

Radio Frequency (RF) Electronics

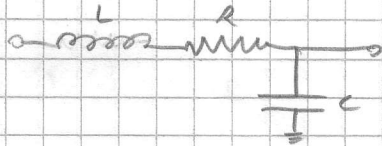
High Frequency \rightarrow Domain where:

- interelectrode capacitance
- wiring inductance
- stored charge
- short wavelength

are important

low pass \rightarrow $F_{cutoff} = \frac{1}{2\pi RC}$

$Z_C = \frac{1}{j\omega C}$ $Z_L = j\omega L$



All connections have some L, R, & C. At Lf. Freq. this starts to matter.

Wavelength:

$c = \lambda \nu$ ← radiation in vacuum

$\lambda = \frac{c}{\nu}$ $c = 3 \times 10^8 \frac{m}{s}$

For $\nu = 10 \text{ kHz}$, $\lambda = 30 \text{ km}$

For $\nu = 1 \text{ MHz}$, $\lambda = 300 \text{ m}$ ← (AM radio)

For $\nu = 100 \text{ MHz}$, $\lambda = 3 \text{ m}$ ← (FM, TV)

For $\nu = 1 \text{ GHz}$, $\lambda = 30 \text{ cm}$ ← (mobile phone)

For $\nu = 100 \text{ GHz}$, $\lambda = 3 \text{ mm}$

For circuits of characteristic size $l \ll \lambda$, we can think of the transmission of voltages & currents as instantaneous. We have been doing this implicitly in our circuit diagrams until now.

