

ANTENNAS AND PROPAGATION

Modeling, Simulation & Measurements

Edited by

MD. RAFIQUUL ISLAM B.Sc., M.Sc., Ph.D., MIEEE
International Islamic University Malaysia

JALEL CHEBIL B.Sc., M.Sc., Ph.D., MIEEE
International Islamic University Malaysia



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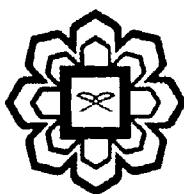
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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EMAIL: iiumprinting@yahoo.com

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Chapter 16

Design of Linear Array Antenna For Smart Antenna Application

Md. Rafiqul Islam¹, A.H. M Zahirul Alam¹, Othman O. Khalifa¹, Khaizuran Abdullah¹ and Ibrahim A. Haji¹

16.1 Introduction

Steering narrow beams at specific resonant frequencies towards desired users is of paramount importance in applications like smart antennas [1] and [3]. The antenna itself comprises number of elements designed in various orientations such as putting them side by side in linear format as is the case in this work. The design of the elements in such a format requires strict consideration of the inter-element spacing and the exact resonance at the required frequency. Closer proximity of the array elements introduces mutual coupling which tends to shift the main beam and puts it in the nulls position hence producing wrong beamsteering towards undesired user [2] and [8]. This chapter deals with the design optimization of the array elements by making sure that the resonant frequency is accurate at 1.85GHz and that the beam is exactly directed to the desired user. The dimension of the single element is optimized and the array is increased from two elements to sixteen elements. The analysis focuses on the four elements and the final sixteen elements where in both situations the exact and correct resonance and the beamsteering are the sole objectives which are achieved successfully.

16.2 Simulation of Single Element Rectangular Patch Antenna

The design of the antenna in this project is based on an inexpensive, lightweight, conformal, easy to manufacture and versatile rectangular patch antenna with suitable type of elements for smart antenna application. With the dimensions as shown in Table 16.1, the antenna should operate at the frequency of 1.85GHz. The first step of the design procedure of a rectangular patch antenna is to compute its physical dimensions. The physical width, W and physical length, L , are computed using transmission line model equations in reference [3]. Similarly, the feed location or excitation feed point is determined using equations in the same reference to match the impedance ($R_{in} = 50\Omega$). The geometry of the single element antenna is as shown in Figure 16.1.

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