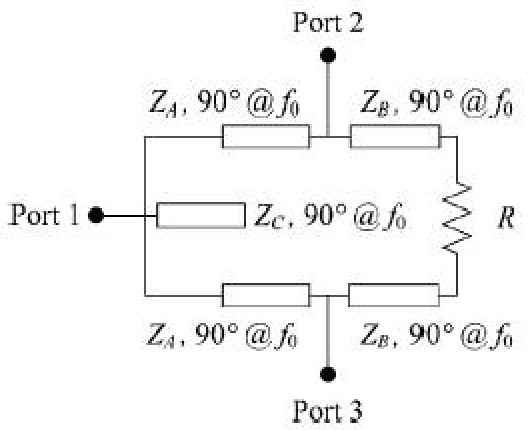
Dual Band, Wilkinson RF Splitter



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This sheet is for a dual-band power-divider.

This is a Wilkinson power splitter that is designed to operate at two frequency bands.

The maths for this filter is from Cheng, Law, IEEE MTT issue 56/2 pages 487 onwards.

Inputs yellow, outputs green

$\mu m := 10^{-6} \cdot m \qquad nH := 10^{-9} \cdot henry$

Main user input area:

$F1 := 1GHz \qquad F2 := 2.3GHz \qquad Zo := 50 \cdot ohm$

$\frac{F2}{F1} = 2.3$

This should be between 1.3 and 2.7

Calculate:

$$\mathbf{e} := \frac{\mathbf{p}}{2} \cdot \frac{\frac{F2}{F1} - 1}{\frac{F2}{F1} + 1} \qquad k := \frac{1 + \sqrt{1 + 8 \cdot (\cot(\mathbf{e}))^2}}{2 \cdot (\cot(\mathbf{e}))^2} \qquad ZA := Zo \cdot \sqrt{(1 + k) \cdot \left[k - (\tan(\mathbf{e}))^2\right]} \qquad Fo := \frac{F2 + F1}{2}$$

$$R := 2 \cdot Zo \cdot \left(1 + \frac{1}{k}\right) \qquad ZB := \frac{ZA}{k} \qquad ZC := \frac{ZA}{k + (\tan(\mathbf{e}))^2}$$

$Fo = 1.65 \cdot GHz$

$ZA = 67.1 \cdot ohm$

$ZB = 51.9 \cdot ohm$

$ZC = 37.3 \cdot ohm$

$R = 177.4 \cdot ohm$

The S21 and S31 are the same and shown below with 3dB loss each, which is expected. The isolation (S23) is quite interesting as it is more than 20dB down at both operating frequencies. Quite an impressive circuit.