$$\vec{\jmath} = v\gamma \qquad \vec{\jmath} = \frac{I\, a^2}{2\pi} e^{-a\rho}$$

$$Q = \int \jmath \, dV = \frac{I\, a^2}{2\pi v} \int_0^\rho \int_0^{2\pi} \int_0^h e^{-a\rho} \rho \, dz \, d\varphi \, d\rho =$$

$$= \frac{Ih}{v} \left(1 - \rho a\, e^{-a\rho} - e^{-a\rho} \right)$$

$$\int E \, dS = \frac{Q}{\varepsilon_0}$$

$$\varepsilon_0 E \cdot 2\pi \rho h = \frac{Ih}{v} \left(1 - \rho a\, e^{-a\rho} - e^{-a\rho} \right)$$

$$F_e = \frac{I\, e}{2\pi \varepsilon_0 v} \left(\frac{1}{\rho} - a\, e^{-\rho} - \frac{1}{\rho} e^{-a\rho} \right)$$

$$F_m = q v B = \frac{I \mu_0\, q\, v}{2\pi} \left[\frac{1}{\rho} - a\, e^{-a\rho} - \frac{1}{\rho} e^{-a\rho} \right]$$

$$\frac{F_m}{F_e} = \mu_0 \varepsilon_0 v^2$$