6-24 Coax has $r_{inner} = 0.3\,cm = a$, sheath has $r_{outer} = .8\,cm = b$

$E_{max}^{spark} = 40\,MV/m$, $\kappa = 3$

Find V_{max}: $D_\rho = \frac{\lambda \hat{\rho}}{2\pi\rho}$ in cylindrical coord.

use $\vec{D} = \varepsilon \vec{E}$

$$E_\rho = \frac{\lambda \hat{r}}{2\pi\varepsilon\rho} = \frac{\lambda \hat{r}}{2\pi\kappa\varepsilon_0 r}$$

$$V = \int_a^b E\,d\rho = \frac{\lambda}{2\pi\kappa\varepsilon_0}\int_a^b d\rho/\rho = \frac{\lambda}{2\pi\kappa\varepsilon_0}\ln(b/a)$$

e.g.

$$\lambda = 2\pi\kappa\varepsilon_0 V / \ln(b/a)$$

Need $E(a) < E_{spark} = 40\,MV/m$

or $V < V_{max}$

$$E_{spark} = \frac{V_{max}}{a \ln b/a}$$

$$\rightarrow V_{max} = a\,E_{spark}\ln(b/a) = 3\times10^{-3}\,m \cdot 40\times10^{6}\,\frac{V}{m}\ln\frac{b}{a}$$

$$= 1.18\times10^{5}\,V \neq V(\kappa)$$