Cairo University

DESIGN, FABRICATION, AND MEASUREMENT OF TAG AND READER ANTENNAS FOR RFID APPLICATIONS

By
Dina Ali Abd EL-Aziz Mohamed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Electronics and Communications Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT

2017

DESIGN, FABRICATION, AND MEASUREMENT OF TAG AND READER ANTENNAS FOR RFID APPLICATIONS

By
Dina Ali Abd EL-Aziz Mohamed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Electronics and Communications Engineering

Under the Supervision of

Prof.Dr. Mostafa El-said Mostafa
……………………………….
Professor of Microwave Engineering
Communications and Electronics Engineering Dpt.
Faculty of Engineering, Cairo University

Prof.Dr. Esmat Abdel-Fattah Abdallah
……………………………….
Professor of Microwave Engineering
Electronics Research Institute

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT

2017

DESIGN, FABRICATION, AND MEASUREMENT OF TAG AND READER ANTENNAS FOR RFID APPLICATIONS

By
Dina Ali Abd EL-Aziz Mohamed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Electronics and Communications Engineering

Approved by the
Examining Committee

____
Prof.Dr. Mostafa El-said Mostafa, Thesis Main Advisor

____
Prof.Dr. Esmat Abdel-Fattah Abdallah, Member, Microstrip Department, Electronics Research Institute

____
Prof.Dr. Samir Fahmi Mahmoud, Internal Examiner

____
Prof. Dr. Hadia Mohamed Said El Hennawy , External Examiner

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT

2017

Engineer's Name: Dina Ali Abd EL-Aziz Mohamed
Date of Birth: 27/01/1990
Nationality: Egyptian
E-mail: eng.dina_ali@hotmail.com
Phone: 01004412468
Address: Khatem El-Morsaleen St. Haram-Giza.

Registration Date: 01/10/2011
Awarding Date: …./…./……..
Degree: Master of Science
Department: Electronics and Communications Engineering
Supervisors: Prof. Dr. Mostafa El-said Mostafa
Prof. Dr.Esmat Abdel-Fattah Abdallah, Microstrip Department, Electronics Research Institute.

Examiners: Prof. Dr. Hadia Mohamed Said El Hennawy (External Examiner) Ain shams university.
Prof. Dr. Samir Fahmi Mahmoud (Internal Examiner)
Prof. Dr. Mostafa El-said Mostafa (Thesis main advisor)
Prof. Dr. Esmat Abdel-Fattah Abdallah(Member)- Microstrip Department, Electronics Research Institute

Title of Thesis:
Design, Fabrication,and Measurement of Tag and Reader Antennas for RFID Applications.

Key Words:
Bandwidth; Bow-tie antenna; Radio frequency identification (RFID); Ultra high frequency (UHF).

Summary:
The Thesis is concerned with:
- Overview on Radio Frequency Identification and it's requirements.
- New proposed methods to design and calculate the complex input impedance of RFID tag bow-tie antenna.
- Design, modeling and fabrication of conventional and modified Bow-Tie RFID tag antennas matched to Monza 5 chip impedance.
- Design, and modeling of a UHF RFID patch tag antenna. This antenna can be used for metallic objects as it achieves high performance when it is mounted on metallic plate.
- Design, modeling and fabricating different shapes of circularly polarized RFID reader antennas so as to monitor RFID tag from any side.
- Measurements and calculation of uncertainty of antennas designed for radio frequency identification system operating at resonance frequency 900MHz.

ACKNOWLEDGMENT

All gratitude is due to " *ALLAH* " who guides me to bring forth to light this thesis.

It gives me pleasure to take this opportunity to acknowledge my indebtedness to all those who have helped me in one way or another in completing the present work.

Firstly, I would like to express my deepest thanks to my supervisor Prof. Dr. Esmat A. Abdallah for help, enthusiastic support, continuous encouragement and guidance during research work and her extremely great effort in revising thesis never forgetting any details.

I also want to thank the thesis main advisor Prof.Dr. Mostafa El-said Mostafa, Communication and Electronics Engineering Department at Cairo University, Egypt for his interest in antennas and his guidance in master qualification courses.

I owe special thanks to Dr.Tamer G.Abuo El-Naga for his early guidance, friendly approach, many helpful discussions, his cooperation at several stages of this thesis work, his extremely great effort in revising published paper "Analysis and Design of UHF Bow-Tie RFID Tag Antenna Input Impedance", and also for his support in antenna simulation and measurement techniques for a complicated tag antenna structure.

Also, I want to thank Dr. Yaser S. Abdo for his help in doing the meteorological data analysis and calculating uncertainty budget for antennas, his guidance and help through thesis work.

I would like to acknowledge my work place, National Institute for Standards (NIS), for providing facilities and hi-tech instrumentation to carry out the present work.

Finally, I am very grateful especially to my mother, who has encouraged me to finish this work, helping me through my college years. Without her I would never have the strength to succeed. Allah bless her.

DEDICATION

To my husband Ahmed, my mother, my father, my sister Sara , my brother Hany and his son Hamza, my grandmother, my aunt Rania, my friends.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES