN).

References:


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Why Compact Antennas?

Why Multi-band Antennas?
## Literature Review

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1. Reducing the antenna size

2. With good antenna characteristics
Geometry of the Proposed Antenna

The optimized dimensions $W = 12$, $L = 20$, $L_1 = 8.5$, $L_2 = 9.1$, $W_1 = 2$, $W_2 = 9.5$, $W_3 = 11.8$, $L_3 = 3.1$, $W_4 = 8.6$, $L_4 = 4$, $L_5 = 4.5$, $L_6 = 10.6$, $g = 1$, $\theta = 60^\circ$, (all dimensions are in mm).
Antenna Evolution Stages

[Diagram showing three stages of antenna evolution with corresponding return loss graphs]
Design Analysis

Frequency (GHz)

Z11 impedance real part (in ohms)

Z11 impedance imaginary part (in ohms)

Ant #1
Ant #2
Ant #3 (proposed)

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Mathematical Analysis

\[ L_6 = \frac{c}{4f_{2\text{min}} \sqrt{\varepsilon_{r,\text{eff}}}} \]  \hspace{1cm} (1) \hspace{1cm} L_5 = \frac{c}{4f_{2\text{max}} \sqrt{\varepsilon_{r,\text{eff}}}} \]  \hspace{1cm} (2)

\[ f_1 = \frac{c}{4Y_1 \sqrt{\varepsilon_{r,\text{eff}}}} \]  \hspace{1cm} (3) \hspace{1cm} \varepsilon_{r,\text{eff}} = \frac{\varepsilon_r + 1}{2} \]  \hspace{1cm} (4)
Parametric Study

Return loss S11 (dB)

Frequency (GHz)

Y1 = L2 + W2 + L3

Y1 = 20.7 mm
Y1 = 21.7 mm
Y1 = 22.7 mm

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Measured Radiation Patterns

E-plane

H-plane

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Peak Gains and Radiation Efficiency
References


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