

Electromagnetic waves in a left-handed/magnetic waveguide structure

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Abstract

Recently, there has been great interest in new type of electromagnetic materials called left-handed media [4]. Over fifty years ago, Veselago was the first to consider the left-handed metamaterial (LHM) which he defined as media with simultaneously negative and almost real electric permittivity and magnetic permeability in some frequency range [5]. The electric and magnetic fields form a left-handed set of vectors with the wave vector [6]. These materials have been shown to exhibit unique properties, such as Snell law and Doppler shift. In the year 2000, Smith, et. al.[7] have built these materials by using two dimensional arrays of splitting resonators and wires and are operating the microwave range. In the year 2006, Kim and Cho investigated the guided dispersion characteristics of grounded slab structures which have been widely used in the antennas[8].

In this work, we have demonstrated theoretically the existence and behavior of the TE guided waves in a ferromagnetic/Left-handed materials /Antiferromagnetic waveguide structure. The dispersion characteristics are performed for different kind of metamaterials. The existence and the type of the solutions to the guided waves with respect to different physical parameters are also investigated and discussed. It has been shown that the Left-handed materials(metamaterials) can lead to different , new unusual properties.

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