

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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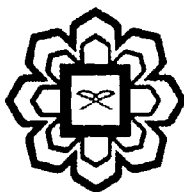
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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Chapter 3

Design Procedure for Microstrip Patch Antenna

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

3.1 Introduction

The design procedure of microstrip patch antenna has been explained details in chapter 1. Transmission line model is used to calculate the dimensions of a patch. There are several main input parameters have to be selected to carry out design of rectangular patch:

- Frequency of operation (f_0): the resonant frequency of the antenna has to be selected. In our project desired frequency of operation is 5.5 GHz.
- Dielectric constant of substrate (ϵ_r): the dielectric material used in this design is metallic with low dielectric constant substrate $\epsilon_r = 5.2$. This is based on availability of Printed Circuit Board (PCB) that we are using in the lab.
- Height of the substrate (h): thickness of substrate is 1.6 mm. This is based on availability of Printed Circuit Board (PCB) that we are using in the lab.
- Input Impedance (Z_0): input impedance is 50Ω . This is based on the transmission line modal theory, that when the input impedance 50Ω , then it is full match impedance.

CST DESIGN ENVIRONMENT™ and have been chosen to create a new CST MICROWAVE STUDIO® project [2-3], by selecting a new template that fits best.. Here, the Antenna (on Planar Substrate) template is chosen since this template automatically sets the units to mm and GHz as well as suit for the rectangular patch antenna design. Simulation of antenna using CST software is required to construct by following the steps mentioned below:

Step 1: Template is selected.

Step 2: Working Planes Properties is set.

Step 3: The Substrate Brick is drawn.

Step 4: The Ground Plane is modeled.

Step 5: Rectangular Patch Antenna is modeled

Step 6: The width of feed is calculated.

Step 7: The feed is modeled; the feed is designed and inserted into the patch.

Step 8: The Waveguide Port is defined; the excitation port is added to the patch antenna.

Step 9: The Frequency Range is defined.

Step 10: The Boundary Conditions is defined.

Step 11: Farfield Monitor is defined; we are interested in farfield gain and E-field pattern.

Step 12: Simulating: S-parameters and the farfield are calculated using the transient solvers.

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