

ANTENNAS AND PROPAGATION

Modeling, Simulation & Measurements

Edited by

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

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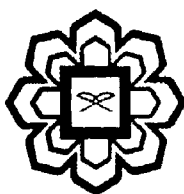
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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Chapter 1

Ultra Wideband Antennas

Muhammad Feroze Akbar J. Khan¹, Shaker MM. Al-Karaki¹ and Md. Rafiqul Islam¹

1.1 Introduction

The word ‘ultra-wideband’ (UWB) commonly refers to signals or systems that either have a large relative or a large absolute bandwidth [1,2]. With such large bandwidth, it offers specific advantages to the communication technologies especially in term capacity of channels, data transfer rate and so on. In last few years, the development and applications ultra wideband has influences a lot in the communication technology; hence the interest has growth exponentially. In this chapter we will brief about the ultra wideband and the microstrip patch antenna.

1.2 Ultra Wideband Technology: Historical Background

Even though the ultra wideband technology is the revolutionary of the wireless communication system, yet it is not the new concept. The first ultra wideband radio, by definition, was the pulse-based Spark Gap radio, developed by Guglielmo Marconi in the late 1800’s. This radio system was used for several decades to transmit Morse code through the airwaves. Later, by 1924, Spark Gap radios were forbidden in most applications due to their strong emissions and interference to narrowband (continuous wave) radio systems, which were developed in the early 1900’s [3,4].

Later on, the early 1960’s, the interest increased in time domain electromagnetic by MIT’s Lincoln Laboratory and Sperry Research Center [4] surged the development of the sampling oscilloscope by Hewlett-Packard in 1962. This enabled the analysis of the impulse response of microwave networks, and catalyzed methods for sub nanosecond pulse generation. A significant research effort also was conducted by antenna designers, including Rumsey and Dyson [4,5], who were developing logarithmic spiral antennas, and Ross, who applied impulse measurement techniques to the design of wideband, radiating antenna elements [6]. With these antenna advances, the potential for using impulse based transmission for radar and communications became clear. Ultra wideband technology was referred to as baseband, carrier-free technology in the late 1980’s. Then, the term “ultra wideband” was not used until 1989. All ultra wideband applications were permissible only under a special license.

For the nearly 40 year period from 1960-1999, over 200 papers were published in accredited IEEE journals, and more than 100 patents were issued on topics related to ultra wideband technology [6]. It shows that the research interest on the ultra wideband and it application is growing exponentially. Currently, the ultra wide applications are widely

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