Log-Distance Path Loss

The log-distance path loss model assumes that path loss varies exponentially with distance. The path loss in dB is given by the equation :

Log-Distance Path Loss

$$\overline{PL}(d) = \overline{PL}(d_0) + 10n \log(\frac{d}{d_0}) + X_\sigma$$

n: path loss exponent,

d: is the distance between transmitter and receiver in meters

d_0: is the close-in reference distance in meters.

PL(d_0): free space path loss.

The value d_0 should be selected such that it is in the far-field of the transmitting antenna, but still small relative to any practical distance used in the mobile communication system. The value of the path loss exponent n varies depending upon the environment.

Calculation of path loss exponent (n):

Building Type	Frequency of Transmission	n
Vacuum, Infinite Space		2.0
Retail Store	914 MHz	2.2
Grocery Store	914 MHz	1.8
Office with hard partition	1.5 GHz	3.0
Office with soft partition	900 MHz	2.4
Office with soft partition	1.9 GHz	2.6
Textile or chemical	1.3 GHz	2.0
Textile or chemical	4 GHz	2.1
Office	60 GHz	2.2
Commercial	60 GHz	1.7

X_σ is a normal (or Gaussian) random variable with zero mean, reflecting the attenuation in decibels caused by flat fading.

- In case of no-fading this variable is 0 and the equation becomes as in (1):

$$\overline{PL}(d) = \overline{PL}(d_0) + 10n \log(\frac{d}{d_0}) \quad (1)$$

- In case of only shadow fading or slow fading, X_σ has Gaussian distribution, whereas in case of only fast fading due to multipath propagation X_σ has Rayleigh or Ricean distribution, and thus the equation has the form of (2):

$$\overline{PL}(d) = \overline{PL}(d_0) + 10n \log(\frac{d}{d_0}) + X_\sigma \quad (2)$$

Path loss : 1172.24 dB