$T_s \leq \frac{1}{2B} \Rightarrow f_s \geq 2B$

$$\frac{1}{\sqrt{\det(2\pi\Sigma)}} \exp\left(-\frac{1}{2}(x-\mu)^T \Sigma^{-1} (x-\mu)\right)$$

$C = B \log_2 \left(1 + \frac{S}{N}\right)$

$\frac{E_b}{N_0} = \frac{2^\eta - 1}{\eta}$

$L = 20 \log_{10}\left(\frac{4\pi d}{\lambda}\right)$

$C_{ij} = \int_{-\infty}^{\infty} S_n(f) \Phi_i^*(f) \Phi_j(f)\, df$

M-FSK

$$P_{eM} = 1 - \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} \left(1 - Q\left(x + \sqrt{\frac{2E_s}{N_0}}\right)\right)^{M-1} \exp\left(-\frac{x^2}{2}\right) dx$$

$P_e \approx \frac{P_{eM}}{2} \frac{M}{M-1}$ $\quad P_{eM} \leq (M-1) Q\left(\sqrt{\frac{E_s}{N_0}}\right)$

M-PSK

$$P_{eM} = \frac{1}{\pi} \int_0^{\pi(1-1/M)} \exp\left(\frac{E_s}{N_0} \frac{\sin^2(\pi/M)}{\sin^2(\phi)}\right) d\phi$$

$P_{eM} \leq 2Q\left(\sqrt{\frac{2E_s}{N_0}} \sin\frac{\pi}{M}\right)$

M-QAM

$E_s = \frac{2}{3} E(M-1)$ $\quad E = \frac{3E_s}{2(M-1)}$

$$P_{eM} \leq 4 \frac{\sqrt{M}-1}{\sqrt{M}} Q\left(\sqrt{\frac{3}{M-1} \frac{E_s}{N_0}}\right)$$

K reuse factor 4 7

$= \frac{\text{freq ch \#}}{\text{ch \# per BTS}}$

reuse

$\leq \sqrt{\frac{2 \log / \log_{10}}{N}}$

$\frac{|a_{i,i}|^2 E_b}{N_0 + \frac{(\#\text{ users})|a_{i,i}|^2 E_b}{PG}}$ $\quad \frac{PG}{\#\text{ users}}$

$K_{avr} \approx \frac{N}{\text{freq}}$

$\frac{C}{(1+SNR)^L}$

$f_{(x)} = \frac{x}{\sigma^2} e^{-x^2/(2\sigma^2)}$

$f_P(p)\ \frac{1}{2\sigma^2} e^{-p/(2\sigma^2)}$

$S(f_D)\ \frac{P_r G}{\pi \sqrt{f_{D,max}^2 - f_D^2}}$

$\bar{P}_e = \frac{1}{2}\left(1 - \sqrt{\frac{\bar{\gamma}}{1+\bar{\gamma}}}\right) \approx \frac{1}{4\bar{\gamma}}$

$P(r) = \frac{r}{\sigma^2} \exp\left(\frac{-r^2 + A^2}{2\sigma^2}\right) I_0\left(\frac{Ar}{\sigma^2}\right)$