Hindawi Publishing Corporation
International Journal of Antennas and Propagation
Volume 2014, Article ID 693412, 7 pages
http://dx.doi.org/10.1155/2014/693412

Research Article

Development of a Semielliptical Partial Ground Plane Antenna for RFID and GSM-900

M. R. Zaman,[1] R. Azim,[1] N. Misran,[1] M. F. Asillam,[2] and T. Islam[1]

[1] *Institute of Space Science (ANGKASA), Level 2, Faculty of Engineering and Built Environment Building, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia*
[2] *National Space Agency of Malaysia, 62100 Putrajaya, Selangor, Malaysia*

Correspondence should be addressed to M. R. Zaman; robelhk@yahoo.com

Received 24 October 2013; Accepted 11 November 2013; Published 9 April 2014

Academic Editor: J. S. Mandeep

A novel compact broadband patch antenna for UHF (ultrahigh frequency), RFID (radio frequency identification), and GSM-900 (global system for mobile communications) band is shown in this paper. The antenna is composed of an ellipse shape annular ring at the patch. The ground plane of the planar antenna is modified with a semiellipse shape slot. The structure can generate substantial amount of current at the feed-line. The geometry of the antenna is evaluated by using HFSS simulation software and deliberated across the paper. Parametric study is exhibited to delineate the response change of the antenna. The antenna has a physical width of 0.24 λ and length of 0.3 λ. It covers a frequency starting from 0.9 GHz to 1.08 GHz. A fractional bandwidth of 18.2% has been achieved from 0.9 GHz till 1.08 GHz. An average gain of 5.5 dBi is achieved at the resonance frequency. The simulated and measured results have good agreement.

1. Introduction

Microstrip antennas are becoming more popular in communication systems day by day. With the help of cost effective substrates and different copper shapes over and under the substrate, researchers are getting new bands of interest with comparatively less complexity than other types of antennae. Recent advances in radio communications have increased the demand in the antenna technology.

A RFID reader antenna using metamaterial is shown in [1]. Coupled branch-line is used to attain dual frequency performance. However, the measured S_{21} response of the antenna falls below −5 dB by introducing loss to the coupled line. A rectangular slot is introduced in the ground plane with a circular ring at the patch in [2] to enhance the impedance bandwidth. Another near field RFID reader antenna is exhibited in [3] to have a reading performance of about 7 cm. Despite that, the antenna has a bulky dimension of 882 mm × 80 mm. A compact rectangular planar antenna is proposed in [4] with a small size and wideband performance. In [5], an antenna is presented for mobile RFID reader. Though the antenna evaluates quadrifilar spiral antenna (QSA) technology for RFID application, nevertheless the antenna gain is as low as 0.06 dBic. An S-shaped impedance matching network is used in designing a mobile RFID reader for 2.45 GHz in [6]. Although the antenna has a gain of 6 dBi at the operating frequency, nonetheless, the antenna thickness is 11 mm which gives a drawback for portable applications. A RFID reader antenna with L-shaped ground plane is displayed in [7]. The antenna has a dimension of 250 mm × 105.5 mm which is sizable in RFID application. Circular slot is introduced to have dual frequency response in [8, 9] by using FR4 substrate. This RFID reader antenna has a measured gain of 3.5 dBi at the operating frequency. A half ellipse shape antenna is designed in [10] for vital sign detection at 400 MHz frequency. In the paper the ellipse shape antenna is compared with a bowtie shape antenna. The impedance characteristics of the ellipse shape antenna jump over 150 Ω at the claimed frequency with an imaginary value of $-j20\ \Omega$. Another half ellipse shape antenna with different height of backed cavity above ground is shown in [11]. The antenna shows an improvement over popular bowtie shape UWB antenna. However, the VSWR of the proposed antenna is greater than 2 at the claimed frequency. An ellipse-loaded