

Review of Amateur-Built 2.4-GHz Wireless-LAN Directional Wire Antennas

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Abstract

This paper is a review of amateur-built high-directivity wire antennas, for wireless local area network (WLAN), operating at 2.4-GHz frequency range. Those antennas can be deployed for range extension and interference reduction, for example. Covered in this review are a biquad antenna with reflector, Yagi-Uda antenna, and helical antenna. The distinctive feature of these antennas is their ease of construction. The performance of those antennas is highly satisfactory, although they are not the commercial ones. Discussed in this review are their physical structures, directivity (gain), input impedance, and polarization.

Keywords: WLAN antenna, quad antenna, biquad antenna, Yagi-Uda antenna, helical antenna, helix.

Introduction

Nowadays, the Internet access is inevitable in daily life. People check their e-mails, and browse the Internet on a daily basis. These activities cannot be accomplished without computer networks. In the past, computers were networked together by means of a wireline technique. Each computer was connected to a hub or switch by using an unshielded twisted pair (UTP) cable (Wikipedia 2009a). The resultant network is called a local area network (LAN). Under some circumstances, the use of cable is not convenient, or even obstructs the access to the network. For example, it is going to be very difficult for people to have their carried notebook computers connected to the network while they are working outdoor.

Thanks to advances in computer technology, today it is possible for computers to connect together wirelessly, which facilitate the use of the Internet dramatically. The wireless computer network is known as wireless LAN (WLAN). The extensive use of WLAN can be understood from the fact that most of the new notebook computers are now equipped with WLAN devices. In order to connect to the network, a WLAN-equipped computer must be within the coverage area of

WLAN access point (AP). The most widely used WLAN standard is IEEE 802.11g, which operates at the 2.4-GHz band (Wikipedia 2008). The range of 802.11g WLAN is typically at the order of 100 m (Wikipedia 2008).

One of the most important parts of a WLAN system is the antenna. The main function of an antenna is for signal radiation and reception in the form of electromagnetic waves. Generally, antennas deployed in WLAN devices are low-directivity omnidirectional, which would radiate the WLAN signal (in the form of electromagnetic waves) in all directions equally. Under some circumstances, it is desirable the range between two WLAN devices to be extended, for example, in a rural area where devices are spaced far apart from each other. This task can be achieved by the transmitting antenna radiating most of its available transmitted power to the desired direction instead of radiating the signal in all directions equally. Similarly, the receiving antenna should receive the signal in the desired direction better than in the other directions.

Here comes the necessity of deploying a special-type antenna, which can perform that task, at one end or both. That kind of antenna is usually called a directional antenna. It should be noted that when an antenna transmits the