Visualization of Energy Waves via Airy Functions in Time-Domain

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Abstract : The main idea is to solve the system of Maxwell's equations in accordance with the causality principle to get the energy quantities via Airy functions in a hollow rectangular waveguide. We used the evolutionary approach to electromagnetics that is an analytical time-domain method. The boundary-value problem for the system of Maxwell's equations is reformulated in transverse and longitudinal coordinates. A self-adjoint operator is obtained and the complete set of Eigen vectors of the operator initiates an orthonormal basis of the solution space. Hence, the sought electromagnetic field can be presented in terms of this basis. Within the presentation, the scalar coefficients are governed by Klein-Gordon equation. Ultimately, in this study, time-domain waveguide problem is solved analytically in accordance with the causality principle. Moreover, the graphical results are visualized for the case when the energy and surplus of the energy for the time-domain waveguide modes are represented via airy functions.

Keywords : airy functions, Klein-Gordon Equation, Maxwell's equations, Surplus of energy, wave boundary operators
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