Given 26.58 cable, 30cm length, shorted at end, 1MHz operation,
\( L = 252 \text{nH/m} \), \( C = 102.4 \text{pF/m} \), \( R = 0.035 \text{ohm/m} \), \( G = 0 \)

Resistance is quite low, test for low loss approximation:

\[
\text{if } (R \ll \omega L) \text{ AND } (G \ll \omega C) \text{ then } \Rightarrow \text{ low loss approximation}
\]

\[
\text{if } \frac{0.035}{\text{ohm/m}} \ll \frac{(1 \times 10^6) \text{ (2pi)} (252 \text{nH/m})}{} \Rightarrow \text{ low loss}
\]

\[
0.035 \text{ ohm/m} \ll 1.58 \Rightarrow \text{ low loss approximation applies: } \begin{cases} \alpha = \frac{R}{2Z_0} \\ Z_0 = \sqrt{\frac{L}{C}} \end{cases}
\]

\[
Z_0 = \sqrt{\frac{252 \text{nH/m}}{102.4 \text{pF/m}}} = 49.61 \Omega
\]

\[
\nu_p = \sqrt{\frac{1}{LC}} = \sqrt{\frac{1}{(252 \times 10^{-9} \text{H/m})(102.4 \times 10^{-12} \text{F/m})}} = 196,856 + 200.4 \text{ m/s}
\]

\[
\alpha = \frac{C}{Z_0} = \frac{0.035}{2(49.61)} = \frac{3.528 \times 10^{-4} \text{Np}}{\text{m}} = \frac{3.528 \times 10^{-9} \text{Np}}{\text{m}} \left( \frac{8.686 \text{dB}}{\text{m}} \right)
\]

\[
= \frac{3.064 \times 10^{-3} \text{dB}}{\text{m}}
\]

(b)

Paralleled resonant circuit is high-Z, coax cable shorted at the end \( \frac{1}{4} \) long will resonate at other end. Also \( e^{\frac{3\lambda}{4}}, \frac{5\lambda}{4} \)

\[
F = \frac{\nu_p}{\lambda} = \frac{196,856,496 \text{ m/s}}{30 \text{ m}} = 6.562 \times 10^8 \text{ Hz} \quad \text{so a 30cm line is one \( \lambda \) at 656.2 MHz.}
\]

At what length is the line \( \frac{2}{4} \) long; e \( \frac{1}{4} \) the frequency = 164 MHz

\( \frac{3\lambda}{4} \) long; e \( \frac{3}{4} \) the frequency = 492 MHz

\( \frac{5\lambda}{4} \) long; e \( \frac{5}{4} \) the frequency = 820 MHz