Robert Claude Gauthier, J Laser Opt Photonics 2017, 4:4 (Suppl)
DOI: 10.4172/2469-410X-C1-017

Fourier-Bessel electromagnetic mode solver (and its inversion)

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Numerical simulations of electromagnetic phenomena provide the researcher and the component designer with a cost effective alternative to device manufacturing of prototypes. Techiques such as FDTD and FEM are commonly employed but hit up against speed and memory boundaries when structures are irregular or extend over all three coordinate axis. The talk will present a numerical technique, based on spectral analysis, which is suitable for numerical analysis of structures which present cylindrical and spherical geometries. The theoretical foundations of the numerical technique will be presented which takes its roots in Maxwell's curl coupled equations rather than the usual wave equations. The eigenvalue matrix system properties were explored and symmetry techniques utilized to reduce the matrix order and tune "mode family" computations were highlighted leading to faster computation engines. Several computation examples will be presented indicating the suitability of the technique to obtain localized states in resonators, axially propagated fields in fiber geometries and in spherical resonators. Recently, the numerical process has been inverted such that the material properties of an optical resonator and waveguide can be determined based on the user defined modal profile and propagation properties selected by the designer theoretical details and numerical examples of the inverse process will close the presentation.

Biography

Robert Claude Gauthier has completed his PhD in 1988 from Dalhousie University (Halifax, Canada). He is presently associated with the Department of Electronics at Carleton University, (Ottawa, Canada). He has published numerous papers primarily in the areas of optical fiber sensors, optical levitation and trapping, photonic crystal and photonic quasicrys. His research interest now focus on numerical studies of optical resonator properties

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