

Homework – week 4

Due: 23:59 Mar. 30 (Thu.)

Submission to: BlackBoard

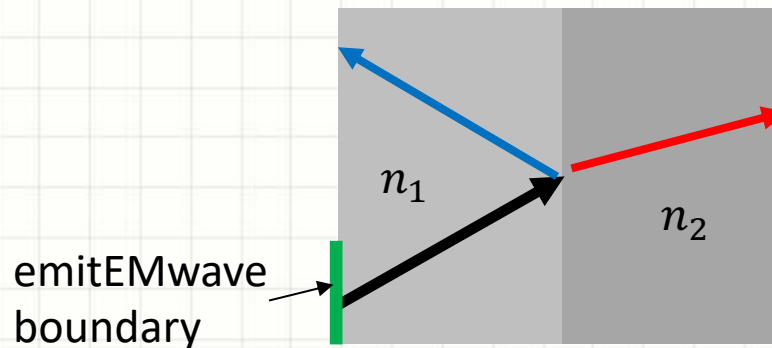
Format: free format. Include the main idea, assumptions (if any), summary of results, and source code. In the source code, each line should be briefly explained by a comment line starting with '#'. No remark may result in point deduction.

For ChatGPT users: attach your own questions used to get ChatGPT results. Do not copy & paste the questions of the homework sheet.

Question 1. Using 'oblique.py', generate a Gaussian beam which propagates in x-direction. Measure the beam radius and peak value of field strength at several different positions along x (including the focal point). Compare the measured radius with the envelope formula. Also check the power conservation along the propagation.

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Question 2. In 'oblique.py', split the domain in x-direction to get two regions with different refractive indices n_1 and n_2 (see the figure). Put the emitEMwave boundary on the left side. For $n_1 > n_2$ (e.g. $n_1 = 2, n_2 = 1$), measure the critical angle. For $n_1 < n_2$, measure the Brewster's angle.



Question 3. Try different diffusion coefficients in Example 1 of Note 4-2. Measure the diffusion times and compare them with the theoretical model.