ANTENNAS AND PROPAGATION

Modeling, Simulation & Measurements

Edited by

MD. RAFIQUL ISLAM B.Sc.,M.Sc.,Ph.D.,MIEEE
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JALEL CHEBIL B.Sc.,M.Sc.,Ph.D.,MIEEE
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IIUM PRESS

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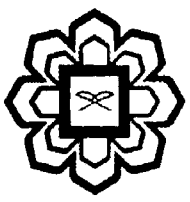

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Md. Rafiqul Islam & Jalel chebil: Antennas and Propogation: Modeling, Simulation & Measurements
Bibliography p.
Includes Index
ISBN

ISBN: 978-967-418-138-3

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
68100 BATU CAVES
SELANGOR DARUL EHSAN
TEL: +603-6188 1542 / 44 / 45 FAX: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

Table of Content

Chapter 2

Patch Antenna Parameters For Ultra Wideband Design

Shaker MM. Al-Karaki[1], Muhammad Feroze Akbar J. Khan[1] and Md. Rafiqul Islam[1]

2.1 Introduction

Usually the overall goal of a design is to achieve specific performance characteristics as stipulated operating frequency. If a microstrip antenna configuration can achieve these overall goals, then the first decision is to select suitable antenna geometry. A rectangular patch antenna can be designed using the procedure described in the next subsections. However, before designing a rectangular microstrip patch antenna, there are several parameter that will affect the antenna bandwidth as well as the resonant frequency. Due to that, it is necessary that analyze these parameters will lead to a proper methodology in designing ultra wideband antenna.

2.2 Parameters Considerations

2.2.1 Substrate selection

The first design step is to select a proper dielectric substrate of appropriate thickness, h and dialectic constant, ε_r. A thicker substrate, besides being mechanically strong will increase the radiated power, reduce conductor loss and improve impedance bandwidth. However, it will increase the weight, dielectric loss, and extraneous radiation from the feed probe [1].

The substrate dielectric constant εr plays a role similar to that to that of substrate thickness. A low value of εr for the substrate will increase the fringing field at the patch periphery, and thus the radiated power. Therefore substrate with $\varepsilon_r \leq 2.5$ is preferred. So an increase of the substrate thickness has a similar effect on the antenna characteristics as a decrease in the value of the ε_r. so it is observed from that bandwidth, directivity and radiation efficiency decrease with the increase in ε_r ,while radiation resistance increases. And this behavior is due to the reduction in the fringing field with increase of ε_r .

However, two main characteristics of rectangular patch antenna depend directly on the substrate selection which they are radiation efficiency and bandwidth.

2.2.2 Substrate Effect On Bandwidth

The energy stored in the patch antenna increases by increasing the substrate εr and reducing its thickness h. This increases the Q of the patch antenna and reduces its bandwidth.

[1] *Department of Electrical and Computer Engineering, Kulliyyah of Engineering International Islamic University Malaysia (IIUM)*