**Answer on Question #72376-Physics-Electromagnetism**

Given a coaxial cable of length 30 centimeter with inner radius 1 millimeter and 4 millimeter respectively, the space between the conductors is assumed to be filled with air. The total charge on the inner conductor is 1 nano coulomb. Find the charge density on each charge and also the internal field

**Solution**

The charge density on inner radius is

$$\sigma = \frac{q}{2\pi r_1 l} = \frac{1 \cdot 10^{-9}}{2\pi(0.001)(0.3)} = 53 \frac{\mu C}{m^2}.$$

The charge density on outer radius is

$$\sigma = \frac{q}{2\pi r_1 l} = \frac{1 \cdot 10^{-9}}{2\pi(0.004)(0.3)} = 13 \frac{\mu C}{m^2}.$$

The internal field is

$$E = 0, if\ 0 < r < 0.001\ m.$$

$If\ 0.001 < r < 0.004\ m.$

$$E = \frac{q}{2\pi\epsilon_0 r l}$$

$$E = \frac{1 \cdot 10^{-9}}{2\pi(8.85 \cdot 10^{-12})(0.3)} \frac{1}{r} = \frac{60}{r} \frac{V}{m}.$$