Maxwell's Equations

Reading assignment

Paul, Whites, and Nasar, 5.3 -> 5.5

Problem 1 - Displacement current

A parallel plate capacitor with circular plates and an air dielectric has a plate radius of 5 mm and a plate separation of 10 μm. The voltage across the plates is $V = 5 \cos \omega t$ where $\omega = 2\pi * 100$ kHz.

a. Find **D** between the plates.

b. Determine the displacement current density, $\partial \mathbf{D}/\partial t$.

c. Is there any free charge motion in the gap between the plates?

d. Compute the total displacement current, $\int \partial \mathbf{D}/\partial t \cdot \mathbf{ds}$, and compare it with the capacitor current, $I = C\, dV/dt$.

e. What is **H** between the plates?