



HANDY MICROWAVE EQUATIONS

Legend:

- | | |
|----------------------------------|--|
| RL = Return Loss | $\pi = 3.14159265359$ |
| SM = Source Match | $\mu_0 = 1.25663706144 \times 10^{-6}$ |
| PP = Peak to Peak Ripple in dB | $\epsilon_0 = 8.85418781762 \times 10^{-12}$ |
| D = Outer Conductor Diameter | $\epsilon_{r(air)} = 1.000649$ |
| d = Inner Conductor Diameter | $c = 2.99792458 \times 10^{10} \text{ cm/sec}$ |
| ML = Mismatch Loss | |

$$RL = -20 \text{Log}_{10} \Gamma$$

$$VSWR_{Total} = VSWR_1 * VSWR_2$$

$$RL = -20 \text{Log}_{10} \frac{VSWR - 1}{VSWR + 1}$$

$$Z_{Airline} = 138.01475 \text{Log}_{10} \frac{D}{d}$$

$$VSWR = \frac{1 + 10^{\frac{-RL}{20}}}{1 - 10^{\frac{-RL}{20}}}$$

$$\frac{D}{d} = 10^{\frac{Z_{Airline}}{138.01475}}$$

$$SM = -20 \text{Log}_{10} (1 - 10^{\frac{-PP}{40}})$$

$$Z_{DielectricLine} = \frac{1}{\sqrt{\epsilon_r}} 138.059528957 \text{Log}_{10} \frac{D}{d}$$

$$PP = -40 \text{Log}_{10} (1 - 10^{\frac{-SM}{20}})$$

$$VSWR = \frac{Z_{Max}}{Z_{Min}}$$

$$\Gamma = \frac{VSWR - 1}{VSWR + 1}$$

$$ML = -10 \text{Log}_{10} (1 - \Gamma^2)$$

$$VSWR = \frac{1 + \Gamma}{1 - \Gamma}$$