

Freewave transmission analysis - Based on memo from G. Malby to D. Edgington

	@915MHz 1300m loc.	@915MHz 1850m loc.	@915MHz 20m (spec.)
Link Distance	63.90km	75.30km	32.19km
Mt. Toro Transmitter Power	29.8dBm	29.8dBm	29.8dBm
Antenna Gain	20.7dBm	20.7dBm	20.7dBm
Coax and Misc losses	-3.0dBm	-3.0dBm	-3.0dBm
Buoy Antenna gain	0.0dBm	0.0dBm	0.0dBm
Coax and Misc losses	-3.0dBm	-3.0dBm	-3.0dBm
Path loss (Toro to buoy loc.)	-127.8dBm	-129.2dBm	-121.8dBm
Atmospheric loss	-0.4dBm	0.6dBm	1.6dBm
Receive Signal Level (best case)	-83.7dBm	-84.1dBm	-75.7dBm
Receiver Sensitivity - Freewave Spec @ 1OE-6 BER	-108.0dBm	-107.0dBm	-106.0dBm
Link Margin	24.3dBm	22.9dBm	30.3dBm
Desired Link Margin	40.0dBm	40.0dBm	40.0dBm

Rain Path Loss - Crane "Electromagnetic Wave Propagation Through Rain"

Probability	0.15 %
Climate Region	C
Rain rate	6.100802422 mm/h

Two-component model attenuation estimate

Parameters	Climate Zone	C	
	Latitude	36.5 deg	
	Frequency	0.99 GHz	<- lowest possible freq.
Terrestrial	Elevation Angle	0.82 deg	
	Station Height	0.989km	
	Path Length	75.3km	
	Polarization	Circular	
Probability		0.1 %	
Expected Attenuation		0.012133334 dB	

Parameters	Climate Zone	C
	Latitude	36.5 deg
	Frequency	2.4 GHz
Terrestrial	Elevation Angle	0.82 deg
	Station Height	0.989km
	Path Length	75.3km
	Polarization	Circular

Probability	Expected Attenuation
0.000001%	1.4209dB
0.000010%	0.8977dB
0.000100%	0.5432dB
0.001000%	0.3102dB
0.010000%	0.1631dB
0.025000%	0.1222dB
0.050000%	0.0966dB
0.075000%	0.0836dB
0.090000%	0.0781dB
0.100000%	0.0751dB
0.150000%	0.0642dB
0.250000%	0.0520dB
0.500000%	0.0381dB
0.650000%	0.0336dB
0.750000%	0.0313dB
0.900000%	0.0285dB
1.000000%	0.0269dB
2.500000%	0.0154dB
5.000000%	0.0087dB
6.500000%	0.0065dB
7.500000%	0.0054dB
9.000000%	0.0040dB
10.000000%	0.0032dB
11.000000%	0.0025dB
12.000000%	0.0018dB
13.000000%	0.0000dB
14.000000%	0.0000dB

Parameters	Climate Zone	C
	Latitude	36.5
	Frequency	2.4
Terrestrial	Elevation Angle	0.82
	Station Height	0.989km
	Path Length	63.9km
	Polarization	Circular

Probability	Expected Attenuation
0.000001%	1.3583dB
0.000010%	0.8473dB
0.000100%	0.5056dB
0.001000%	0.2843dB
0.010000%	0.1469dB
0.025000%	0.1092dB
0.050000%	0.0858dB
0.075000%	0.0739dB
0.090000%	0.0689dB
0.100000%	0.0662dB
0.150000%	0.0563dB
0.250000%	0.0455dB
0.500000%	0.0331dB
0.650000%	0.0291dB
0.750000%	0.0271dB
0.900000%	0.0246dB
1.000000%	0.0232dB
2.500000%	0.0131dB
5.000000%	0.0072dB
6.500000%	0.0054dB
7.500000%	0.0044dB
9.000000%	0.0032dB
10.000000%	0.0026dB
11.000000%	0.0020dB
12.000000%	0.0014dB
13.000000%	0.0000dB
14.000000%	0.0000dB

deg
GHz
deg

Parameters	Climate Zone	C
	Latitude	36.5 deg
	Frequency	0.99 GHz
Terrestrial	Elevation Angle	0.82 deg
	Station Height	0.989km
	Path Length	75.3km
	Polarization	Circular

Probability	Expected Attenuation
0.000001%	0.1819dB
0.000010%	0.1192dB
0.000100%	0.0750dB
0.001000%	0.0448dB
0.010000%	0.0248dB
0.025000%	0.0190dB
0.050000%	0.0153dB
0.075000%	0.0134dB
0.090000%	0.0126dB
0.100000%	0.0121dB
0.150000%	0.0105dB
0.250000%	0.0086dB
0.500000%	0.0065dB
0.650000%	0.0058dB
0.750000%	0.0054dB
0.900000%	0.0049dB
1.000000%	0.0047dB
2.500000%	0.0028dB
5.000000%	0.0016dB
6.500000%	0.0012dB
7.500000%	0.0010dB
9.000000%	0.0008dB
10.000000%	0.0007dB
11.000000%	0.0005dB
12.000000%	0.0004dB
13.000000%	0.0000dB
14.000000%	0.0000dB

Parameters	Climate Zone	C
	Latitude	36.5 deg
	Frequency	0.99 GHz
Terrestrial	Elevation Angle	0.82 deg
	Station Height	0.989km
	Path Length	63.9km
	Polarization	Circular

Probability	Expected Attenuation
0.000001%	0.1733dB
0.000010%	0.1122dB
0.000100%	0.0697dB
0.001000%	0.0410dB
0.010000%	0.0223dB
0.025000%	0.0170dB
0.050000%	0.0136dB
0.075000%	0.0118dB
0.090000%	0.0111dB
0.100000%	0.0107dB
0.150000%	0.0092dB
0.250000%	0.0075dB
0.500000%	0.0056dB
0.650000%	0.0050dB
0.750000%	0.0046dB
0.900000%	0.0042dB
1.000000%	0.0040dB
2.500000%	0.0024dB
5.000000%	0.0014dB
6.500000%	0.0010dB
7.500000%	0.0009dB
9.000000%	0.0007dB
10.000000%	0.0005dB
11.000000%	0.0004dB
12.000000%	0.0003dB
13.000000%	0.0000dB
14.000000%	0.0000dB

Expected Attenuation due to rain - 1300m location
@ 0.99 GHz

