Important Frequency Reuse Concept Formulas PDF

Formulas
Examples
with Units

List of 16
Important Frequency Reuse Concept Formulas

1) Carrier Frequency using Maximum Doppler Shift Formula

Evaluate Formula

Formula

$$F_c = \frac{F_m \cdot [c]}{V}$$

Example with Units

$$1898.6856\,\text{kHz} = \frac{0.0551\,\text{kHz} \cdot 3\text{E}{+}8\,\text{m/s}}{8700\,\text{m/s}}$$

2) Channel Reuse Ratio Formula

Evaluate Formula

Formula

$$Q = \sqrt{3 \cdot K}$$

Example

$$3.2404 = \sqrt{3 \cdot 3.5}$$

3) Coherence Bandwidth for Multipath Channel Formula

Evaluate Formula

Formula

$$B_c = \frac{1}{5 \cdot \sigma_t}$$

Example with Units

$$0.0007\,\text{kHz} = \frac{1}{5 \cdot 0.286\,\text{s}}$$

4) Coherence Bandwidth for Random Phases of Two Received Signals Formula

Evaluate Formula

Formula

$$B_{c'} = \frac{1}{4 \cdot 3.14 \cdot \Delta}$$

Example with Units

$$7.8\text{E}{-}5\,\text{kHz} = \frac{1}{4 \cdot 3.14 \cdot 1.02\,\text{s}}$$

5) Coherence Bandwidth for Two Fading Amplitudes of Two Received Signals Formula

Evaluate Formula

Formula

$$B_{fad} = \frac{1}{2 \cdot 3.14 \cdot \Delta}$$

Example with Units

$$0.0002\,\text{kHz} = \frac{1}{2 \cdot 3.14 \cdot 1.02\,\text{s}}$$

6) Coherence Time Formula

Evaluate Formula

Formula

$$T_c = \frac{0.423}{F_m}$$

Example with Units

$$0.0077\,\text{s} = \frac{0.423}{0.0551\,\text{kHz}}$$

7) Delay Spread Formula

Evaluate Formula

Formula

$$\Delta = \frac{1}{2 \cdot 3.14 \cdot B_{fad}}$$

Example with Units

$$1.0207\,\text{s} = \frac{1}{2 \cdot 3.14 \cdot 0.000156\,\text{kHz}}$$

8) Forward Frame Formula

Evaluate Formula

Formula

$$F.F = \tau + R.F + 44 \cdot T_s$$

Example with Units

$$2213 = 8\,\text{s} + 5 + 44 \cdot 50\,\text{s}$$

9) M-Ary PAM Formula

Evaluate Formula

Formula

$$P_{\sqrt{M}} = 1 - \sqrt{1 - P_{\sqrt{Q}}}$$

Example

$$0.9 = 1 - \sqrt{1 - 0.99}$$

10) M-Ary QAM Formula

Evaluate Formula

Formula

$$P_{\sqrt{Q}} = 1 - \left(1 - P_{\sqrt{M}}\right)^2$$

Example

$$0.99 = 1 - \left(1 - 0.9\right)^2$$

11) Maximum Doppler Shift Formula

Evaluate Formula

Formula

$$F_m = \left(\frac{V}{[c]}\right) \cdot F_c$$

Example with Units

$$0.0551\,\text{kHz} = \left(\frac{8700\,\text{m/s}}{3E{+}8\,\text{m/s}}\right) \cdot 1900\,\text{kHz}$$

12) Maximum Excess Delay Formula

Evaluate Formula

Formula

$$X = \tau_x - \tau_0$$

Example with Units

$$7.65\,\text{dB} = 14\,\text{dB} - 6.35\,\text{dB}$$

13) Reverse Frame Formula

Evaluate Formula

Formula

$$R.F = F.F - \left(\tau + 44 \cdot T_s\right)$$

Example with Units

$$5 = 2213 - \left(8\,\text{s} + 44 \cdot 50\,\text{s}\right)$$

14) RMS Delay Spread Formula

Evaluate Formula

Formula

$$\sigma_t = \sqrt{\tau'' - \left(\tau'\right)^2}$$

Example with Units

$$0.2863\,\text{s} = \sqrt{0.084\,\text{s} - \left(0.045\,\text{s}\right)^2}$$

15) Symbol Time Period Formula

Evaluate Formula

Formula

$$T_s = \frac{F.F - (\tau + R.F)}{44}$$

Example with Units

$$50_s = \frac{2213 - (8_s + 5)}{44}$$

16) Time Slots Formula

Evaluate Formula

Formula

$$\tau = F.F - (R.F + 44 \cdot T_s)$$

Example with Units

$$8_s = 2213 - (5 + 44 \cdot 50_s)$$

Variables used in list of Frequency Reuse Concept Formulas above

- B_c Coherence Bandwidth *(Kilohertz)*
- $B_{c'}$ Coherence Bandwidth Random Phase *(Kilohertz)*
- B_{fad} Coherence Bandwidth Fading *(Kilohertz)*
- F_c Carrier Frequency *(Kilohertz)*
- F_m Maximum Doppler Shift *(Kilohertz)*
- **F.F** Forward Frame
- **K** Frequency Reuse Pattern
- $P_{\sqrt{M}}$ M-Ary PAM
- $P_{\sqrt{Q}}$ M-Ary QAM
- **Q** Co Channel Reuse Ratio
- **R.F** Reverse Frame
- T_c Coherence Time *(Second)*
- T_s Symbol Time *(Second)*
- **V** Velocity *(Meter per Second)*
- **X** Maximum Excess Delay *(Decibel)*
- **Δ** Delay Spread *(Second)*
- σ_t RMS Delay Spread *(Second)*
- τ' Mean Excess Delay *(Second)*
- τ'' Variance Mean Excess Delay *(Second)*
- τ_0 First Arriving Signal *(Decibel)*
- τ_x Excess Delay Spread *(Decibel)*
- τ Time Slots *(Second)*

Constants, Functions, Measurements used in list of Frequency Reuse Concept Formulas above

- constant(s): **[c]**, 299792458.0
  Light speed in vacuum
- Functions: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Frequency** in Kilohertz (kHz)
  Frequency Unit Conversion
- Measurement: **Sound** in Decibel (dB)
  Sound Unit Conversion

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