

Important Mobile Radio Propagation Formulas PDF



Formulas
Examples
with Units

List of 16 Important Mobile Radio Propagation Formulas

1) Block of N Serial Source Formula

Formula

$$N_s = \frac{T_d}{T}$$

Example with Units

$$6 = \frac{1800s}{300s}$$

Evaluate Formula 

2) Cumulative Distribution Function Formula

Formula

$$CDF = t_{avg} \cdot n_R$$

Example with Units

$$38.5 = 3.5s \cdot 11$$

Evaluate Formula 

3) Level Crossing Rate Formula

Formula

$$N_R = \left(\sqrt{2 \cdot \pi} \right) \cdot F_m \cdot \rho \cdot e^{-(\rho^2)}$$

Example with Units

$$13.6741 = \left(\sqrt{2 \cdot 3.1416} \right) \cdot 0.0551\text{kHz} \cdot 0.1 \cdot e^{-(0.1^2)}$$

Evaluate Formula 

4) Long Term Fading Formula

Formula

$$M_t = \frac{R_t}{R_{ot}}$$

Example

$$2.5 = \frac{26}{10.4}$$

Evaluate Formula 

5) Maximum Possible S by N Ratio Formula

Formula

$$SN_m = SN_{out} \cdot F$$

Example with Units

$$390\text{dB} = 30\text{dB} \cdot 13\text{dB}$$

Evaluate Formula 

6) Mobile Radio Distance Formula

Formula

$$d = \left(\frac{\alpha}{C} \right)^{\frac{1}{4}}$$

Example with Units

$$2_m = \left(\frac{160}{10w} \right)^{\frac{1}{4}}$$

Evaluate Formula 



7) Mobile Radio Signal Formula

Formula

$$R_t = M_t \cdot R_{ot}$$

Example

$$26 = 2.5 \cdot 10.4$$

Evaluate Formula 

8) Mobile Receiver Carrier Power Formula

Formula

$$C = \alpha \cdot d^{-4}$$

Example with Units

$$10\text{ W} = 160 \cdot 2\text{ m}^{-4}$$

Evaluate Formula 

9) Multipath Fading Formula

Formula

$$R_{ot} = \frac{R_t}{M_t}$$

Example

$$10.4 = \frac{26}{2.5}$$

Evaluate Formula 

10) Noise Figure Formula

Formula

$$F = \frac{SN_m}{SN_{out}}$$

Example with Units

$$13\text{ dB} = \frac{390\text{ dB}}{30\text{ dB}}$$

Evaluate Formula 

11) Path Loss Coefficient Formula

Formula

$$\alpha = \frac{C}{d^{-4}}$$

Example with Units

$$160 = \frac{10\text{ W}}{2\text{ m}^{-4}}$$

Evaluate Formula 

12) Selective Retransmission Formula

Formula

$$R_s = \frac{N_{wd} \cdot L}{H \cdot E_n + B_{wd} \cdot E_1 \cdot N_{wd}}$$

Example

$$0.0723 = \frac{19 \cdot 3}{9 \cdot 4 + 12 \cdot 3.3 \cdot 19}$$

Evaluate Formula 

13) Serial to Parallel Modulation Time Period Formula

Formula

$$T = \frac{T_d}{N_s}$$

Example with Units

$$300\text{ s} = \frac{1800\text{ s}}{6}$$

Evaluate Formula 

14) Short Term Fading Formula

Formula

$$R_o = R_t \cdot M_t$$

Example

$$65 = 26 \cdot 2.5$$

Evaluate Formula 



15) Stop-and-Wait ARQ Technique Formula

Formula

$$R = \frac{N_{wd} \cdot L}{(H + B_{wd} \cdot N_{wd}) \cdot E_n}$$

Example

$$0.0601 = \frac{19 \cdot 3}{(9 + 12 \cdot 19) \cdot 4}$$

Evaluate Formula 

16) Symbol Duration Formula

Formula

$$T_d = N_s \cdot T$$

Example with Units

$$1800_s = 6 \cdot 300_s$$

Evaluate Formula 



Variables used in list of Mobile Radio Propagation Formulas above

- **B_{wd}** Number of Bits per Word
- **C** Mobile Receiver Carrier Power (*Watt*)
- **CDF** Cumulative Distribution Function
- **d** Transmitter Receiver Distance (*Meter*)
- **E_1** Expected One Transmission
- **E_n** Expected Number of Transmission
- **F** Noise Figure of Amplifier (*Decibel*)
- **F_m** Maximum Doppler Shift (*Kilohertz*)
- **H** Header Bits
- **L** Information Bits
- **M_t** Long Term Fading
- **n_R** Normalized LCR
- **N_R** Level Crossing Rate
- **N_s** Block of N Serial Source
- **N_{wd}** Number of Word Message Consist
- **R** Stop-and-Wait ARQ Technique
- **R_o** Short Term Fading
- **R_{ot}** Multipath Fading
- **R_s** Selective Retransmission
- **R_t** Mobile Radio Signal
- **SN_m** Maximum Possible S/N Ratio (*Decibel*)
- **SN_{out}** Actual S/N Ratio at Output (*Decibel*)
- **T** Time Period (*Second*)
- **t_{avg}** Average Duration of Fade (*Second*)
- **T_d** Symbol Duration (*Second*)
- **α** Path Loss Coefficient
- **ρ** Normalized RMS Value

Constants, Functions, Measurements used in list of Mobile Radio Propagation Formulas above

- **constant(s):** **π** ,
3.14159265358979323846264338327950288
Archimedes' constant
- **constant(s):** **e**,
2.71828182845904523536028747135266249
Napier's constant
- **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:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Time** in Second (s)
Time 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 



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