

Problem 1.3

A coaxial cable that is assumed lossless has a wavelength of the electric and magnetic fields of $\lambda = 20$ cm at 900 MHz. Find the relative dielectric constant of the insulation.

Solution

Here the wavelength, which is given as the ratio between phase velocity and frequency, can be expressed in terms of the speed of light and the relative dielectric constant (see Problem 1.1 and textbook page 8)

$$\lambda = \frac{c}{f} = \frac{c}{(\sqrt{\epsilon_r})f}$$

from which we find

$$\epsilon_r = \left(\frac{c}{\lambda f}\right)^2 = 2.44$$

Problem 1.4

The electric wave field of a positive z -traveling wave in a medium with relative dielectric constant of $\epsilon_r = 4$ and with frequency of 1 GHz is given by

$$E_z = E_{00} \cos(\omega t - k_1 z) \text{ V/m}$$

- Find the magnetic field if $E_{00} = 10^3$ V/m.
- Determine phase velocity and wavelength.
- Compute the spatial advance of the traveling wave between time intervals $t_1 = 1\text{ps}$ and $t_2 = 7\text{ps}$.

Solution

- From textbook page 8, equation (1.2), we use

$$\frac{E_{00}}{H_{00}} = Z_0 = 377\Omega \left(\frac{1}{\sqrt{\epsilon_r}}\right)$$

$$H_{00} = \frac{E_{00}\sqrt{\epsilon_r}}{377\Omega} = 5.3 \times 10^3 \text{ A/m}$$

- The phase velocity is $v_p = c/(\sqrt{\epsilon_r}) = 1.5 \times 10^8 \text{ m/s}$, from which the wavelength follows as $\lambda = v_p/f = 30\text{cm}$.
- We pick $\cos(\omega t_1 - k_1 z) = 1$, and obtain

$$\omega t_1 = k_1 z_1 \Rightarrow z_1 = \frac{\omega t_1}{k} = \frac{2\pi(1\text{GHz}) \times 1\text{ps}}{2\pi/\lambda} = 450\text{cm}$$

and for $\cos(\omega t_2 - k_1 z_2) = 1$, it is concluded that

$$\omega t_2 = k_1 z_2 \Rightarrow z_2 = \frac{\omega t_2}{k} = \frac{2\pi(1\text{GHz}) \times 7\text{ps}}{2\pi/\lambda} = 1050\text{cm}$$

Thus, the wave is advanced by 600 cm. The MATLAB routine shown below is used for the computation of the numerical results.

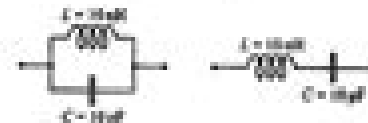
```
% Problem 1.4
%
%   = 3e8;
%   = 1e9;
%   = 1e-12;
%   = 7e-12;
%   = (2*pi)/lambda;
%
%   omega = (2*pi)*f;
%   z_pos1 = omega * t1; % z = 44.28 m, z1 = 44.28 m/s * (s), omega, t1;
%
%   z = omega*t2/omega;
%   z = 1050;
%
%   z1 = omega*t1/omega;
%   z2 = omega*t2/omega;
%   z_pos2 = omega * t2; % z = 1049.99 m, z2 = 1049.99 m * (s), omega, t2, z1, z2;
%
%   print -sape 'p1_4.sape'
```

Executing the code yields

omega = 3.14159e+003 A/s, wp = 1.50e+008 m/s
 z1 = 4.428e+001 m, z2 = 1.05e+003 m, (z2-z1) = 4.50e+002 m

Problem 1.5

Find the frequency response of the impedance magnitude of the following series and parallel LC circuits:



Compare your results to the situation when the ideal inductance is replaced by the same inductance and a 5 Ω resistance connected in series. Assume that these circuits operate in the VHF/UHF frequency band of 30–3000 MHz.

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Annelies Wilder-Smith



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Hat Nov 2, 2014 — The second hat followed the free Princess Crown Pattern where the crown is a band of same sized points, knit from the top of the points down. Frozen inspired Elsa hat pattern by Heidi Arjes Feb 22, 2015 — This is a hat inspired by Elsa from the Disney movie Frozen. This hat will definitely delight the little Elsa fans in your life! Crochet Beanie Free Pattern, Elsa Beanie Work up this crochet beanie free pattern in just one and a half hours. The easy textured stitch is perfect for beginner crocheters. Every Princesses DREAM | Frozen Crochet Elsa Hat - YouTube Hole's Human Anatomy & Physiology | Multiple Choice Quiz A web site to accompany the McGraw-Hill college textbook Hole's Human ... Multiple Choice Quiz. Please answer all questions. 1. Which field, when compared to ... Chapter Assessment Answers Hole's Human Anatomy and Physiology (Shier), 13th Edition. Chapter Assessment Answers. Chapter 01 Assessment Answers (46.0K) Anatomy and physiology Mcgraw Hill Exam 1 Flashcards See an expert-written answer! We have an expert-written solution to this problem! Which one of the following is not in the correct anatomical position? Chapter 1 Anatomy & Physiology (McGraw Hill) Flashcards Study with Quizlet and memorize flashcards containing terms like Ultrastructure, Histopathology, Histology and more. Practice Question Answers Hole's Human Anatomy and Physiology (Shier), 13th Edition. Practice Question Answers. Preview Chapter (24.0K) · Chapter 1 (33.0K) · Chapter 2 (31.0K) Anatomy And Physiology Mcgraw Hill Quiz Answers Pdf Anatomy And Physiology Mcgraw Hill Quiz Answers Pdf. INTRODUCTION Anatomy And Physiology Mcgraw Hill Quiz. Answers Pdf FREE. Anatomy And Physiology Mcgraw Hill Quiz Answers Pdf Page 1. Anatomy And Physiology Mcgraw Hill Quiz Answers Pdf. INTRODUCTION Anatomy And Physiology Mcgraw Hill Quiz. Answers Pdf Copy. Test Banks Hole's Human Anatomy and Physiology (Shier), 13th Edition. Test Banks. Use the ... Practice Question Answers; Chapter Assessment Answers; Integrative Assessment ... Study Tools | AccessMedicine | McGraw Hill Medical Generate multiple-choice quizzes from the resources below. Clinical Neuroanatomy, 29e 100 Questions. New! Clinical Neuroanatomy, 30th Edition Anatomy And Physiology Mcgraw Hill Quiz Answers Pdf Anatomy And Physiology Mcgraw Hill Quiz. Answers Pdf. INTRODUCTION Anatomy And Physiology Mcgraw Hill Quiz. Answers Pdf (2023)