Question #1

12. 120Ω Resistor → 6.5mm long
   6Ω Resistor → 3.2mm long
   0.1Ω Resistor → 1.8mm long

- If sufficient excitation
- If two resistors is Disc

1. When can each resistor safely be considered lumped (Permeability)?

Use laminate versus component size criterion

Safety lumped is where component size is ≤ 0.01λ

For the case where 75: 0.01, λ = \frac{0.01 \times 75}{F}

So for 120Ω resistor, (6.5mm ≤ \frac{0.01 \times 75}{F})

\[ F = \frac{0.0075}{75} \times 10^9 \text{ Hz} \]

= 2.76 GHz

For 120Ω (3.2mm), 2.2mm ≤ \frac{0.01 \times 75}{F}

\[ F = \frac{0.0075}{3.2} \times 10^9 \text{ Hz} \]

= 5.625 GHz

For 0.1Ω (1.0mm), 1.0mm ≤ \frac{0.01 \times 75}{F}

\[ F = \frac{0.0075}{1.0} \times 10^9 \text{ Hz} \]

= 7.5 GHz