URSI - RCRS 2022, IIT (Indore), India, 1 - 4 December, 2022

Characteristics of Fast wave in Dielectric Loaded Radially thick Helix

Ajay Kumar Pandey *(1), Surya Kumar Pathak(2)
Institute for Plasma Research, A CI of Homi Bhabha National Institute, Gandhinagar- 382428, Gujarat, India
[1]ajay.pandey@ipr.res.in, [2]surya@ipr.res.in

A current and active topic of study is the characterization of electromagnetic waves for a source embedded in a dielectric medium loaded helix. Depending on the surface property and boundary conditions, waves created by such a source interact with the dielectric interface to produce surface waves and radiated fields. Conditional on whether the associated discrete pole is proper or improper, the fields that are directly radiated into space produce the continuous space-wave spectrum, whereas those that are reflected from the discontinuity produce the discrete guided wave spectrum and leaky wave spectrum, respectively. Additionally, the appropriate speed of EM waves (or the group velocity of light) can be constrained by appropriately modifying the components of EM mediums [1-2].

This work mainly focuses on how to control the wave propagation speed through a dielectric loaded helix for technological applications. Controlling the group velocity of waves in the medium can help with this. In order to do this, we take into account the waves in a sheath helix loaded guide and create the eigenvalue equation by using appropriate boundary conditions. The investigation conclusion shows that the structural model will support fast waves that could be precisely controlled. It has been established that the guide supports the mode degeneracy property, which mostly depends on the guiding section's dimension and operating frequency range. In this context, the helix structure's pitch angle also has a significant impact. The utility of these guides in dual-mode filter applications is suggested by this attribute. The above all finding will be discussed in the talk.

[1] F. Mesa, D.R. Jackson, M.J. Freire, "Evolution of leaky modes on printed-circuit lines", *Microwave Theory and Techniques IEEE Transactions on*, vol. 50, no. 1, pp. 94-104, 2002.

[2] M. A. Baqir and P. K. Choudhury, "On the Fast-Waves in Dispersive Core-Twisted Clad Waveguides," in *IEEE Antennas and Wireless Propagation Letters*, vol. 15, pp. 1735-1738, 2016.