A Semi-Supervised Deep Learning Approach for Detection and Classification of Lung Diseases

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A miniaturized UWB monopole antenna for sub-6 GHz 5G wireless applications

Aparna Panja; Arnab De; Koyndrik Bhattacharjee; Somnath Maity; Ankan Bhattacharya; Bappadittya Roy; Partha Pratim Sarkar; Anup Kumar Bhattacharjee

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Total Quality Management (TQM) for clean, affordable and reliable energy in research and development lab - A case-study from north east India

Vaskar Rajkhowa; M. K. Loganathan; Manvinder Singh Pahwa

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Publisher: IEEE

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Abstract:
This article describes a miniaturized, ultra-wideband monopole antenna with dimensions of 23.00 x 20.00 x 1.60 mm ^{3} (0.23λ 0 x 0.23λ 0 x 0.016λ 0) designed for sub-6 GHz 5G wireless applications. The suggested layout is compatible with sub-6 GHz 5G, including satellite X-band (7.5-8.5 GHz), ITU n77 (3.3-4.2 GHz), and n79 (4.4-5 GHz) bands, 802.11a WLAN (5.15 - 5.85 GHz), and WiMAX bands (3.5/5.5 GHz). The suggested structure uses a fusion shape of rectangular, triangular, and trapezoidal slits on the ground plane and isosceles triangle, octagonal slot on the metal patch to improve the radiation characteristics and impedance bandwidth. The addition of rectangular slits which are incorporated into the bottom plane just below the microstrip line and trapezoidal-shaped slots shifts the lower cut-off frequency towards the left, while the octagon-shaped slot and the isosceles triangular slit on the radiating patch shift the higher cut-off frequency towards the right. The suggested structure operates over the range from 3.10 to 18.87GHz, having an equivalent fractional bandwidth of 143.58% and a peak gain of around 5.37 dBi. The antenna has a radiation efficiency of 80.00% and displays a decent S 11 ≤-10 dB throughout the bandwidth. Results from measurement and simulation are good in agreement.

Published in: 2023 IEEE Silchar Subsection Conference (SILCON)

Date of Conference: 03-05 November 2023

Date Added to IEEE *Xplore*: 30 January 2024

ISBN Information:

Electronic ISBN:979-8-3503-1414-4

Print on Demand(PoD) ISBN:979-8-3503-1415-1

DOI: 10.1109/SILCON59133.2023.10405231

Publisher: IEEE

Conference Location: Silchar, India

A miniaturized UWB monopole antenna for sub-6 GHz 5G wireless applications

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2023 IEEE Silchar Subsection Conference (SILCON) | 979-8-3503-1414-4/23/$31.00 ©2023 IEEE | DOI: 10.1109/SILCON59133.2023.10405231

***Abstract*—This article describes a miniaturized, ultra-wideband monopole antenna with dimensions of 23.00 x 20.00 x 1.60 mm^3 (0.23λ_0 x 0.23λ_0 x 0.016λ_0) designed for sub-6 GHz 5G wireless applications. The suggested layout is compatible with sub-6 GHz 5G, including satellite X-band (7.5-8.5 GHz), ITU n77 (3.3-4.2 GHz), and n79 (4.4-5 GHz) bands, 502.11a WLAN (5.15 - 5.85 GHz), and WiMAX bands (3.5/5.5 GHz). The suggested structure uses a fusion shape of rectangular, triangular, and trapezoidal slits on the ground plane and isosceles triangle, octagonal slot on the metal patch to improve the radiation characteristics and impedance bandwidth. The addition of rectangular slits which are incorporated into the bottom plane just below the microstrip line and trapezoidal-shaped slots shifts the lower cut-off frequency towards the left, while the octagon-shaped slot and the isosceles triangular slit on the radiating patch shift the higher cut-off frequency towards the right. The suggested structure operates over the range from 3.10 to 18.87GHz, having an equivalent fractional bandwidth of 143.56% and a peak gain of around 5.37 dBi. The antenna has a radiation efficiency of 80.00% and displays a decent S_{11} ≤-10 dB throughout the bandwidth. Results from measurement and simulation are good in agreement.**

***Keywords*— isosceles triangular slot, miniaturized UWB antenna, N77, trapezoidal slots, 5G sub-6 GHz Band Applications**

I. Introduction

Due to the outstanding improvement of wireless communication technologies, 5G technology has recently emerged as a significant development trend [1,2]. Because of its advantages, including high data rate, fast speed, improved capacity, low latency and connection, fifth-generation (5G) technology has played a crucial part in current communication systems [3,4]. Offering users data speeds up to 10 Gbps is the primary objective of 5G technology, which is roughly ten times as fast as 4G-LTE while keeping low latency and great reliability [5]. More astonishing data transfer rates in a vast region covered and indoor network accessibility were made possible by a sub-6 GHz frequency spectrum [6,7]. The 5G RANs (Radio Access Networks) are predicted to handle several 5G bands concurrently while using different frequencies [8]. The ITU-R has established various criteria to evaluate the spectrum's demand needed for IMT (international mobile telecommunication). Recently, ITU-R has been researching to meet the requirements for 2020 and is nearly finished [6]. An initiative has been launched to commercially install 5G in the sub-6 GHz band[9]. Sub-6 GHz and Millimetre wave band have been designated by the ITU for 5G. Engineers were encouraged to utilize 5G technology effectively and efficiently by creating antennas that support nearly all of these desirable aspects due to the ever-increasing need for distribution at elevated data speeds with little power consumption and low prices. Microstrip patch antennas are appropriate for 5G systems operating below 6 GHz because they are inexpensive, lightweight, and easy to manufacture and also function at lower band frequencies [10].

The slot antenna technology is one of many sub-6 GHz antenna ideas discussed in the available research, where impressive results have primarily been demonstrated. The innovations have resulted in miniaturized antennas with high efficiency. Slot antennas are used for various purposes, specifically WLAN, 4G LTE, WiMAX, Bluetooth etc. Despite the uses that have already been mentioned, slot antennas are widely employed for 5G wireless communications, which now mostly involve portable devices. Liu, W.-C.[11] investigated