Ultra-Wide-Band Microstrip Concentric Annular Ring Antenna for Wireless Communications

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Abstract

In this paper, a new design technique for bandwidth enhancement of concentric microstrip annular ring slot antennas is presented. Using this technique, an Ultra-Wide-Band antenna is designed with simulated bandwidth of 111.29%.

Keywords: *Microstrip antenna, wideband, concentric patch, bandwidth, low impedance.*

1. Introduction

Microstrip patch antennas are widely used because of their several advantages such as light weight, low volume, low fabrication cost, and capability of dual, triple and several frequency operations. However microstrip antennas suffer from a number of disadvantages, particularly the narrow bandwidth[1]. This is a serious limitation of these microstrip patch antennas. Different techniques are used to overcome this narrow bandwidth limitation. These techniques include increasing the thickness of the dielectric substrate, decreasing dielectric constant and using parasitic patches [2]. These techniques have limitations like, excitation of surface waves and increase in antenna size [3].

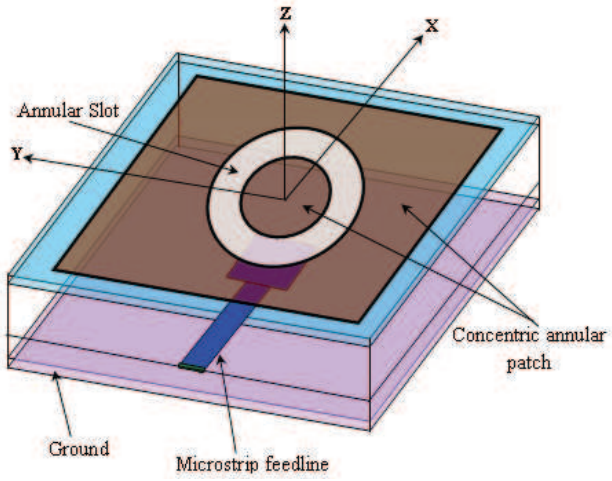
Annular ring slot antennas are considered to be among the narrowband resonant antennas [4]. Multi-element concentric ring slots have been used to design multi-band antennas. However, because of transmission zeros that exist between the different resonances, these resonances cannot easily be merged to obtain a wideband response [4, 5]. The purpose of this paper is to propose a microstrip structure which will increase the bandwidth without increasing its physical dimensions.

2. Antenna design

Annular ring slot antenna has a reduce size more than circular patch antenna and the ultra-wideband characteristic [6]. In this paper, to broaden the bandwidth of annular ring slot antenna, we placed the concentric annular patch inside circular slot and designed the low impedance feed line.

Because, for an annular ring slot antenna, the resonant frequency of the lowest order mode TM11 can be much lower than a circular patch of the same size, the annular ring slot antenna can be designed to the smaller size than the circular patch antenna [5, 6]. This fact could be appreciated physically by noting that the average path length travelled by the current in the annular ring is much longer than the circular ring for the lowest order mode [5, 6].

Fig. 1 shows the configuration of the ultra-wide-band concentric annular ring microstrip antenna. We placed a microstrip feed line to the bottom of a substrate with relative permittivity of 4.3 and thickness of 2mm. The concentric circular patch embedded in an annular slot is placed on the substrate to match the impedance.



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