

Sheet1

FREQUENCY 23.175  
 ANTENNA HEIGHT ABOVE GROUND  
 ANTENNA DIAMETER  
 FADE MARGIN  
 TRANSMITTER POWER  
 CROSS POLARIZATION FACTOR

| DISTANCE<br>(MILES) | FREE<br>SPACE<br>LOSS (dB) |
|---------------------|----------------------------|
| 0.5                 | 117.879794943051           |
| 1                   | 123.900394856331           |
| 1.5                 | 127.422220037444           |
| 2                   | 129.92099476961            |
| 2.5                 | 131.859195029771           |
| 3                   | 133.442819950724           |
| 3.5                 | 134.781755743336           |
| 4                   | 135.94159468289            |
| 4.5                 | 136.964645131838           |
| 5                   | 137.879794943051           |
| 5.5                 | 138.707648646216           |
| 6                   | 139.463419864004           |
| 6.5                 | 140.158661989188           |
| 7                   | 140.802355656616           |
| 7.5                 | 141.401620124165           |
| 8                   | 141.96219459617            |
| 8.5                 | 142.488773370617           |
| 9                   | 142.985245045117           |
| 9.5                 | 143.454866962108           |
| 10                  | 143.900394856331           |
| 10.5                | 144.324180837729           |
| 11                  | 144.728248559495           |
| 11.5                | 145.114351663403           |
| 12                  | 145.484019777283           |
| 12.5                | 145.838595116492           |
| 13                  | 146.179261902467           |
| 13.5                | 146.507070226231           |
| 14                  | 146.822955569895           |
| 14.5                | 147.12775490103            |
| 15                  | 147.422220037444           |
| 15.5                | 147.707028819737           |
| 16                  | 147.982794509449           |
| 16.5                | 148.250073740609           |
| 17                  | 148.509373283896           |
| 17.5                | 148.761155830057           |
| 18                  | 149.005844958397           |
| 18.5                | 149.243829424391           |

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|      |                  |
|------|------------------|
| 19   | 149.475466875387 |
| 19.5 | 149.701087083581 |
| 20   | 149.92099476961  |

## Sheet1

## MICROWAVE PATH EVALUATION SPREADSHEET

GHZ

WAVELENGTH

80

## 1.5 FEET ANTENNA GAIN

## 25 dB BEAMWIDTH LOSSES

14 dBm HALF POWER BEAMWIDTH

40

PATH

FIXED AC

## ALTITUDE

## LOSS PROBABILITY

(FT)

(dB)

302

26.8

305

26.8

26.8

26.8

26.8

26.8

26.8

26.8

26.8

26.8

26.8

26.8

20.8  
26.820.8  
26.820.0  
26.8

26.8  
26.8

26.8  
26.8

26.8  
26.926.8  
26.926.8  
26.926.8  
26.9

26.8

26.8

Sheet1

0.0129449838187702 M PATH LENGTH  
 FEET 80 FEET  
 38.3222200374443 dB COAXIAL LOSS  
 6.04099244875944 dB  
 POWER BEAMWIDTH MWIDTH 2.01366414958648 DEGREES  
 dB CLIMATE FACTOR 0.25 TERRAIN FACTOR

| CT. FADE<br>ROBABILITY<br>(db) | NET PATH<br>Y LOSS<br>(db) | EARTH<br>CURVATURE<br>FEET | PATH<br>HEIGHT<br>AMSL |     |
|--------------------------------|----------------------------|----------------------------|------------------------|-----|
| 5.72545193550017E-09           | -54.0353548681624          | 4.99999750000125           |                        | 382 |
| 4.58036154840014E-08           | -60.0559547814421          | 9.9999950000025            |                        | 385 |
| 1.54587202258505E-07           | -63.5777799625557          | 14.9999925000038           |                        | 80  |
| 3.66428923872011E-07           | -66.0765546947217          | 19.999990000005            |                        | 80  |
| 7.15681491937521E-07           | -68.0147549548828          | 24.9999875000063           |                        | 80  |
| 1.23669761806804E-06           | -69.5983798758353          | 29.9999850000075           |                        | 80  |
| 1.96383001387656E-06           | -70.9373156684476          | 34.9999825000088           |                        | 80  |
| 2.93143139097609E-06           | -72.0971546080013          | 39.999980000001            |                        | 80  |
| 4.17385446097963E-06           | -73.1202050569489          | 44.9999775000113           |                        | 80  |
| 5.72545193550017E-06           | -74.0353548681624          | 49.9999750000125           |                        | 80  |
| 7.62057652615073E-06           | -74.8632085713269          | 54.9999725000138           |                        | 80  |
| 9.8935809445443E-06            | -75.6189797891149          | 59.999970000015            |                        | 80  |
| 1.25788179022939E-05           | -76.3142219142992          | 64.9999675000162           |                        | 80  |
| 1.57106401110125E-05           | -76.9579155817272          | 69.9999650000175           |                        | 80  |
| 1.93234002823131E-05           | -77.5571800492761          | 74.9999625000187           |                        | 80  |
| 2.34514511278087E-05           | -78.1177545212809          | 79.999960000002            |                        | 80  |
| 2.81291453591123E-05           | -78.6443332957279          | 84.9999575000212           |                        | 80  |
| 3.3390835687837E-05            | -79.1408049702285          | 89.9999550000225           |                        | 80  |
| 3.92708748255957E-05           | -79.610426887219           | 94.9999525000237           |                        | 80  |
| 4.58036154840014E-05           | -80.0559547814421          | 99.999950000025            |                        | 80  |
| 5.30234103746671E-05           | -80.4797407628408          | 104.999947500026           |                        | 80  |
| 6.09646122092058E-05           | -80.8838084846066          | 109.999945000028           |                        | 80  |
| 6.96615736992306E-05           | -81.2699115885143          | 114.999942500029           |                        | 80  |
| 7.91486475563544E-05           | -54.8395797023945          | 119.999940000003           |                        | 80  |
| 8.94601864921902E-05           | -55.1941550416032          | 124.999937500031           |                        | 80  |
| 0.000100630543218351           | -55.5348218275788          | 129.999935000032           |                        | 80  |
| 0.00011269407044645            | -55.8626301513422          | 134.999932500034           |                        | 80  |
| 0.0001256851208881             | -56.1785154950068          | 139.999930000035           |                        | 80  |
| 0.000139638047254914           | -56.4833148261416          | 144.999927500036           |                        | 80  |
| 0.000154587202258505           | -56.7777799625557          | 149.999925000037           |                        | 80  |
| 0.000170566938610486           | -57.0625887448479          | 154.999922500039           |                        | 80  |
| 0.00018761160902247            | -57.3383544345605          | 159.999920000004           |                        | 80  |
| 0.00020575556620607            | -57.6056336657202          | 164.999917500041           |                        | 80  |
| 0.000225033162872899           | -57.8649332090075          | 169.999915000042           |                        | 80  |
| 0.00024547875173457            | -58.1167157551679          | 174.999912500044           |                        | 80  |
| 0.000267126685502696           | -58.3614048835082          | 179.999910000045           |                        | 80  |
| 0.00029001131688889            | -58.5993893495023          | 184.999907500046           |                        | 80  |

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|                      |                   |                  |    |
|----------------------|-------------------|------------------|----|
| 0.000314166998604765 | -58.8310268004986 | 189.999905000047 | 80 |
| 0.000339628083361935 | -59.0566470086924 | 194.999902500049 | 80 |
| 0.000366428923872011 | -59.2765546947217 | 199.999900000005 | 80 |

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20 MILES

0.9 dB

EARTH 1.333334  
1

| RELIABILITY      | TY RCVR<br>LEVEL<br>(dBm) | FIRST<br>FRESNEL<br>ZONE | SECOND<br>FRESNEL<br>ZONE | PREDICTED<br>OUTAGES (MIN)<br>PER YEAR |
|------------------|---------------------------|--------------------------|---------------------------|--|
| 99.999999942746  | -29.0353548681624         | 2.16920233689615         | 3.06771536436994          | 0.00300929753729889                    |
| 99.9999999541964 | -35.0559547814421         | 3.0281302818824          | 4.28242291327075          | 0.0240743802983911                     |
| 99.9999998454128 | -38.5777799625557         | 3.65956318116963         | 5.17540388317132          | 0.08125103350707                       |
| 99.9999996335711 | -41.0765546947217         | 4.16820438524233         | 5.89473117235271          | 0.192595042387129                      |
| 99.9999992843185 | -43.0147549548828         | 4.59501342376669         | 6.49833030317729          | 0.376162192162361                      |
| 99.9999987633024 | -44.5983798758353         | 4.96115554879109         | 7.01613346214289          | 0.65000826805656                       |
| 99.99999803617   | -45.9373156684476         | 5.27926849490219         | 7.46601310489968          | 1.03218905529352                       |
| 99.9999970685686 | -47.0971546080013         | 5.55760584698977         | 7.85964156313694          | 1.54076033909703                       |
| 99.9999958261455 | -48.1202050569489         | 5.80189495828601         | 8.20511853747216          | 2.19377790469089                       |
| 99.9999942745481 | -49.0353548681624         | 6.01628480964259         | 8.50831157289579          | 3.00929753729889                       |
| 99.9999923794235 | -49.8632085713269         | 6.20387589831949         | 8.77360543468299          | 4.00537502214482                       |
| 99.9999901064191 | -50.6189797891149         | 6.36703736913995         | 9.00435059957402          | 5.20006614445248                       |
| 99.9999874211821 | -51.3142219142992         | 6.50760701068844         | 9.20314609310982          | 6.61142668944566                       |
| 99.9999842893599 | -51.9579155817272         | 6.62702260433446         | 9.37202524520286          | 8.25751244234816                       |
| 99.9999806765997 | -52.5571800492761         | 6.72641090318011         | 9.51258152537157          | 10.1563791883838                       |
| 99.9999765485489 | -53.1177545212809         | 6.80664925831663         | 9.62605569542814          | 12.3260827127763                       |
| 99.9999718708546 | -53.6443332957279         | 6.86840884487275         | 9.71339694034236          | 14.7846788007494                       |
| 99.9999666091643 | -54.1408049702285         | 6.9121849976814          | 9.77530576935287          | 17.5502232375271                       |
| 99.9999607291252 | -54.610426887219          | 6.93831811545702         | 9.81226357893826          | 20.6407718083331                       |
| 99.9999541963845 | -55.0559547814421         | 6.94700730873721         | 9.82455195392118          | 24.0743802983911                       |
| 99.9999469765896 | -55.4797407628408         | 6.93831811545702         | 9.81226357893826          | 27.869104492925                        |
| 99.9999390353878 | -55.8838084846066         | 6.9121849976814          | 9.77530576935287          | 32.0430001771586                       |
| 99.9999303384263 | -56.2699115885143         | 6.86840884487275         | 9.71339694034236          | 36.6141231363156                       |
| 99.9999208513524 | -29.8395797023945         | 6.80664925831663         | 9.62605569542814          | 41.6005291556199                       |
| 99.9999105398135 | -30.1941550416032         | 6.72641090318011         | 9.51258152537157          | 47.0202740202952                       |
| 99.9998993694568 | -30.5348218275788         | 6.62702260433446         | 9.37202524520286          | 52.8914135155653                       |
| 99.9998873059296 | -30.8626301513422         | 6.50760701068844         | 9.20314609310982          | 59.2320034266541                       |
| 99.9998743148791 | -31.1785154950068         | 6.36703736913995         | 9.00435059957402          | 66.0600995387852                       |
| 99.9998603619527 | -31.4833148261416         | 6.20387589831949         | 8.77360543468299          | 73.3937576371826                       |
| 99.9998454127977 | -31.7777799625557         | 6.01628480964259         | 8.50831157289579          | 81.2510335070701                       |
| 99.9998294330614 | -32.0625887448479         | 5.80189495828601         | 8.20511853747216          | 89.6499829336712                       |
| 99.999812388391  | -32.3383544345605         | 5.55760584698977         | 7.85964156313694          | 98.60866170221                         |
| 99.9997942444338 | -32.6056336657202         | 5.27926849490219         | 7.46601310489968          | 108.14512559791                        |
| 99.9997749668371 | -32.8649332090075         | 4.96115554879109         | 7.01613346214289          | 118.277430405996                       |
| 99.9997545212483 | -33.1167157551679         | 4.59501342376669         | 6.49833030317729          | 129.02363191169                        |
| 99.9997328733145 | -33.3614048835082         | 4.16820438524233         | 5.89473117235271          | 140.401785900217                       |
| 99.9997099886831 | -33.5993893495023         | 3.65956318116963         | 5.17540388317132          | 152.429948156801                       |

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|                  |                   |                  |                  |                  |
|------------------|-------------------|------------------|------------------|------------------|
| 99.9996858330014 | -33.8310268004986 | 3.0281302818824  | 4.28242291327075 | 165.126174466665 |
| 99.9996603719166 | -34.0566470086924 | 2.16920233689615 | 3.06771536436994 | 178.508520615033 |
| 99.9996335710761 | -34.2765546947217 | 0                | 0                | 192.595042387129 |