# PRINCIPLES OF TRANSDUCER DEVICES AND COMPONENTS

**Edited by**

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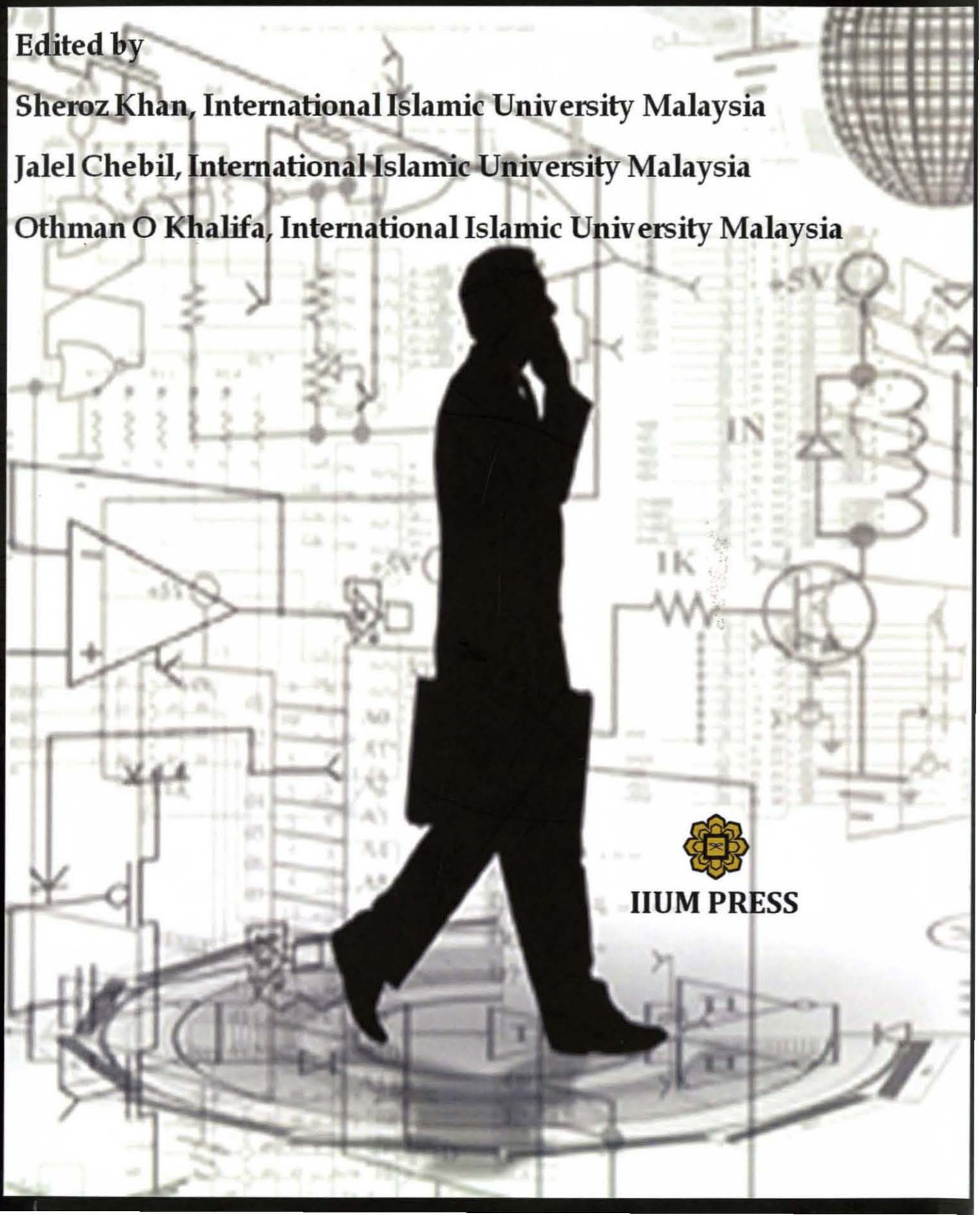

**IIUM PRESS**

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Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011


Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Sheroz Khan, Jalal Chebil & Othman Khalifa: Principles of Transducer Devices and Components

ISBN: 978-967-418-172-7

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed By:
**IIUM PRINTING SDN.BHD.**
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
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Selangor Darul Ehsan
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# CONTENTS

# Chapter 25

# 2.45 GHz PASSIVE RFID TAG ANTENNA MOUNTING ON VARIOUS PLATFORMS

ABUBEKER A. YUSSUF, MD RAFIQUL ISLAM, SHEROZ KHAN, OTHMAN O. KHALIFA, AHM ZAHIRUL ALAM

## 25.0 INTRODUCTION

This chapter presents the design of Microwave RFID tag antenna. The tag antennas are designed using the electromagnetic simulation software called CST for a passive RFID tag operating in the Microwave frequency band. A microwave band tag antenna was designed and simulated for 2.45GHz. A high gain (5.842dB), a good impedance matching with the microchip (-30.0 dB Return Loss) and a satisfactory read range performance (up to 5 m) was obtained. One approach of designing RFID tag is that the tag should be less sensitive to the various types of objects. The effects of obstacles on antenna's characteristics have been investigated by placing the tag antenna against a metallic, rubber, glass and wood surfaces. Simulation results show slight variations which is within tolerance range.

RFID system composes of a tag, which is attached to an object and uses an antenna to communicate with a reader. There are several possible antenna types which can be used for RFID tags. The dipole types of antennas such as folded dipoles and meandered dipoles are used in many applications. However, when they are mounted on the metallic objects, the antenna performance is degraded because of the variation of antenna impedance [1]. The Microwave band RFID system is a passive system where a tag does not contain its own power source. Therefore, the reader antenna sends a radio signal into the air to activate the tag, then listens for a backscatter from the tag by powering it first, and reads to accept the data transmitted by the tag. Passive tag antenna must be designed to transmit maximum power to the microchip without possible losses. Hence, near perfect impedance matching is required between the tag antenna and the microchip. Designing a passive tag antenna matched with the complex microchip impedance is the most challenging factor in this work, since a microchip has its small resistance and large capacitive reactance. Also, the impedance of an RFID tag antenna varies when it is mounted on different objects. Particularly, metallic objects strongly affect the antenna performance by lowering the tag's efficiency. Hence, tag antennas have to be designed to enable tags to be read near and on metallic objects without performance degradation. In order to obtain stable antenna performance on various metallic platforms, minimizing the effect of the metallic supporting object is an important work. In this chapter microwave tag antennas which are mountable on different object are introduced and analyzed.