High-Gain Low-Cost Antenna Systems for WLAN and HyperLAN Point to Point Links

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In the last few years, the development of wireless local area networks (WLANs) has represented one of the attractives in the wireless communications field.

The primary driver for WLAN access is the demand for bandwidth by Personal Digital Assistants (PDAs) and portable PCs applications like streaming video, broadband Internet and corporate applications; and the demand by corporations for ad hoc networking access needed for collaborative applications and messaging. WLAN technology provides the high-speed delivery required for these applications. WLAN and especially WLAN value-added services present an interesting opportunity for existing Internet Service Providers (ISPs) who want to provide the same types of services regardless of the traditional access methods employed by the end-user.

Many Wireless ISPs (WISPs) using the common 802.11-based equipment operating in the 2.44 and 5.25 GHz range, usually require outdoor masts or tower on which one or more antennas lie in line of sight with client antennas.

This determines the necessity to implement point-to-point links employing antennas, operating at microwave frequencies, with specific features.

Specifically the major goal is to design very low cost-high gain antennas system to provide the links.

In this paper we present an antenna system in which such features are satisfied using standard commercial TVSAT parabolic reflectors fed by a printed antenna. This feeder is implemented on the most common substrate usually employed for printed circuit boards (PCBs), i.e. FR4. Different solutions are presented in the choice of the radiating element of the feeding system; namely, printed dipole, patch and slot are studied in detail showing pros and cons.The whole feed is then arranged in a 2×2 elements array configuration, connected by a microstrip feeding network, implemented on a single layer substrate.The interelement distances allows to shape the feed radiating pattern thus obtaining the best performance in terms of tapering and spillover efficiency. A gain of 24 dBi for the 802.11b (2.4–2.484 GHz) and 30 dBi for the 802.11a (5.15–5.35 GHz) are achieved using a 73×80 cm offset reflector corresponding to a 78% aperture efficiency. Several prototypes have been realized and measured; their input impedance and radiation characteristics have been found in fair agreement with the numerical predictions provided by design tools.