| Handset Transmitter Power (dBm)               | 23       |
|---|----------|
| Base Station Height (m)                       | 30       |
| Handset User height: (m)                      | 1.5      |
| Base Station Antenna gain: (dBi)              | 16.15    |
| Handset Antenna Gain: (dBi)                   | 0        |
| Frequency: (MHz)                              | 1960     |
| Outside Shadowing standard deviation: (dB)    | 10       |
| Building Penetration Margin: (suburban dB)    | 10       |
| Building Penetration standard deviation: (dB) | 8        |
| Noise Figure = (dB)                           | 5        |
| Noise Floor: (dBm)                            | -174     |
| kbps bandwidth (dB)                           | 56.0206  |
| SNR (dB)                                      | 7        |
| Probability Multiple                          | 1.28     |
|   |          |
| (Noise Floor + Noise Figure + kbps + SNR)     | -105.979 |
| Sigma Composite (Bp^2 + Op^2)^(1/2)           | 12.80625 |
| Link Budget (dBm)                             | -79.5874 |

| Handset Transmitter Power (dBm)   | 23                   |
|---|----------------------|
| Base Station Height (m)   | 30                   |
| Handset User height: (m)  | 1.5                  |
| Base Station Antenna gain: (dBi)  | 16.15                |
| Handset Antenna Gain: (dBi)   | 0                    |
| Frequency: (MHz)  | 1960                 |
| Outside Shadowing standard deviation: (dB)                              | 10                   |
| Building Penetration Margin: (suburban dB)                              | 10                   |
| Building Penetration standard deviation: (dB)                           | 8                    |
| Noise Figure = (dB)   | 5                    |
| Noise Floor: (dBm)  | -174                 |
| kbps bandwidth (dB)   | 56.0206              |
| SNR (dB)  | 7                    |
| Area (km^2)   | 900                  |
| Probability Multiple  | 1.28                 |
| (Noise Floor + Noise Figure + kbps + SNR)                               | -105.979             |
| Sigma Composite (Bp^2 + Op^2)^(1/2)                                     | 12.80625             |
| Link Budget (dBm)   | -79.5874             |
|   |                      |
| Lp (dB) = A + B log10 (d) + C   |                      |
| Where;  |                      |
| A = 46.3+ 33.9 log10 (fc ) – 13.82 log10 (hb ) – a (hm)                 |                      |
| B = 44.9 – 6.55 log 10 (hb )  |                      |
| C= 0 for medium city and suburban areas                                 |                      |
| a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas |                      |
| a(hm).  | 0.046303             |
| A.  | 137.4474             |
| В.  | 35.22486             |
| C.  | 0                    |
|   | 440 7074             |
| IP = Link Budget + TxP + G hs   | 118 /3/4             |
| $LP = Link Budget + TxP + G_bs$ $log(d) = (LP - A - C) / B$             | 118.7374<br>-0 53116 |
| log(d) = (LP - A - C) / B   | -0.53116             |
| _   |                      |

| Handset Transmitter Power (dBm)   | 23   |
|---|--|
| Base Station Height (m)   | 30   |
| Handset User height: (m)  | 1.5  |
| Base Station Antenna gain: (dBi)  | 16.15  |
| Handset Antenna Gain: (dBi)   | 0  |
| Frequency: (MHz)  | 2500   |
| Outside Shadowing standard deviation: (dB)  | 10   |
| Building Penetration Margin: (suburban dB)  | 10   |
| Building Penetration standard deviation: (dB)                                     | 8  |
| Noise Figure = (dB)   | 5  |
| Noise Floor: (dBm)  | -174   |
| kbps bandwidth (dB)   | 56.0206  |
| SNR (dB)  | 7  |
| Area (km^2)   | 900  |
| Probability Multiple  | 1.28   |
| (Noise Floor + Noise Figure + kbps + SNR)   | -105.979   |
| Sigma Composite (Bp^2 + Op^2)^(1/2)   | 12.80625   |
| Link Budget (dBm)   | -79.5874   |
|   |  |
| Lp (dB) = A + B log 10 (d) + C  |  |
| Where;  |  |
| A = 46.3+ 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm)                           |  |
| B = 44.9 – 6.55 log 10 (hb )  |  |
| C= 0 for medium city and suburban areas   |  |
|   |  |
| a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas           |  |
|   | 0.055815   |
| a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas a(hm). A. | 0.055815<br>141.0205                             |
| a(hm).  | 141.0205   |
| a(hm).<br>A.  | 141.0205<br>35.22486                             |
| a(hm).<br>A.<br>B.<br>C.  | 141.0205<br>35.22486                             |
| a(hm). A. B. C.  LP = Link Budget + TxP + G_bs                                    | 141.0205<br>35.22486<br>0                        |
| a(hm). A. B. C.  LP = Link Budget + TxP + G_bs  log(d) = (LP - A - C) / B         | 141.0205<br>35.22486<br>0<br>118.7374<br>-0.6326 |
| a(hm). A. B. C.  LP = Link Budget + TxP + G_bs                                    | 141.0205<br>35.22486                             |

| Base Station Height (m)  Handset User height: (m)  Base Station Antenna gain: (dBi)  Handset Antenna Gain: (dBi)  Frequency: (MHz)  Outside Shadowing standard deviation: (dB)  Building Penetration Margin: (suburban dB)  Building Penetration standard deviation: (dB)  Building Penetration standard deviation: (dB)  Building Penetration standard deviation: (dB)  Solve Figure = (dB)  Noise Figure = (dB)  Noise Floor: (dBm)  Area (km^2)  Probability Multiple  Outside Shadowing standard deviation: (dB)  Solve Floor: (dBm)  Frequency: (MBz)  Solve Floor: (dBm)  Frequency: (dB |  |   |   |
|--|--|---|---|
| Handset User height: (m)  Base Station Antenna gain: (dBi)  Handset Antenna Gain: (dBi)  O  O  O  Frequency: (MHz)  Outside Shadowing standard deviation: (dB)  Building Penetration Margin: (suburban dB)  Building Penetration standard deviation: (dB)  Noise Figure = (dB)  Noise Figure = (dB)  Noise Filoor: (dBm)  Area (km^2)  Probability Multiple  O  (Noise Floor + Noise Figure + kbps + SNR)  Sigma Composite (Bp^2 + Op^2)^(1/2)  Link Budget (dBm)  B = 44.9 - 6.55 log 10 (hb)  C= 0 for medium city and suburban areas  a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  (LP = Link Budget + TxP + G_bs  log(d) = (LP - A - C) / B  distance (km)  Area of cell = 2.598(d^2)  Area of cell = 2.598(d^2)  O   (D   O   O   1.56  O   O  0  0  0  0  0  0  0  0  0  0  0  0  0  | Handset Transmitter Power (dBm)  | 23  | 23  |
| Base Station Antenna gain: (dBi)       16.15       16.15         Handset Antenna Gain: (dBi)       0       0         Frequency: (MHz)       1960       2500         Outside Shadowing standard deviation: (dB)       10       10         Building Penetration Margin: (suburban dB)       10       10         Building Penetration standard deviation: (dB)       8       8         Noise Figure = (dB)       5       5         Noise Floor: (dBm)       -174       -174         kbps bandwidth (dB)       56.0206       56.0206         SNR (dB)       7       7         Area (km^2)       900       900         Probability Multiple       0.675       0.675         (Noise Floor + Noise Figure + kbps + SNR)       -105.979       -105.979         Sigma Composite (Bp^2 + Op^2)^(1/2)       12.80625       12.80625         Link Budget (dBm)       -87.3352       -87.3352         Lp (dB) = A + B log10 (d) + C       Where;       A         A = 46.3 + 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm)       B       44.9 - 6.55 log 10 (hb )         C = 0 for medium city and suburban areas       a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas       a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas <t< td=""><td>Base Station Height (m)</td><td>30</td><td>30</td></t<>   | Base Station Height (m)  | 30  | 30  |
| Handset Antenna Gain: (dBi) 0 0 0 0    Frequency: (MHz) 1960 2500    Outside Shadowing standard deviation: (dB) 10 10    Building Penetration Margin: (suburban dB) 10 10    Building Penetration standard deviation: (dB) 8 8 8    Noise Figure = (dB) 5 5 5    Noise Floor: (dBm) -174 -174    kbps bandwidth (dB) 56.0206 56.0206    SNR (dB) 7 7    Area (km^2) 900 900    Probability Multiple 0.675 0.675    (Noise Floor + Noise Figure + kbps + SNR) -105.979 -105.979    Sigma Composite (Bp^2 + Op^2)^(1/2) 12.80625    Link Budget (dBm) -87.3352 -87.3352    Lp (dB) = A + B log10 (d) + C    Where; A = 46.3+ 33.9 log10 (fc) - 13.82 log10 (hb) - a (hm)    B = 44.9 - 6.55 log 10 (hb)    C= 0 for medium city and suburban areas    a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas    a(hm). A.   | Handset User height: (m)   | 1.5   | 1.5   |
| Trequency: (MHz)   | Base Station Antenna gain: (dBi)   | 16.15   | 16.15   |
| Outside Shadowing standard deviation: (dB)  Building Penetration Margin: (suburban dB)  Building Penetration standard deviation: (dB)  8  8  8  Noise Figure = (dB)  Noise Floor: (dBm)  Figure = (dBm)  Noise Floor: (dBm)  Noise Floor: (dBm)  Noise Floor: (dBm)  Noise Floor: (dBm)  Figure = (dBm)  Noise Floor: (dBm)  Figure + kbps + SNR)  Figure + kbps + SNR)  Figure + kbps + SNR)  Figure - kbps + SNR  Figure - kbp | Handset Antenna Gain: (dBi)  | 0   | 0   |
| Building Penetration Margin: (suburban dB)  Building Penetration standard deviation: (dB)  8 8 8  Noise Figure = (dB) 5 5  Noise Floor: (dBm) -174 -174  kbps bandwidth (dB) 56.0206  SNR (dB) 7 7  Area (km^2) 900 900  Probability Multiple 0.675 0.675  (Noise Floor + Noise Figure + kbps + SNR) -105.979 -105.979  Sigma Composite (Bp^2 + Op^2)^(1/2) 12.80625 12.80625  Link Budget (dBm) -87.3352 -87.3352  Lp (dB) = A + B log10 (d) + C  Where;  A = 46.3 + 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm)  B = 44.9 - 6.55 log 10 (hb )  C = 0 for medium city and suburban areas  a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A. 137.4474 141.0205  B. 35.22486  C. 0 0  LP = Link Budget + TxP + G_bs  log(d) = (LP - A - C) / B  distance (km) 0.488421 0.386683  Area of cell = 2.598(d^2) 0.619766 0.388463  | Frequency: (MHz)   | 1960  | 2500  |
| Building Penetration standard deviation: (dB) 8 8 Noise Figure = (dB) 5 5 Noise Floor: (dBm) -174 -174 kbps bandwidth (dB) 56.0206 56.0206 SNR (dB) 7 7 Area (km^2) 900 900 Probability Multiple 0.675 0.675  (Noise Floor + Noise Figure + kbps + SNR) -105.979 -105.979 Sigma Composite (Bp^2 + Op^2)^(1/2) 12.80625 Link Budget (dBm) -87.3352 -87.3352  Lp (dB) = A + B log10 (d) + C Where; A = 46.3+33.9 log10 (fc) - 13.82 log10 (hb) - a (hm) B = 44.9 - 6.55 log 10 (hb) C= 0 for medium city and suburban areas a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas a(hm). 0.046303 0.055815 A. 137.4474 141.0205 B. 35.22486 C. 0 0  LP = Link Budget + TxP + G_bs 126.4852 126.4852 log(d) = (LP - A - C) / B -0.31121 -0.41264 distance (km) 0.488421 0.386683 Area of cell = 2.598(d^2) 0.619766 0.388463  | Outside Shadowing standard deviation: (dB)   | 10  | 10  |
| Noise Figure = (dB) 5 5 5 Noise Floor: (dBm) -174 -174 -174 kbps bandwidth (dB) 56.0206 56.0206 58.020 | Building Penetration Margin: (suburban dB)   | 10  | 10  |
| Noise Floor: (dBm) -174 -174   -174   kbps bandwidth (dB)   56.0206   56.0206   56.0206   58.020 | Building Penetration standard deviation: (dB)  | 8   | 8   |
| kbps bandwidth (dB)       56.0206       56.0206         SNR (dB)       7       7         Area (km^2)       900       900         Probability Multiple       0.675       0.675         (Noise Floor + Noise Figure + kbps + SNR)       -105.979       -105.979         Sigma Composite (Bp^2 + Op^2)^(1/2)       12.80625       12.80625       12.80625         Link Budget (dBm)       -87.3352       -87.3352         Lp (dB) = A + B log10 (d) + C       Where;       A = 46.3+ 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm)       B = 44.9 - 6.55 log 10 (hb)         C = 0 for medium city and suburban areas       a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas       a(hm)       0.046303       0.055815         A.       137.4474       141.0205       35.22486       35.22486       35.22486       35.22486       35.22486       35.22486       126.4852       126.4852       126.4852       126.4852       126.4852       126.4852       10g(d) = (LP - A - C) / B       -0.31121       -0.41264       distance (km)       0.488421       0.386683         Area of cell = 2.598(d^2)       0.619766       0.388463  | Noise Figure = (dB)  | 5   | 5   |
| SNR (dB)       7       7         Area (km^2)       900       900         Probability Multiple       0.675       0.675         (Noise Floor + Noise Figure + kbps + SNR)       -105.979       -105.979         Sigma Composite (Bp^2 + Op^2)^(1/2)       12.80625       12.80625         Link Budget (dBm)       -87.3352       -87.3352         Lp (dB) = A + B log10 (d) + C       Where;       A = 46.3+ 33.9 log10 (fc) - 13.82 log10 (hb) - a (hm)       B = 44.9 - 6.55 log 10 (hb)         C = 0 for medium city and suburban areas       a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas       a(hm)         A.       137.4474       141.0205         B.       35.22486       35.22486         C.       0       0         LP = Link Budget + TxP + G_bs       126.4852       126.4852         log(d) = (LP - A - C) / B       -0.31121       -0.41264         distance (km)       0.488421       0.386683         Area of cell = 2.598(d^2)       0.619766       0.388463   | Noise Floor: (dBm)   | -174  | -174  |
| Area (km^2) 900 900  Probability Multiple 0.675 0.675  (Noise Floor + Noise Figure + kbps + SNR) -105.979 -105.979 Sigma Composite (Bp^2 + Op^2)^(1/2) 12.80625 12.80625  Link Budget (dBm) -87.3352 -87.3352  Lp (dB) = A + B log10 (d) + C  Where; A = 46.3+ 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm) B = 44.9 - 6.55 log 10 (hb) C= 0 for medium city and suburban areas a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas a(hm). A. 137.4474 141.0205 B. 35.22486 C. 0 0  LP = Link Budget + TxP + G_bs 126.4852 log(d) = (LP - A - C) / B -0.31121 -0.41264 distance (km) Area of cell = 2.598(d^2) 0.619766 0.388463  | kbps bandwidth (dB)  | 56.0206   | 56.0206   |
| Probability Multiple       0.675       0.675         (Noise Floor + Noise Figure + kbps + SNR)       -105.979       -105.979         Sigma Composite (Bp^2 + Op^2)^(1/2)       12.80625       12.80625         Link Budget (dBm)       -87.3352       -87.3352         Lp (dB) = A + B log10 (d) + C       Where;       A = 46.3 + 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm)       B = 44.9 - 6.55 log 10 (hb )         C = 0 for medium city and suburban areas a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas       0.046303       0.055815         A.       137.4474       141.0205         B.       35.22486       35.22486         C.       0       0         LP = Link Budget + TxP + G_bs       126.4852       126.4852         log(d) = (LP - A - C) / B       -0.31121       -0.41264         distance (km)       0.488421       0.386683         Area of cell = 2.598(d^2)       0.619766       0.388463  | SNR (dB)   | 7   | 7   |
| (Noise Floor + Noise Figure + kbps + SNR)  Sigma Composite (Bp^2 + Op^2)^(1/2)  Link Budget (dBm)  -87.3352  -87.3352  Lp (dB) = A + B log10 (d) + C  Where;  A = 46.3+ 33.9 log10 (fc) - 13.82 log10 (hb) - a (hm)  B = 44.9 - 6.55 log 10 (hb)  C= 0 for medium city and suburban areas a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas a(hm).  A.  137.4474  141.0205 B.  C.  0  0  LP = Link Budget + TxP + G_bs log(d) = (LP - A - C) / B distance (km)  Area of cell = 2.598(d^2)  126.4852 0.388663  Area of cell = 2.598(d^2)  | Area (km^2)  | 900   | 900   |
| Sigma Composite (Bp^2 + Op^2)^(1/2)       12.80625       12.80625         Link Budget (dBm)       -87.3352       -87.3352         Lp (dB) = A + B log10 (d) + C       Where;       A = 46.3 + 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm)       B = 44.9 - 6.55 log 10 (hb )         C= 0 for medium city and suburban areas       a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas       0.046303       0.055815         A.       137.4474       141.0205         B.       35.22486       35.22486         C.       0       0         LP = Link Budget + TxP + G_bs       126.4852       126.4852         log(d) = (LP - A - C) / B       -0.31121       -0.41264         distance (km)       0.488421       0.386683         Area of cell = 2.598(d^2)       0.619766       0.388463  | Probability Multiple   | 0.675   | 0.675   |
| Sigma Composite (Bp^2 + Op^2)^(1/2)       12.80625       12.80625         Link Budget (dBm)       -87.3352       -87.3352         Lp (dB) = A + B log10 (d) + C       Where;       A = 46.3 + 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm)       B = 44.9 - 6.55 log 10 (hb )         C= 0 for medium city and suburban areas       a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas       0.046303       0.055815         A.       137.4474       141.0205         B.       35.22486       35.22486         C.       0       0         LP = Link Budget + TxP + G_bs       126.4852       126.4852         log(d) = (LP - A - C) / B       -0.31121       -0.41264         distance (km)       0.488421       0.386683         Area of cell = 2.598(d^2)       0.619766       0.388463  |  |   |   |
| Link Budget (dBm)  Lp (dB) = A + B log10 (d) + C  Where;  A = 46.3+ 33.9 log10 (fc) – 13.82 log10 (hb) – a (hm)  B = 44.9 – 6.55 log 10 (hb)  C= 0 for medium city and suburban areas a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A. 137.4474 141.0205 B. 35.22486 C. 0 0  LP = Link Budget + TxP + G_bs 126.4852 log(d) = (LP - A - C) / B -0.31121 -0.41264 distance (km)  Area of cell = 2.598(d^2) 0.619766 0.388463  | (Noise Floor + Noise Figure + kbps + SNR)  | -105.979  | -105.979  |
| Lp (dB) = A + B log10 (d) + C  Where;  A = 46.3+ 33.9 log10 (fc) – 13.82 log10 (hb) – a (hm)  B = 44.9 – 6.55 log 10 (hb)  C= 0 for medium city and suburban areas  a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  | Sigma Composite (Bp^2 + Op^2)^(1/2)  | 12.80625  | 12.80625  |
| Where; A = 46.3+ 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm) B = 44.9 - 6.55 log 10 (hb ) C= 0 for medium city and suburban areas a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  | Link Budget (dBm)  | -87.3352  | -87.3352  |
| Where; A = 46.3+ 33.9 log10 (fc ) - 13.82 log10 (hb ) - a (hm) B = 44.9 - 6.55 log 10 (hb ) C= 0 for medium city and suburban areas a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  |  |   |   |
| A = 46.3+ 33.9 log10 (fc ) – 13.82 log10 (hb ) – a (hm)  B = 44.9 – 6.55 log 10 (hb )  C= 0 for medium city and suburban areas  a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  | Lp (dB) = A + B log 10 (d) + C   |   |   |
| $B = 44.9 - 6.55 \log 10 \text{ (hb )}$ $C = 0 \text{ for medium city and suburban areas}$ $a(hm) = (1.1\log 10(f) - 0.7)\text{hm} - (1.56\log 10(f) - 0.8) \text{ for suburban areas}$ $a(hm).$ $0.046303  0.055815$ $A.  137.4474  141.0205$ $B.  35.22486  35.22486$ $C.  0  0$ $LP = \text{Link Budget} + \text{TxP} + \text{G_bs}$ $\log(d) = (\text{LP} - \text{A} - \text{C}) / \text{B}$ $distance \text{ (km)}$ $Area of \text{ cell} = 2.598(d^2)$ $0.388463$  | Where;   |   |   |
| C= 0 for medium city and suburban areas a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  137.4474 141.0205 B.  C.  0  0  LP = Link Budget + TxP + G_bs log(d) = (LP - A - C) / B distance (km)  Area of cell = 2.598(d^2)  0.046303 0.055815 137.4474 141.0205 137.4474 141.0205 137.4474 141.0205 137.4474 141.0205 0.0488421 0.386683  | A = 46.3+ 33.9 log10 (fc) – 13.82 log10 (hb) – a (hm)  |   |   |
| a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  0.046303  0.055815  A.  137.4474  141.0205  B.  35.22486  C.  0  0  LP = Link Budget + TxP + G_bs  log(d) = (LP - A - C) / B  distance (km)  Area of cell = 2.598(d^2)  0.0488421  0.386683  0.388463   | B = 44.9 – 6.55 log 10 (hb)  |   |   |
| a(hm). 0.046303 0.055815 A. 137.4474 141.0205 B. 35.22486 35.22486 C. 0 0  LP = Link Budget + TxP + G_bs 126.4852 126.4852 log(d) = (LP - A - C) / B -0.31121 -0.41264 distance (km) 0.488421 0.386683 Area of cell = 2.598(d^2) 0.619766 0.388463   | C. O for modifying situs and assessment areas  |   |   |
| A. 137.4474 141.0205 B. 35.22486 C. 0 0  LP = Link Budget + TxP + G_bs 126.4852 log(d) = (LP - A - C) / B -0.31121 -0.41264 distance (km) 0.488421 0.386683 Area of cell = 2.598(d^2) 0.619766 0.388463  | C= 0 for medium city and suburban areas  |   |   |
| A. 137.4474 141.0205 B. 35.22486 C. 0 0  LP = Link Budget + TxP + G_bs 126.4852 log(d) = (LP - A - C) / B -0.31121 -0.41264 distance (km) 0.488421 0.386683 Area of cell = 2.598(d^2) 0.619766 0.388463  | •  |   |   |
| B. 35.22486 C. 0 0  LP = Link Budget + TxP + G_bs 126.4852 log(d) = (LP - A - C) / B distance (km) Area of cell = 2.598(d^2) 35.22486 35.22486 35.22486 35.22486 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   | •  |   |   |
| C. 0 0 0  LP = Link Budget + TxP + G_bs 126.4852 126.4852 log(d) = (LP - A - C) / B -0.31121 -0.41264 distance (km) 0.488421 0.386683 Area of cell = 2.598(d^2) 0.619766 0.388463  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  | 0.046303  | 0.055815  |
| LP = Link Budget + TxP + G_bs 126.4852 126.4852 log(d) = (LP - A - C) / B -0.31121 -0.41264 distance (km) 0.488421 0.386683 Area of cell = 2.598(d^2) 0.619766 0.388463  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas<br>a(hm).  |   |   |
| log(d) = (LP - A - C) / B  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas<br>a(hm).<br>A.  | 137.4474  | 141.0205  |
| log(d) = (LP - A - C) / B  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas a(hm). A. B.   | 137.4474<br>35.22486  | 141.0205<br>35.22486  |
| distance (km)       0.488421       0.386683         Area of cell = 2.598(d^2)       0.619766       0.388463  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas a(hm). A. B.   | 137.4474<br>35.22486  | 141.0205<br>35.22486  |
| Area of cell = 2.598(d^2) 0.619766 0.388463  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas a(hm). A. B.   | 137.4474<br>35.22486<br>0                                     | 141.0205<br>35.22486<br>0                                     |
| ·  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  B.  C.  LP = Link Budget + TxP + G_bs   | 137.4474<br>35.22486<br>0<br>126.4852                         | 141.0205<br>35.22486<br>0<br>126.4852                         |
| Cells = Total Area / Area of cell 1452.162 2316.824  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  B.  C.  LP = Link Budget + TxP + G_bs  log(d) = (LP - A - C) / B                | 137.4474<br>35.22486<br>0<br>126.4852<br>-0.31121             | 141.0205<br>35.22486<br>0<br>126.4852<br>-0.41264             |
|  | a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas  a(hm).  A.  B.  C.  LP = Link Budget + TxP + G_bs  log(d) = (LP - A - C) / B  distance (km) | 137.4474<br>35.22486<br>0<br>126.4852<br>-0.31121<br>0.488421 | 141.0205<br>35.22486<br>0<br>126.4852<br>-0.41264<br>0.386683 |

|   |          |          | 1        |          |          |          |          | 1        |
|---|----------|----------|----------|----------|----------|----------|----------|----------|
| Handset Transmitter Power (dBm)   | 23       | 23       | 23       | 23       | 23       | 23       | 23       | 23       |
| Base Station Height (m)   | 30       | 30       |          | 30       | 30       | 30       | 30       | 30       |
| Handset User height: (m)  | 1.5      | 1.5      | 1.5      | 1.5      | 1.5      | 1.5      | 1.5      | 1.5      |
| Base Station Antenna gain: (dBi)  | 16.15    | 16.15    | 16.15    | 16.15    | 16.15    | 16.15    | 16.15    | 16.15    |
| Handset Antenna Gain: (dBi)   | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| Frequency: (MHz)  | 1960     | 1960     | 1960     | 1960     | 2500     | 2500     | 2500     | 2500     |
| Outside Shadowing standard deviation: (dB)                              | 10       | 10       | 10       | 10       | 10       | 10       | 10       | 10       |
| Building Penetration Margin: (suburban dB)                              | 10       | 10       | 10       | 10       | 10       | 10       | 10       | 10       |
| Building Penetration standard deviation: (dB)                           | 8        | 8        | 8        | 8        | 8        | 8        | 8        | 8        |
| Noise Figure = (dB)   | 5        | 5        | 5        | 5        | 5        | 5        | 5        | 5        |
| Noise Floor: (dBm)  | -174     | -174     | -174     | -174     | -174     | -174     | -174     | -174     |
| kbps  | 13000    | 13000    | 64000    | 64000    | 13000    | 13000    | 64000    | 64000    |
| kbps bandwidth (dB)   | 41.13943 | 41.13943 | 48.0618  | 48.0618  | 41.13943 | 41.13943 | 48.0618  | 48.0618  |
| SNR (dB)  | 7        | 7        | 7        | 7        | 7        | 7        | 7        | 7        |
| Area (km^2)   | 900      | 900      | 900      | 900      | 900      | 900      | 900      | 900      |
| Probability Multiple  | 1.28     | 0.675    | 1.28     | 0.675    | 1.28     | 0.675    | 1.28     | 0.675    |
|   |          |          |          |          |          |          |          |          |
| (Noise Floor + Noise Figure + kbps + SNR)                               | -120.861 | -120.861 | -113.938 | -113.938 | -120.861 | -120.861 | -113.938 | -113.938 |
| Sigma Composite (Bp^2 + Op^2)^(1/2)                                     | 12.80625 | 12.80625 | 12.80625 | 12.80625 | 12.80625 | 12.80625 | 12.80625 | 12.80625 |
| Link Budget (dBm)   | -94.4686 | -102.216 | -87.5462 | -95.294  | -94.4686 | -102.216 | -87.5462 | -95.294  |
|   |          |          |          |          |          |          |          |          |
| Lp (dB) = A + B log10 (d) + C   |          |          |          |          |          |          |          |          |
| Where;  |          |          |          |          |          |          |          |          |
| A = 46.3+ 33.9 log10 (fc ) – 13.82 log10 (hb ) – a (hm)                 |          |          |          |          |          |          |          |          |
| B = 44.9 – 6.55 log 10 (hb )  |          |          |          |          |          |          |          |          |
| C= 0 for medium city and suburban areas                                 |          |          |          |          |          |          |          |          |
| a(hm) = (1.1log10(f) - 0.7)hm - (1.56log10(f) - 0.8) for suburban areas |          |          |          |          |          |          |          |          |
|   |          |          |          |          |          |          |          |          |
| a(hm).  | 0.046303 | 0.046303 | 0.046303 | 0.046303 | 0.055815 | 0.055815 | 0.055815 | 0.055815 |
| A.  | 137.4474 | 137.4474 | 137.4474 | 137.4474 | 141.0205 | 141.0205 | 141.0205 | 141.0205 |
| В.  | 35.22486 | 35.22486 | 35.22486 | 35.22486 | 35.22486 | 35.22486 | 35.22486 | 35.22486 |
| C.  | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
|   |          |          |          |          |          |          |          |          |
| LP = Link Budget + TxP + G_bs   | 133.6186 | 141.3663 | 126.6962 | 134.444  | 133.6186 | 141.3663 | 126.6962 | 134.444  |
| log(d) = (LP - A - C) / B   | -0.1087  | 0.111256 | -0.30522 |          |          | 0.009817 |          | -0.1867  |
| distance (km)   |          |          |          | 0.821745 |          |          |          | 0.650576 |
| Area of cell = 2.598(d^2)   |          |          |          | 1.754337 |          |          |          |          |
| Cells = Total Area / Area of cell                                       |          |          |          | 513.0143 |          | 331.1073 |          |          |
|   |          |          |          |          |          |          |          |          |