Final Equation

aokblast

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Contents

1 Line of Sight Eq

$$d = 3.57\sqrt{Kh}, \text{ where } K = \frac{4}{3}, d = 3.57(\sqrt{Kh_1} + \sqrt{K_h 2})$$

2 Free Space Loss

$$L = \frac{P_t}{P_r} = \frac{(4\pi d)^2}{\lambda^2}, \text{ where } L_{dB} = 10logL = -20log(\lambda) + 20log(d) + 21.98$$

3 Free Space Loss with other antennas

$$\frac{P_t}{P_r} = \frac{L}{G_r G_t} = \frac{((\lambda d)^2)}{A_r A_t}, \text{ where } L_{dB} = 10logL = 20log(\lambda) + 20logd - 10log(A_t A_r)$$

4 Thermal Noise

$N = BN_0 = BkT$, where $k = 1.3803 * 10^{-23}$ and $N_{dB} = 10log(kTB) = -228.6 + 10log(T) + 10log(B)$

5 Expression

$$\frac{E_b}{N_0} = \frac{S/R}{N_0} = \frac{S}{kTR} = \frac{S}{N}\frac{B_T}{R} = \frac{B}{C}(2^{\frac{C}{B}} - 1), (\frac{E_b}{N_0})_{dB} = S_{dBW} - 10logR + 228.6 - 10logT$$

6 MFSK

$s_i(t) = Acos2\pi f_i t$, where $1 \leq i \leq M$, where $f_i = f_c + (2i - 1 - M)f_d, B = 2Mf_d, 2f_d = \frac{1}{LT}$

7 Bandwidth

ASK, PSK $= (1+r)R$, FSK $= 2\delta F + (1+R)R$, MPSK $= \frac{R}{L} = \frac{R(1+r)}{\log_2 M}$, MFSK $= \frac{(1+r)RM}{\log_2 M}$

, AM $= 2B$, (PM, FM) $= 2(\beta + 1)B where \beta = n_p A_m$ for PM, $\frac{n_f A_m}{2\pi B}$for FM

8 PCM(SNR)

$$\text{SNR}_{dB} = 20lkog2^n + 1.76 = 6.02n + 1.76$$

9 Frequency Reuse Patternw

$\frac{D}{R} = \sqrt{3N}\frac{D}{d} = \sqrt{N}$, cover Area $= 1.5R^2\sqrt{3}$, channel per cell $= \frac{\text{channels}}{\text{reuse factor(N)}}$

10 Okumura/Hata's Model

$L_{db} = 69.55 + 26.16_c - 13.82_t - A(h_r) + (44.9 - 6.55_t)logd$, small city

$= (1.1_c - 0.7)h_r - (1.56_c - 0.8)$, large city $= f_c \leq 300$MHz?$8.29[\log(1.54h_r)]^2 - 1.1$

: $83.2[\log(11.75h_r)]^2 - 4.97$System Load $= A = \lambda h = \phi N$

LCD, LCC, LCH MTSO, PSTN