Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3358** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

Metamaterials and the Lambert W functio

Wednesday, 8 June 2022 15:30 (15 minutes)

The generalized Lambert W function has been found useful in various problems like the square well, double potential well, Double Dirac Delta potential and the electronic properties of graphene nanoribbons (GN). In the example of GN, it is shown that the solutions to the equations governing the electronic states are closely related to the Lambert W and the Generalised Lambert W Function. In all these examples a geometric analytic solution is obtained that provides better visualization of the problem at hand. A similar analysis is used to get a geometric- analytical solution of the transverse magnetic and electric mode for the step-index electromagnetic waveguide. The allowed modes of propagation for light waves in varying refractive indices are studied in detail, especially for the negative and complex values of the refractive indices [1].
Metamaterials are capable of a very strong interaction with the magnetic component of light. Therefore, the range of response to radiated light is expanded beyond ordinary optical limitations. In addition, as artificially constructed materials, both the magnetic and electric components of the radiated light can be controlled as light propagates through the metamaterial. Desired waveguide properties can be obtained with the appropriate electromagnetic response of the metamaterial.
Transformation optics relates to the capability of bending light or electromagnetic waves in any preferred or desired fashion, for a desired application. The precise degree of electric and magnetic response can be precisely controlled in a metamaterial. Since effective control can be maintained over the responses of the material, this leads to an enhanced and highly flexible gradient-index material [2]. The Lambert curve solutions provide interesting possibilities to study metamaterials.
[1] Narola et al. J. Phys. Commun.4, 065001 (2020).
[2] Chen et al. Nature Materials, 9(5), 387–396 (2010).

Primary authors: Mr SHREYAS, SURESH (Department of Physics and CAMOST, Indian Institute of Technology Tirupati); Mr JEYASITHARAM, J (Department of Physics and CAMOST, Indian Institute of Technology Tirupati); Prof. MAIGNAN, Aude (university Grenoble Alpes); Prof. DESHMUKH, Pranawa (Indian Institute of Technology Tirupati and Department of Physics, Dayananda Sagar University); Dr ROBERTS, Ken (University of Western Ontario); Prof. JISRAWI, Najeh (Department of Physics and Astronomy and King's University College, Western University); Prof. VALLURI, Sree (Department of Physics and Astronomy and King's University College, Western University)

Presenter: Prof. JISRAWI, Najeh (Department of Physics and Astronomy and King's University College, Western University)

Session Classification: W3-9 Laser Development (DAMOPC) | Progrès dans les lasers (DPAMPC)

Track Classification: Technical Sessions / Sessions techniques: Atomic, Molecular and Optical Physics, Canada / Physique atomique, moléculaire et photonique, Canada (DAMOPC-DPAMPC)