



## Excitation of Electromagnetic Waves by a Nonsymmetric Antenna Located On the Surface of a Semi-Infinite Gyrotropic Cylinder

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### Abstract

Electromagnetic wave excitation by sources with nonsymmetric electric-current distribution in the presence of a semi-infinite gyrotropic cylinder is considered. It is assumed that the sources are specified on the surface of the cylinder located in free space. The total source-excited field and the fields scattered by the end-face of the cylinder are expanded in terms of eigenwaves of an infinite open waveguide and free space. The powers radiated from the source in both the directions of the cylinder are numerically calculated and the radiation pattern for the far-zone field is determined. Conditions are found..

### 1 Introduction

In the past decades, an enhanced attention has been paid to the problem of electromagnetic wave excitation in systems including open gyrotropic guiding structures and given electric currents. In the case of employing a magnetized plasma as a gyrotropic medium, such a model can be used for describing antennas operated in laboratory devices – helicon plasma sources, which are used in numerous experimental researches [1]. In that type of radiating systems, it is important to take into account the finite size of a plasma column when diffraction effects on its end-face take place. However, most theoretical studies devoted to such sources deal with the case where antenna is placed far from the ends of a plasma column so that it can be represented as an infinite cylinder [1]. Moreover, in most works consideration is limited to the excitation of only the discrete-spectrum waves (eigenmodes), which play a major role in forming the plasma discharge. In the case of a nonsymmetric antenna located on the surface of an infinite plasma-filled cylindrical waveguide surrounded by free space, the full spectrum of excited waves was taken into account for determining the energy characteristics [3] and radiation patterns [4] of such a source.

In this work the energy and radiation characteristics of a nonsymmetric antenna located on the surface of a semi-infinite gyrotropic cylinder is considered. The investigation of the excited field and fields of waves scattered by the end-face of the cylinder is performed using an expansion of these fields over the set of eigenwaves of an infinite open

gyrotropic waveguide [2] and free space.

### 2 Formulation of the Problem

### 3 The Source-Excited and Diffracted Fields

### 4 Numerical results

### 5 Acknowledgements

Acknowledgements go in here.

### References

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