Chapter 4: Antennas

Introduction

Antennas can be considered as one of the most important parts of the radio-communication chain because antennas transform an electromagnetic wave propagating along the transmission line to the wave propagating in free-space and vice versa. Consequently, antenna parameters (directivity pattern, impedance, gain) significantly influence final properties of the radio link.

In this chapter, an overview of antennas and technical details of their design and exploitation are not presented. We consider these topics as well understandable and well described in the existing literature (in **[1]** , e.g.). We turn our attention to the principles of radiation and to the ways of its mathematical modeling.

The initial paper describes the modeling of a wire dipole by the method of moments. Using this method, a current distribution on the antenna is computed as a primarily quantity. If the current distribution is known, all the other parameters can be computed. The complete description is given in the layer A. In the layer B, a Dutch translation of the layer A is given.

The second paper deals with the analysis of wire antennas consisting of more elements. We become familiar with the method of induced electromotoric forces, which enables to compute properties of not only self-standing dipoles but too their mutual coupling.

Even the third paper is devoted to the analysis of wire antennas consisting of more elements. Our attention is turned to Yagi antenna and to its analysis by the method of moments. Comparing papers 2 and 3, the reader can compare both the approaches.

In the fourth paper and in the fifth paper, wire antennas are left and the attention is turned to microstrip antennas. First, a microstrip dipole is analyzed using one-dimensional method of moments. Second, a patch antenna analyzed by two-dimensional method of moments.

Analysis of microstrip antennas is much more complicated compared to the analysis of wire antennas. This is given by the fact that microstrip antennas are manufactured exploiting dielectric substrates, and therefore, analysis methods have to respect fulfilling continuity conditions on the boundary of two media.

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