

Experiment on Triangular Copper-Strip as Impedance Matching for 2.4-GHz Helical Antenna

Virach Wongpaibool

Faculty of Engineering, Assumption University
Bangkok, Thailand

Email: <virachwng@au.edu>

Abstract

Performance of a helical antenna designed for 2.4-GHz WLAN is experimentally investigated in terms of impedance matching. A section of the helical wire near the antenna feed point is replaced by a simple triangular copper strip. By deploying such technique, impedance matching can be achieved. Overall return loss is below -14 dB across entire WLAN frequency range. Moreover, overall return loss does not strongly depend on strip length around its optimum, allowing 15 mm of strip-length variation around the optimum of 50 mm. Adding the triangular impedance-matching strip causes the characteristic of the helical antenna to be similar to a parallel resonant RLC circuit, resulting in frequency dependence of return loss for a given length of triangular impedance-matching strip.

Keywords: Helix, transformer, WLAN antenna, resonant RLC circuit, portable computer, axial-mode helical antenna.

Introduction

In the past, computers were connected together by using wireline techniques, such as local area network (LAN). This seemed to be inconvenient in some situations since computers must be within the range of cables. As the network technology progresses, it is possible for computers to connect together wirelessly. For example, at the present time, we can use our computers to connect to the internet by using wireless LAN (WLAN), operating at 2.4-GHz frequency range (WLAN 2008). Nowadays the use of the Internet is inevitable in our everyday lives. With portable computers, and WLAN, the internet can be accessed anywhere provided that it is within the coverage area of a WLAN access point. The range of 802.11g WLAN is typically at the order of 100 m (WLAN 2008).

One of the most important parts of WLAN is an antenna. The antenna functions as a transducer, which converts electrical signal to electromagnetic wave, and vice versa. Generally, antennas, deployed in WLAN, are low-gain omni-directional. However, it is

possible to extend the connection range between a WLAN-equipped computer and an access point by utilizing high-directivity (high gain) antennas either at one end or both. There are many types of antenna, which exhibits high gains, and are suitable for 2.4-GHz WLAN. The one that is of our interest is an axial-mode helical antenna (gain is highest along the axis of the antenna) (Kraus 2003; Balanis 1997; ARRL2007; Bart 2003; and Weeratumanoon 2000). The picture of a helical antenna is as shown in Fig. 1.

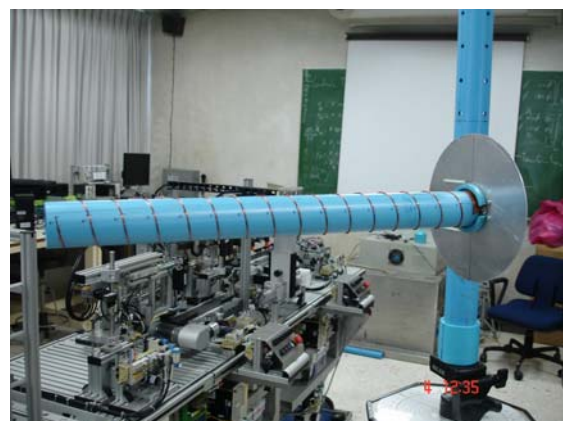


Fig. 1. Helical antenna.