Design and Characterization of an Electrically Small Meander Line Antenna for UHF RFID Applications

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The proliferation in applications of automatic identification have made radio frequency identification (RFID) become the de facto technology in modern wireless communication. RFID systems which basically consists of tags which receives modulated RF signal from the RFID reader, is heavily dependent on the efficiency of the designed tag antenna. Moreover, RFID tags achieves optimum operating condition, whenever the antenna impedance have good matching with the chip impedance. As a result, accurate RFID tag antenna design becomes imperative which comes down to the enhancement of the reflection coefficient between the tag antenna and the chip. Nevertheless, passive UHF tags represents an optimal combination of cost and performance which have necessitated its use in most modern applications [1]. RFID tag antennas are designed in various forms such as fractal, meander, text and microstrip determines the operability of the RFID system [2]. However, meander line antenna which basically shortens the electrical length of a monopole or dipole antenna by bending its lengths in horizontal vertical positions exhibits higher efficiency in comparison with other tag antennas. In this paper, we propose an electrically small meander line antenna with an overall dimension of 63mm × 20mm operating at the UHF frequency range (860 – 960) MHz band. The antenna is design from two rectangular parallel folded lines with a 50Ω input impedance and it is modelled using the Ansoft HFSS software. The geometry, return loss and the input impedance of the meander line antenna is presented below:
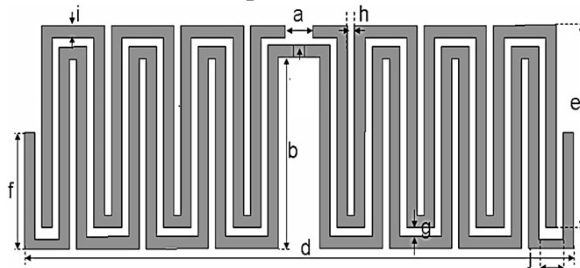

Dimensions (mm) of the folded lines			
a	3.2	f	11.5
b	19.1	g	0.9
c	4.8	h	0.8
d	63	i	1.2
e	19.9	j	2.8

Fig.1. Geometry of the antenna   Table 1. Dimensions of the folded lines used for meandering

The antenna shows a return loss of 34.3dB at 867MHz with an approximate 3MHz bandwidth sufficient for any RFID application. In addition, the input impedance of the simulated antenna is obtained to be (14.3 – j134.8) Ω.
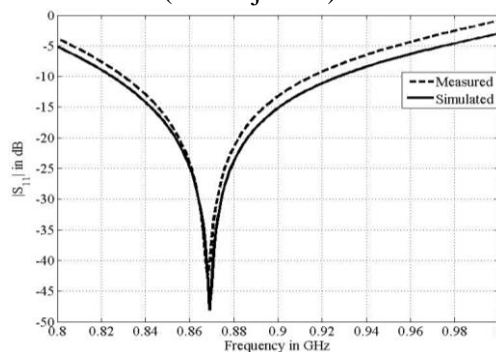

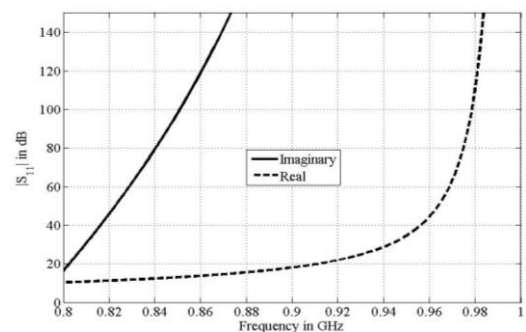Fig.2. Reflection coefficient S_{11} of the meander antenna   Fig.3. Input impedance of the meander antenna

REFERENCES

1.   V. Daniel Hunt, A.P., Mike Puglia, *RFID - A Guide To Radio Frequency Identification*. 2007, USA and Canada: Wiley-Interscience by John Wiley & Sons, Inc., Hoboken, New Jersey. 241.
2.   Salama, A.M.A., *Antennas for RFID Tags*. InfoTech. 2010, Olajnica 19/2, 32000 Vukovar, Croatia: Intech.