# Incorporating Design of Compact Microstrip Antenna in the wireless Curricula for Global Applications

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**Abstract:**

Wireless communication systems have become of great importance with globalization trend that the world has experienced in recent years. It has become a significant part of the telecom and wireless industry.

The future curriculum for Electrical Engineering in institutes of higher education across the globe should consider including a course in wireless communication. This would be so the graduates are able to cope with these changing industrial needs. It has been estimated that over 300,000 additional workers with wireless knowledge will be needed by 2005. Technology experts are addressing" infocom" in place of IT and telecommunications. Infocom is the convergence of Media (Internet, TV radio, printing, publishing etc.), Telecommunications (wireless, data, paging etc.), and Computers (hardware, software, networking, etc.).

This rapid growth in wire less technology has created an acute shortage of RF engineers during the past decade. To develop manpower to cater to the needs of industry a number of colleges and universities have introduced a new course in the field of microwave antenna theory and techniques and communication systems [1, 2].

This paper presents the results of a study on Microstrip antenna, and discusses the advantages of incorporating this topic in the undergraduate wireless curricula.

**Introduction:**

Wireless communication is one of the most rapidly growing fields in the telecommunication industry. Cellular industry is probably the world's fastest growing major industry, with cellular technology playing a pivotal role in how people communicate around the world. In recent years, rapid expansion of the

wireless communication industry has created a need for multi frequency band operation portable devices to meet the ever-increasing subscriber demand.

All segments of the wireless industry - cellular, personal communication services (PCS), paging, and specialized mobile radio (SMR) - are expected to grow at double-digit rates.

This rapid technological growth has put new demands on engineering technology curricula. Industry seeks graduates with appropriate background and training in electromagnetic engineering and wireless technology. Electronics/ Electrical Engineering graduates are not only expected to understand the theory of start-of-the-art telecommunications networks but also exhibit hands-on lab experience and skills with RF equipment and tools.

To cater to these changing industrial needs, it is imperative that a wireless engineering course be incorporated in the Electrical Engineering curricula of all colleges, technical institutes and universities.

The course should include: 1.Core courses in wireless emphasizing wireless communication systems, networks accompanied with wireless communication lab. 2. It should be supported by hardware specialization in RF electronics, Digital signal processing. 3. The laboratory course must include design and development of various types of antennas and measurement and testing methods.

The following case study deals with the design and development of microstrip compact antenna for mobile communication systems. Microstrip antennas are useful for both indoor and outdoor applications. Microstrip array antennas are specifically designed to be used as a client antenna in any Wireless LAN and Wireless ISP systems. This study makes a contribution to both academic and industrial applications.

**Experimental Study:**

The paper presents the typical configuration of narrow slots on ground plane of rectangular microstrip antenna to achieve frequency reduction which in turn leads to size reduction of antenna. The characteristics of the prototypes of antenna have been simulated by using zeland IE3D simulation software and measured with a network analyzer.

The present-day mobile communication systems usually require smaller antenna size in order to meet the miniaturization requirements of mobile units. Thus size reduction and bandwidth enhancement are becoming major design considerations for practical applications of microstrip antennas. For this reason, studies to achieve compact and broadband operations of microstrip antennas have greatly increased. Several slot loaded techniques have been reported in the literature for obtaining the compact size and broadband operation.

Also by putting slots on ground plane and by meandering the ground plane the lowering of fundamental resonant frequencies with increased bandwidth and gain can be achieved. [3, 4, 5]. In this study, we present typical configuration of a group of slots on ground plane parallel to patch radiating edge, Fig 1. By varying the number of slots, the variation in the resonant frequency, bandwidth has been studied. The antennas are designed starting with one slot to seven numbers of slots with optimized length.

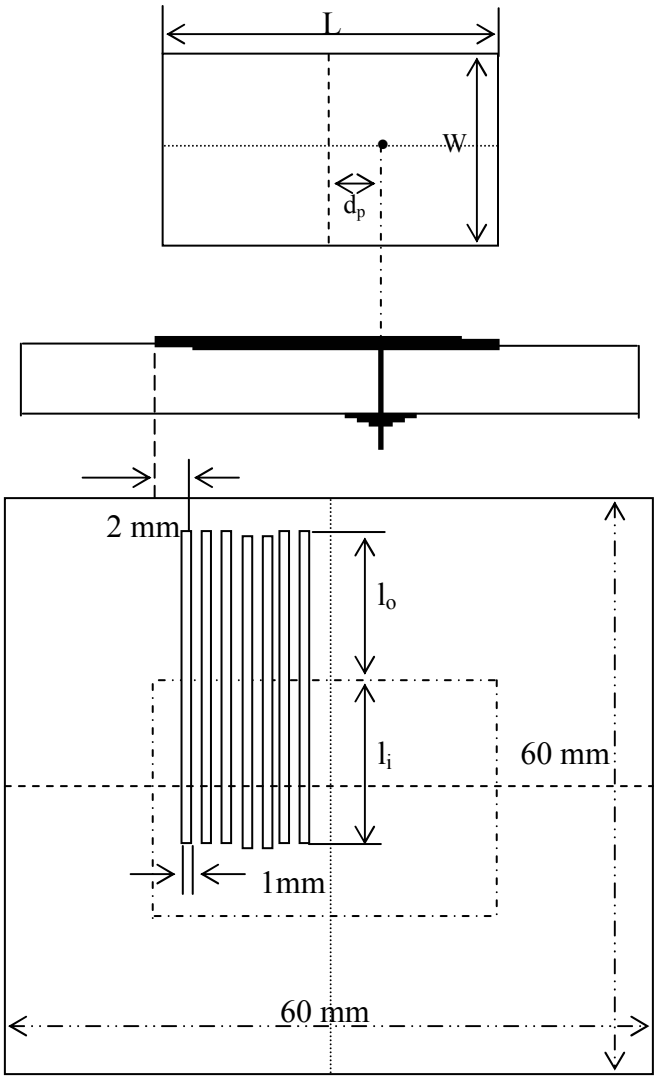


**Fig 1. Geometry of rectangular patch with slots on ground plane**

$\varepsilon_r$=4.4, h=1.6 mm, L=37.3 mm, W=24.87 mm, $d_p$=5.15 mm, $r_p$=0.6 mm, $l_s$=26.435mm

**Results:**

The experimental results show a good agreement with simulated one. The results show that by increasing the number of slots, the patch will resonate at much lower frequency compared to conventional patch.

The return loss characteristics of conventional and proposed patches with slots are shown in Fig 2. For the conventional antenna the fundamental resonant frequency is at 1.907 GHz with bandwidth of 1.36%. With seven numbers of slots the resonant frequency is 1.506 GHz, which is 0.789 times that of the reference antenna. Also it has been observed that the impedance bandwidths of all prototypes are all greater than that of the reference antenna.
The results reveals that by putting the slots on the ground plane the patch will resonate at much lower frequency and also there is an enhancement in impedance bandwidth and gain.

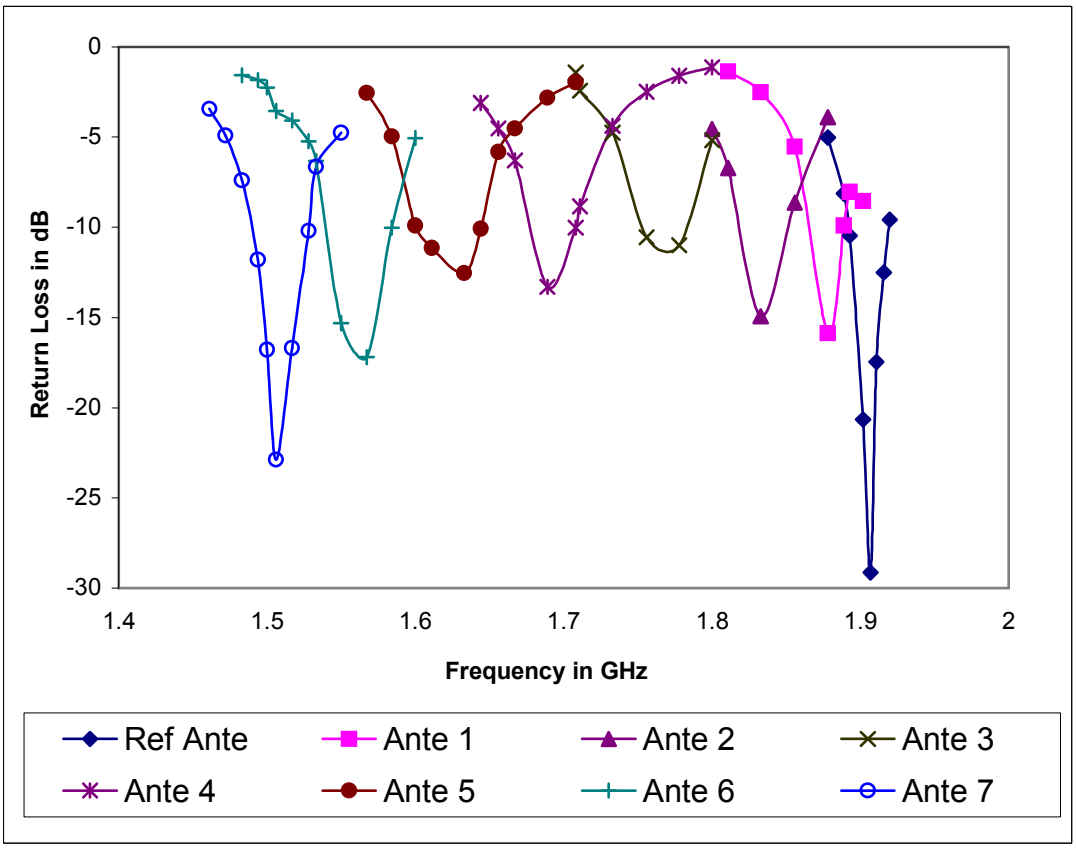


**Fig 2. Return Loss characteristics of prototype patches and reference antenna.**

## Conclusion:

The paper presented gives an exposure about the small antenna and their design. With the introduction of a wireless course students will become familiar with the design aspects of antennas, also with the applications of these antenna. The new course incorporated should provide the graduates with knowledge of current wireless technologies, identify the emerging technologies and standards, and more importantly develop hands-on skills with RF equipment to implement and service wireless systems**.**

Industry could play an important role to produce engineering graduates with expertise in this area of global importance. To accomplish this, the industry would provide funding/grants for undergraduate projects to be included in the electromagnetics, RF circuits and wireless communication courses. This project could also lead to a master level thesis and could be a part of the graduate program in electrical engineering. The industry would then benefit by hiring these graduates with expertise in this area.

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## Biography:

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