PREFACE

In recent years, the advancement of wireless technology and its progress in integrated circuit technology have lead to a continual decrease in the overall size of radio transceivers for wireless mobile handheld devices. Importantly it appears that the technology in being lead by today's consumer demand for portable handheld devices to be low cost and low weight, compact in size, low profile, and with a look that is aesthetically pleasing. As the overall handsets become compact and thinner, the antenna must be compact and planar structure too. To meet the aforementioned requirement of the mobile handsets, planar monopole antennas are promising candidates due to their numerous advantages such as thin profile, low weight, compact and planar structure. Therefore, several research efforts have been devoted to investigate the antennas for mobile handset which includes inverted-F antenna (IFA), planar inverted-F antenna (PIFA), and planar monopole antenna (PMA). In view of the above, the author has made an attempt to study and analyze the performance of planar monopole antenna in free space, mobile environment, and user proximity emphasizing mainly on reflection coefficient, radiation performances, surface current distributions, specific absorption rate (SAR), and total radiated power (TRP). The entire investigations are carried out on multiband/wideband compact planar monopole antennas, the results of which embody the present thesis.

In the opening chapter, the introduction of the internal antennas for mobile handsets application is presented emphasizing mainly on the various wireless communication bands and their applications. This is followed by design and radiation mechanism of various internal antenna used in mobile handsets. Furthermore, SAR and TRP as antenna performance in user proximity are discussed.

In Chapter 2, literature review on the relevant topic based on internal antennas for mobile handsets applications is presented.

In chapter 3, the microstrip line fed compact planar monopole antenna for slim mobile handset application is investigated to achieve GSM900, GSM1800, GSM1900, UMTS, IMT2100, WLAN, WiMAX along with most of the higher LTE bands of modern mobile phone applications. Consequently, antenna characterization in free space as well as in mobile environment is presented.

In order to further widen the lower GSM band to cover GSM850/900 along with GSM1800, GSM1900, UMTS, IMT2100, WLAN, WiMAX along with all the higher LTE bands, shorted planar monopole antenna is presented. Consequently, simulation study is carried out to analyze the effect of the various lengths and widths of the strips associated with the antenna on the bandwidth enhancement. Antenna characterization in free space as well as in mobile environment is also presented.

In chapter Five, design consideration and configuration, a compact wideband planar monopole antenna suitable for slim mobile handsets applications is presented. The wider impedance bandwidth is achieved by placing the meandered line as parasitic element on the back side of the coupling and shorted radiating elements. With this configuration, the antenna gives extremely wide impedance bandwidth which covers all the required frequency bands of the smart mobile phones. Consequently, antenna characterization in free space as well as in mobile environment is presented.

In chapter Six, performance study of all the three planar monopole antennas are carried out in the presence of the user proximity. The effect of user proximity is analyzed in talk mode, data mode, read mode by placing the antenna at top and bottom position of the mobile circuit board. The S-parameter, radiation performances, SAR calculation, and total radiated power (TRP) calculation are studied, peak realized gain, total antenna efficiency.

The major findings of the entire investigations are summarized in the last chapter which also emphasizes the future work on the topic.