

## **ANALYSIS OF ELECTROMAGNETIC CYLINDRICAL WAVE INTERACTION WITH INHOMOGENEOUS PLANAR MEDIA**

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**Abstract**—An analytical method based on combination of Fourier transform and Taylor's series expansion is presented for analyzing interaction of electromagnetic cylindrical waves with inhomogeneous planar layered media. In the proposed method, constitutive parameters and Fourier transformed electric and magnetic fields of inhomogeneous layer are expressed using Taylor's series expansion. The validity of the method is verified by considering some special types of inhomogeneous media and comparing the obtained results by the presented method with those of other reported methods. The results showed that when Fourier transform combined with Taylor's series expansion, they could provide a powerful technique for analyzing such problems.

### **1. INTRODUCTION**

Considerable researches have been performed on the application of inhomogeneous media in the problems of electromagnetic wave propagation, scattering and radiation. Inhomogeneous media are described by the constitutive parameters varying with spatial variables and are efficiently used in various microwave devices [1–3]. Exact solution of the wave equation in inhomogeneous media is known for only a few particular profiles; and due to this, the scattering from inhomogeneous media has been intensively investigated and several approaches for analyzing such problems have been presented [4–17].

In most of the previous works, the analysis of reflection and transmission problems involving inhomogeneous planar layered

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*Received 19 March 2013, Accepted 11 April 2013, Scheduled 23 April 2013*

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