

Preface

In the last three decades, the microstrip patch antenna (MPA) has been developed into a sophisticated and versatile antenna. Because of its planar profile, ease of fabrication, compatibility with integrated circuit technology, and conformability with a shaped surface, this class of antennas has become the favorite of antenna designers, and has found extensive applications both in the commercial sector and in the military sector. There is a need for graduate students and practicing engineers to gain an in-depth understanding of this subject. Although there are a number of books on microstrip antennas, they were written as reference books rather than as textbooks. The proposed book will present the subject in a way that is suitable as a textbook for a graduate course on antennas, or as a self-study textbook for practicing engineers. As befits a textbook, we will include problems and/or mini-projects at the end of each chapter, which are absent in existing books on microstrip antennas.

Chapter 1 begins with a brief discussion of some commonly used antennas before MPAs came on the scene. This helps the reader appreciate the attractiveness of MPAs. The chapter then discusses, in general terms, the basic geometry of the MPA, material considerations, and various feeding methods for the single element. A discussion on the knowledge and skills needed to design MPAs follows. Chapter 2 reviews some background material in mathematics and electromagnetics which are essential to understand the theory of MPA. Chapter 3 introduces the cavity model, which is used in Chapters 4-6 to obtain the main characteristics of rectangular, circular, annular-ring and equitriangular MPAs. Chapter 7 introduces the integral equation method and the finite difference time domain method. Methods of increasing the frequency agility of MPAs are discussed in Chapter 8. Chapters 9-12 are concerned with broadbanding techniques, including coaxial and aperture coupled stacked patches, U-slot patches, and L-probe fed patches. Size reduction techniques are discussed in chapter 13. Dual and Multi-frequency designs are discussed in chapter 14. Dual

polarization and circular polarization designs are presented in chapters 15 and 16 respectively. The book concludes with chapter 17 on the design of broadside microstrip antenna arrays.

Since we have been involved with the research and development of MPAs from the early 1980's, a significant fraction of the material is drawn from our own work. Thus, this book can also be regarded as a partial record of our personal journeys in this field. We are glad that we have had the opportunity to work in the field of microstrip patch antennas, and hope that this book will provide useful information for both new comers and established practitioners alike.