

Electric Field Distribution of ZnO-PCL Nanocomposites Using Rectangular Waveguide, Microstrip, FEM

Abubakar Yakubu¹

¹Kebbi University of Science and Technology, Aliero, Nigeria

Abstract

Microstrip line and rectangular waveguide are widely used as transmission lines in microwave integrated circuits and high speed interconnecting buses. In this paper, we use COMSOL Multiphysics to study electric field distribution and scattering parameters of ZnO-PCL nanocomposites when placed inside a rectangular waveguide and as an overlay on a microstrip at microwave frequency (8-12 GHz). We specifically illustrated the effect of sample thickness and ZnO nanofiller composition on the electric field distribution on the waveguide and microstrip respectively, in addition to the calculation of the scattering parameter of the substrate using both waveguide and microstrip. Result showed very good agreement between the computational results of the scattering parameters and electric field obtained. Furthermore, the result from the measurement showed that the nano filler significantly affected the field distribution of the ZnO-PCL nanocomposites when placed on top a microstrip. The determination of the different percentages of the ZnO nanofiller is correctly predicted using the microstrip method for the first time in microwave research. Measurement result showed that the 70% ZnO nano filler produced the lowest field distribution. The microstrip method is pioneered in this study for substrate percentage determination.