

Consider a coaxial cable with inner diameter a and outer diameter b filled with a dielectric material with $\epsilon = 2\epsilon_0$. An electromagnetic wave propagates down the cable such that the voltage between the inner and outer conductor is given by:

$$V(t) = V_0 e^{ikz} e^{-i\omega t}.$$

- a. Find an expression for the charge density on the inner conductor as a function of z and t .