From the drawing - All field lines that enter the net, exit thru the circular end.

Thus the net flux (pardon the pun) thru closed surface = 0.

As there is no enclosed charge,

\[ \Phi_{\text{net}} = - \Phi_{\text{enclosed}} = - \pi a^2 E \quad \text{Note Sign} \]

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\[ E = \frac{2}{2\pi \epsilon_0 r} \]

\[ j = \epsilon_0 \epsilon E \cdot \lambda = \frac{2}{9 \times 10^9 N \cdot m^2 / C^2} \cdot (4.5 \times 10^4 \, N/C \cdot 1 / 2 \, m) \]

\[ j = 2 \times 10^{-5} \, C/m \]