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Transmission Line & Antenna Theory Formulas

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List of 15 Transmission Line & Antenna Theory Formulas

Transmission Line & Antenna Theory

1) Beamwidth of Reflector

Open Calculator

fx $$\psi = \frac{70 \cdot \lambda}{D}$$

ex $$10427.83^\circ = \frac{70 \cdot 7.8\text{m}}{3\text{m}}$$

2) Current Maxima

Open Calculator

fx $$i_{max} = i_{id} + I_r$$

ex $$5.6\text{A} = 4.25\text{A} + 1.35\text{A}$$

3) Current Minima

Open Calculator

fx $$i_{min} = i_{id} - I_r$$

ex $$2.9\text{A} = 4.25\text{A} - 1.35\text{A}$$

4) Cutoff Wavenumber in TM and TE Mode

Open Calculator

fx $$k_c = \frac{m \cdot \pi}{d}$$

ex $$9666.439\text{Diopter} = \frac{4 \cdot \pi}{0.0013\text{m}}$$

5) Focal Length of Reflector

Open Calculator

fx $$f_{ref} = \left(\frac{D^2}{16 \cdot c}\right)$$

ex $$0.046875\text{m} = \left(\frac{(3\text{m})^2}{16 \cdot 12\text{m}}\right)$$

6) Gain of Parabolic Reflector Antenna

Open Calculator

fx $$G_{pr} = 10 \cdot \log 10\left(k \cdot \left(\pi \cdot \frac{D}{\lambda}\right)^2\right)$$

ex $$0.394143\text{dB} = 10 \cdot \log 10\left(0.75 \cdot \left(\pi \cdot \frac{3\text{m}}{7.8\text{m}}\right)^2\right)$$

7) Minimum Distance from Antenna

Open Calculator

fx $$r_{min} = \frac{2 \cdot D^2}{\lambda}$$

ex $$2.307692\text{m} = \frac{2 \cdot (3\text{m})^2}{7.8\text{m}}$$

8) Parallel Waveguide Distance from Cutoff Wavenumber

Open Calculator

fx $$d = \frac{m \cdot \pi}{k_c}$$

ex $$0.0013\text{m} = \frac{4 \cdot \pi}{9666.43\text{Diopter}}$$

9) Phase Constant in Telephone Cable

Open Calculator

fx $$\Phi = \sqrt{\frac{\omega \cdot R \cdot C}{2}}$$

ex $$0.407124\text{rad/s} = \sqrt{\frac{2000\text{rad/s} \cdot 12.75\Omega \cdot 13\mu\text{F}}{2}}$$

10) Polarization Mismatch Loss

Open Calculator

fx $$M_L = -20 \cdot \log 10(\cos(\theta))$$

ex $$1.249387\text{dB} = -20 \cdot \log 10(\cos(30^\circ))$$

11) Return Loss(dB)

Open Calculator

fx $$P_{ret} = 20 \cdot \log 10\left(\frac{P_i}{P_{ref}}\right)$$

ex $$5.367961\text{dB} = 20 \cdot \log 10\left(\frac{15.25\text{W}}{8.22\text{W}}\right)$$

12) Velocity Factor

Open Calculator

fx $$V_f = \frac{1}{\sqrt{K}}$$

ex $$0.613139 = \frac{1}{\sqrt{2.66}}$$

13) Velocity of Propagation in Telephonic Cable

Open Calculator

fx $$V_P = \sqrt{\frac{2 \cdot \omega}{R \cdot C}}$$

ex $$4912.508\text{m/s} = \sqrt{\frac{2 \cdot 2000\text{rad/s}}{12.75\Omega \cdot 13\mu\text{F}}}$$

14) Voltage Maxima

Open Calculator

fx $$V_{max} = V_i + V_r$$

ex $$10.5\text{V} = 6\text{V} + 4.5\text{V}$$

15) Voltage Minima

Open Calculator

fx $V_{min} = V_i - V_r$

ex $1.5V = 6V - 4.5V$

Variables Used

- **c** Depth of Parabola *(Meter)*
- **C** Capacitance *(Microfarad)*
- **d** Parallel Waveguide Distance *(Meter)*
- **D** Parabolic Reflector Diameter *(Meter)*
- f_{ref} Focal Length of Reflector *(Meter)*
- G_{pr} Gain of Parabolic Reflector Antenna *(Decibel)*
- i_{id} Incident Current *(Ampere)*
- i_{max} Current Maxima *(Ampere)*
- i_{min} Current Minima *(Ampere)*
- I_r Reflected Current *(Ampere)*
- **k** Efficiency Factor of Parabolic Reflector
- **K** Dielectric Constant
- k_c Cutoff Wavenumber *(Diopter)*
- **m** Mode Index
- M_L Polarization Mismatch Loss *(Decibel)*
- P_i Incident Power Fed into Antenna *(Watt)*
- P_{ref} Reflected Power by Antenna *(Watt)*
- P_{ret} Return Loss *(Decibel)*
- **R** Resistance *(Ohm)*
- r_{min} Minimum Distance from Antenna *(Meter)*
- V_f Velocity Factor
- V_i Incident Voltage *(Volt)*

- V_{max} Voltage Maxima *(Volt)*
- V_{min} Voltage Minima *(Volt)*
- V_P Velocity of Propagation in Telephonic Cable *(Meter per Second)*
- V_r Reflected Voltage *(Volt)*
- θ Theta *(Degree)*
- λ Wavelength *(Meter)*
- Φ Phase Constant *(Radian per Second)*
- ψ Beamwidth *(Degree)*
- ω Angular Velocity *(Radian per Second)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **cos**, cos(Angle)
  Trigonometric cosine function
- 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: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Power** in Watt (W)
  Power Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Noise** in Decibel (dB)
  Noise Unit Conversion
- Measurement: **Capacitance** in Microfarad (µF)
  Capacitance Unit Conversion
- Measurement: **Electric Resistance** in Ohm (Ω)
  Electric Resistance Unit Conversion
- Measurement: **Wavelength** in Meter (m)
  Wavelength Unit Conversion

- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion
- Measurement: **Angular Velocity** in Radian per Second (rad/s)
  Angular Velocity Unit Conversion
- Measurement: **Wave Number** in Diopter (Diopter)
  Wave Number Unit Conversion

Check other formula lists

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

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