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Transmission Line Characteristics Formulas

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List of 15 Transmission Line Characteristics Formulas

Transmission Line Characteristics

1) Bandwidth of Antenna

Open Calculator

fx $$BW = 100 \cdot \left(\frac{F_H - f_L}{F_c} \right)$$

ex $$18.76\text{kHz} = 100 \cdot \left(\frac{500\text{kHz} - 31\text{kHz}}{2.5\text{kHz}} \right)$$

2) Characteristic Impedance of Transmission Line

Open Calculator

fx $$Z_o = \sqrt{\frac{L}{C}}$$

ex $$19.80676\Omega = \sqrt{\frac{5.1\text{mH}}{13\mu\text{F}}}$$

3) Conductance of Distortionless Line

Open Calculator

fx $$G = \frac{R \cdot C}{L}$$

ex $$0.0325\mho = \frac{12.75\Omega \cdot 13\mu\text{F}}{5.1\text{mH}}$$

4) Current Standing Wave Ratio (CSWR)

Open Calculator

fx $$\mathrm{CSWR} = \frac{\mathrm{i_{max}}}{\mathrm{i_{min}}}$$

ex $$1.931034 = \frac{5.6\mathrm{A}}{2.9\mathrm{A}}$$

5) Impedance Matching in Single Section Quarter Wave Line

Open Calculator

fx $$\mathrm{Z_o} = \sqrt{\mathrm{Z_L} \cdot \mathrm{Z_s}}$$

ex $$19.80808\Omega = \sqrt{68\Omega \cdot 5.77\Omega}$$

6) Insertion Loss in Transmission Line

Open Calculator

fx $$\mathrm{I_L} = 10 \cdot \log 10\left(\frac{\mathrm{P_t}}{\mathrm{P_r}}\right)$$

ex $$5.093059\mathrm{dB} = 10 \cdot \log 10\left(\frac{0.42\mathrm{W}}{0.13\mathrm{W}}\right)$$

7) Length of Wound Conductor

Open Calculator

fx $$\mathrm{L_{cond}} = \sqrt{1 + \left(\frac{\pi}{\mathrm{P_{cond}}}\right)^2}$$

ex $$2.581545\mathrm{m} = \sqrt{1 + \left(\frac{\pi}{1.32}\right)^2}$$

8) Phase Velocity in Transmission Lines

Open Calculator

fx $$V_p = \lambda \cdot f$$

ex $$1950\text{m/s} = 7.8\text{m} \cdot 0.25\text{kHz}$$

9) Reflection Coefficient in Transmission Line

Open Calculator

fx $$\Gamma = \frac{Z_L - Z_o}{Z_L + Z_o}$$

ex $$0.548975 = \frac{68\Omega - 19.8\Omega}{68\Omega + 19.8\Omega}$$

10) Relative Pitch of Wound Conductor

Open Calculator

fx $$P_{cond} = \left(\frac{L_s}{2 \cdot r_{layer}} \right)$$

ex $$1.328904 = \left(\frac{8\text{m}}{2 \cdot 3.01\text{m}} \right)$$

11) Resistance at Second Temperature

Open Calculator

fx $$R_2 = R_1 \cdot \left(\frac{T + T_f}{T + T_o} \right)$$

ex $$2.431828\Omega = 3.99\Omega \cdot \left(\frac{243\text{K} + 27\text{K}}{243\text{K} + 200\text{K}} \right)$$

12) Return Loss by Means of VSWR

Open Calculator

fx $$P_{ret} = 20 \cdot \log 10\left(\frac{VSWR + 1}{VSWR - 1}\right)$$

ex $$5.365477\text{dB} = 20 \cdot \log 10\left(\frac{3.34 + 1}{3.34 - 1}\right)$$

13) Standing Wave Ratio

Open Calculator

fx $$SWR = \frac{V_{max}}{V_{min}}$$

ex $$7 = \frac{10.5\text{V}}{1.5\text{V}}$$

14) Voltage Standing Wave Ratio (VSWR)

Open Calculator

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

ex $$3.347826 = \frac{1 + 0.54}{1 - 0.54}$$

15) Wavelength of Line

Open Calculator

fx $$\lambda = \frac{2 \cdot \pi}{\beta}$$

ex $$7.853982\text{m} = \frac{2 \cdot \pi}{0.8}$$

Variables Used

- **BW** Bandwidth of Antenna *(Kilohertz)*
- **C** Capacitance *(Microfarad)*
- **CSWR** Current Standing Wave Ratio
- **f** Frequency *(Kilohertz)*
- F_c Centre Frequency *(Kilohertz)*
- F_H Highest Frequency *(Kilohertz)*
- f_L Lowest Frequency *(Kilohertz)*
- **G** Conductance *(Mho)*
- I_L Insertion Loss *(Decibel)*
- i_{max} Current Maxima *(Ampere)*
- i_{min} Current Minima *(Ampere)*
- **L** Inductance *(Millihenry)*
- L_{cond} Length of Wound Conductor *(Meter)*
- L_s Length of Spiral *(Meter)*
- P_{cond} Relative Pitch of Wound Conductor
- P_r Power Received After Insertion *(Watt)*
- P_{ret} Return Loss *(Decibel)*
- P_t Power Transmitted Before Insertion *(Watt)*
- **R** Resistance *(Ohm)*
- R_1 Initial Resistance *(Ohm)*
- R_2 Final Resistance *(Ohm)*

- r_{layer} Radius of Layer *(Meter)*
- **SWR** Standing Wave Ratio (SWR)
- **T** Temperature Coefficient *(Kelvin)*
- T_f Final Temperature *(Kelvin)*
- T_o Initial Temperature *(Kelvin)*
- V_{max} Voltage Maxima *(Volt)*
- V_{min} Voltage Minima *(Volt)*
- V_p Phase Velocity *(Meter per Second)*
- **VSWR** Voltage Standing Wave Ratio
- Z_L Load Impedance of Transmission Line *(Ohm)*
- Z_o Characteristics Impedance of Transmission Line *(Ohm)*
- Z_s Source Impedance *(Ohm)*
- β Propagation Constant
- Γ Reflection Coefficient
- λ Wavelength *(Meter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **log10**, log10(Number)
  Common logarithm function (base 10)
- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Electric Current** in Ampere (A)
  Electric Current Unit Conversion
- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Power** in Watt (W)
  Power Unit Conversion
- Measurement: **Noise** in Decibel (dB)
  Noise Unit Conversion
- Measurement: **Frequency** in Kilohertz (kHz)
  Frequency Unit Conversion
- Measurement: **Capacitance** in Microfarad (µF)
  Capacitance Unit Conversion
- Measurement: **Electric Resistance** in Ohm (Ω)
  Electric Resistance Unit Conversion
- Measurement: **Electric Conductance** in Mho (℧)
  Electric Conductance Unit Conversion

- Measurement: **Inductance** in Millihenry (mH)
  Inductance Unit Conversion
- Measurement: **Wavelength** in Meter (m)
  Wavelength Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion

Check other formula lists

- **Transmission Line & Antenna Theory Formulas**
- **Transmission Line Characteristics Formulas**

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