

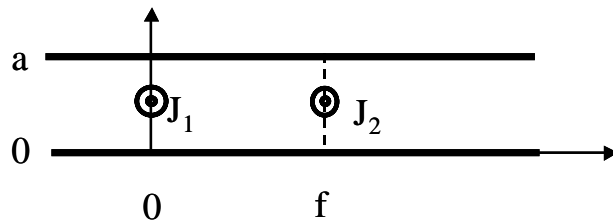
EECS 210
 Fall 2006
 Tu, Th 12:30-2
 400 Cory

Applied Electromagnetic Theory
 Office Hours
 M, (W), 11AM
 Tu, Th, (F) 10AM

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Homework # 7: Due Start of Class Thursday, Nov 9th Project Specification is Posted



$$\bar{J}_1 = J_0 \sin\left(\frac{3\pi x}{a}\right) \delta(z) \hat{y}$$

$$\bar{J}_2 = J_0 \sin\left(\frac{3\pi x}{a}\right) \delta(z - f) \hat{y}$$

P.e.c Waveguide with height a in x Width b in y

7.1) Source Matching Method:

- Explain why the source does not excite TM waves.
- Explain why the source only excites the $TE_{3,0}$ mode.
- Analyze the contribution of source J_1 by using a modal representation and match boundary conditions at $z = 0$.
- Shift the solution to c) to find the solution for source J_2 .
- Use superposition to find the solution when both J_1 and J_2 are present.
- What values of f in terms of a and b will make the fields zero for $z > f$?
- Is there a value of f for which the fields will be zero for $0 < z < f$?

7.2) Reciprocity Analysis Method:

Repeat problem 7.1 using the reciprocity method in of Jackson section 8.12C. Be sure to work out all of the normalization factors.

7.3) Plasmons:

Consider a silver surface and wavelengths of 350, 450 and 550 nm.

- Obtain the refractive indices at these wavelength for silver from the RIT web site (see restricted pages for details).
- Evaluate k_z for a Plasmon at the given wavelengths.
- Find the surface wavelength of the plasmon at the given wavelengths.
- Find the $1/e$ decay distance parallel to the surface for the electric field of the plasmon at the given wavelengths.
- Find the $1/e$ decay distance away from the surface in air for the electric field of the plasmon at the given wavelengths.
- Evaluate the ratio of the $1/e$ decay distance away from the surface in air to the surface wavelength at the given wavelengths. (Is it 2π ?)