Master in Photonics – "PHOTONICS BCN"
Master ERASMUS Mundus "EuroPhotonics"

MASTER THESIS PROPOSAL

Dates: April 2023 – July or September 2023

Laboratory: Departament de Física Aplicada
Institution: Univ. Barcelona
City, Country: Barcelona

Title of the master thesis: *Illustrating the electromagnetic fields at interfaces*

Name of the master thesis supervisor and co-supervisor: Salvador Bosch
(for external proposals a co-supervisor from the Master program and a collaboration agreement is needed)
Email address: sbosch@ub.edu
Phone number: ++34 636049862
Mail address: Martí i Franquès 1, 08028 Barcelona

Keywords: electromagnetic fields, Poynting vector, interfaces between materials.

Summary of the subject (maximum 1 page): The formulation of the electromagnetic problem corresponding to the light pass between different media (isotropic materials) is an interesting topic in order to illustrate the theoretical concepts involved and to increase its comprehension. In terms of the electromagnetic theory of light and according to the standard separation in the 's' and 'p' polarization cases, we want to illustrate the state of polarization of the incident, reflected and transmitted waves and the corresponding Poynting vectors which define the effective energy transmission.

Objectives: To develop a set of Matlab (or Python, or Mathematica) progams that illustrate in a complete and didactical way the light beams that get involved in the plane interfaces between different isotropic materials and their polarization state. Thus, the propagation direction and the oscillation directions of the electric and magnetic fields, for the incident, reflected and transmitted ones, have to be graphically represented in a clear and illustrative way. Moreover, the ratios between the energies of the beams will be calculated in order to complete all the relevant information of the phenomenon.

Additional information (if needed):
* Required skills: the student must be proficient in Matlab (or Python, or Mathematica)
* Miscellaneous: