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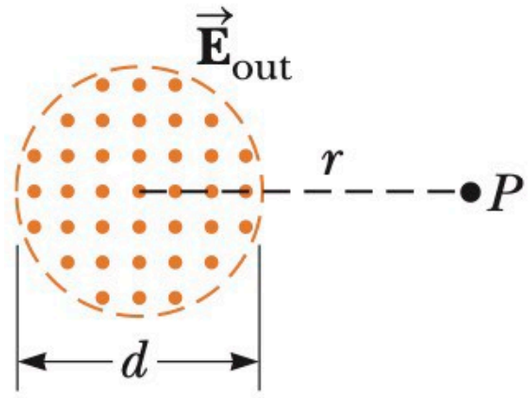
Exercise-1 [Displacement current & general form of Ampere's law]

Consider the situation as shown in the figure. An electric field of 300 V/m is confined to a circular area $d = 10.0$ cm in diameter and directed outward perpendicular to the plane of the figure. If the field is increasing at a rate of 20.0 V/m·s, what are the direction and the magnitude of the magnetic field at the point P, $r = 15.0$ cm from the center of the circle?



Exercise-2 [Plane EM waves]

In SI units, an electromagnetic wave has an electric field described by

$$\vec{E} = \hat{k}1000\sin(20y + \omega t)$$

- What is the angular frequency ω?
- What is the frequency f?
- What is the direction of $\vec{E}$?
- What is $\vec{B}$?
- What is the average energy density and average intensity?

Exercise-3 [Energy carried by EM Waves]

In the region of free space, the electric girls at an instant of time is $\overrightarrow{E} = (80.0\hat{i} + 32.0\hat{j} - 64.0\hat{k})$ N/C and the magnetic girls is $\overrightarrow{B} = (0.200\hat{i} + 0.0808\hat{j} + 0.290\hat{k})\ \mu$T.

- Show that the two fields are perpendicular to each other
- Determine the Poynting vector for these fields

Exercise-4 [Energy carried by EM Waves]

Assuming the antenna of a 10.0 kW radio station radiates spherical electromagnetic waves, compute the maximum value of the magnetic field 5.00 km from the antenna.

Exercise-5 [Momentum and radiation pressure]

A 15.0 mW helium-neon laser emits a beam of circular cross section with a diameter of 2.00 mm.

- Find the maximum electric field in the beam
- What total energy is contained in a 1.00 m length of the beam
- Find the momentum carried by a 1.00 m length of the beam