$$P_{rec}(d)=\frac{P_t G_t G_r \lambda^2}{(4\pi)^2 d^2 L}$$ {Free-space Model}, $\lambda = c/f_c$

Free space Path Loss $PL(dB)=-10\log\frac{G_t G_r \lambda^2}{(4\pi)^2 d^2}$ or $PL(dB)=-10\log\frac{\lambda^2}{(4\pi)^2 d^2}$

$$Power(dBm)=10\log\left(\frac{Power(Watt)}{0.001}\right)$$

Average received power at distance (d) : $\overline{P_{rec}(d)}_{dB}=\overline{P_{rec}(d_o)}_{dB}-10n\log\left(\frac{d}{d_o}\right)$

$$\text{Prob}\left(P_{rec}(d)>\gamma\right)=Q\left(\frac{\gamma-\overline{P_{rec}(d)}}{\sigma}\right)$$

Doppler shift $f_d=f_m\cos(\theta)$ where $f_m=v/\lambda$

$\bar{\tau}=\frac{\sum_k P_k \tau_k}{\sum_k P_k}$, $\overline{\tau^2}=\frac{\sum_k P_k \tau_k^2}{\sum_k P_k}$ (The rms delay spread) $\sigma_\tau=\sqrt{\overline{\tau^2}-\bar{\tau}^2}$)

Coherence Bandwidth $B_c(50\%)=\frac{1}{5\sigma_\tau}$, Coherence Time $T_c(50\%)=\frac{9}{16\pi f_m}$,

Rayleigh PDF $f_R(r)=\frac{r}{\sigma^2}e^{-\frac{r^2}{2\sigma^2}}$, Rician PDF $f_R(r)=\frac{r}{\sigma^2}e^{-\frac{(r^2+A^2)}{2\sigma^2}}I_o\left(\frac{Ar}{\sigma^2}\right)$

No. of level-R crossings/second : $N_R=\sqrt{2\pi}f_m\rho e^{-\rho^2}$

Average fade duration below level R: $\bar{\tau}=\frac{e^{\rho^2}-1}{\rho f_m\sqrt{2\pi}}$

Coherence Distance $D_c(50\%)=\frac{9\lambda}{16\pi}$

Raised Cosine pulse Bandwidth: $BW_{BaseBand}=\frac{1+\alpha}{2T_s}$, $BW_{RF}=\frac{1+\alpha}{T_s}$