$$d\underset{\sim}{E} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{dQ}{r} \cos\phi$$

$$= \int_0^1 \int_0^{2\pi} \frac{1}{4\pi\varepsilon_0} \cdot \frac{dQ}{r} \cos\phi$$

$$= \int_0^1 \int_0^{2\pi} \frac{1}{4\pi\varepsilon_0} * \frac{\rho_s \, d\rho \, d\phi}{\rho^2 + z^2} * \frac{z^2}{\sqrt{\rho^2+z^2}}$$

$$= \frac{\rho_s z}{4\pi\varepsilon_0} \int_0^1 \int_0^{2\pi} \frac{\rho \, d\rho \, d\phi}{(\rho^2+z^2)^{\frac{2}{3}}}$$

$$= \frac{\rho_s z}{4\pi\varepsilon_0} \left[2\pi \left(\frac{1}{2} * \frac{-2}{\sqrt{\rho^2+1}} \right) \Big|_0^1 \right]$$

$$= 3.309 \times 10^4 \text{ V/m } a_z$$