

Design of Active Internal Antenna by Switched Feeds and Switched Grounds

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The rapid development of electronics and mobile communication standards leads to have a great demand on designing very compact mobile terminal which can operate different type of communication standards such as GSM850 (824-894MHz), GSM900 (880-960MHz), GPS (1575MHz), DCS (1710-1880MHz), PCS (1850-1990MHz), UMTS (1920-2170MHz), WLAN (2400-2484MHz) and so on.

In addition, as the form factor of electronic devices inside mobile terminal decreases, multi-band compact internal antennas become a key factor for small handheld devices. The size of the traditional micro-strip antenna seems is too large at cellular frequencies. The PIFA is widely used because it uses a short circuit to the ground plane so that the size of the radiating patch is reduced by half. For multi-band antenna aspect, two or more radiating elements are shared by the same feed or ground pins and combined into one antenna.

Alternatively, the locations of the feed and ground pins are parameters that can vary the antenna characteristic such as operating frequency band, radiation pattern, and antenna efficiency. By incorporating an active circuit (i.e, MEMs, GaAs switch, pin diode) attached to the antenna, the location of either feeds or grounds can be switched such that the antenna characteristic can be changed according to the standards needed by user. By using switched grounds or feeds, the antenna can be reconfigured and the whole antenna volume can be reused.

In this study, the active internal antennas using switched feeds and grounds are used for switching the frequency bands (i.e. different GSM Bands). Both simulations and experimental prototypes are tested. The antenna characteristics of return loss, radiation pattern, antenna efficiency were measured and compared to a “perfect” antenna where the switches are replaced by galvanic connections.