

1 Explanation of MSCL

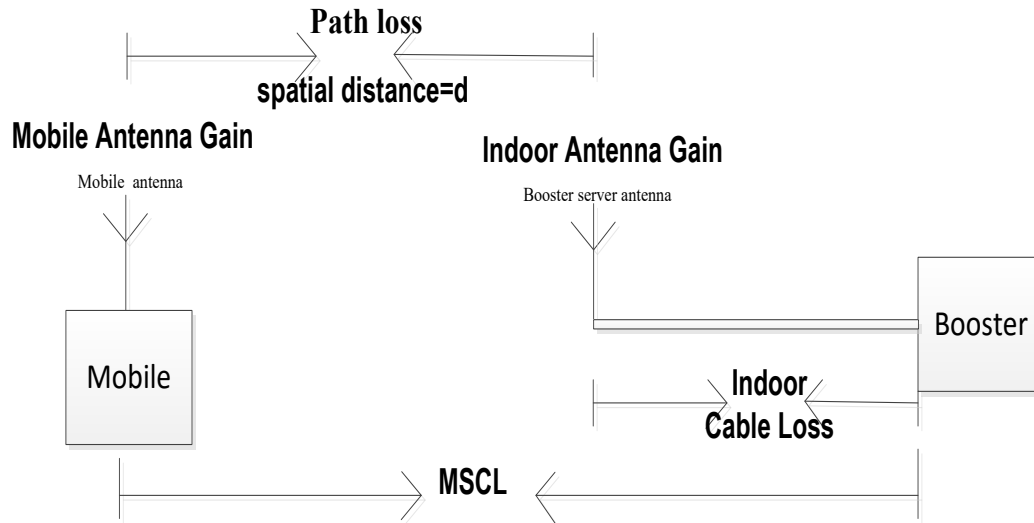


Figure 1

$$\text{MSCL} = \text{Path loss} + \text{Indoor Cable Loss} - \text{Mobile Antenna Gain} - \text{Indoor Antenna Gain} + \text{Polarity Loss} \dots \textcircled{1}$$

1.1 Decibel version of free-space propagation loss equation

$$\text{Path loss (dB)} = 20Lgf + 20Lgd + 32.45 \dots \textcircled{2} \text{ or } \text{Path loss (dB)} = 20Lgf + 20LgD - 27.55 \dots \textcircled{3}$$

$$f \text{ (MHz)}, d \text{ (km)}, D \text{ (m)}, d = 1000D$$

1.1.1 Operation Frequency

At PCS (1850-1915MHz) $f = 1850 \text{ MHz}$

At Cellular (824-849MHz) $f = 824 \text{ MHz}$

At AWS (1710-1755MHz) $f = 1710 \text{ MHz}$

At LTE (698-716MHz) $f = 698 \text{ MHz}$

At LTE (776-787MHz) $f = 776 \text{ MHz}$

1.1.2 Minimum Separation Distances for MSCL base on FCC new rule D (m)

Minimum Separation Distances for MSCL Calculation or Measurements D(m)	
Indoor server antenna types	Minimum separation distances D (m)
Ceiling Mounted (i.e., Dome-type) Antennas	2.0
Wall Mounted (i.e., Panel or other type) Antennas	1.0 or 2.0*
Table Top Antennas	1.0

* Note:

Wall Mounted (i.e., Panel or other type) Antennas: Alternatively, if a manufacturer clearly specifies a minimum separation distance to consumer devices in the installation manual or other user documentation provided with the booster, a reasonable minimum separation distance could be up to 6 feet (or 2 meters) horizontally removed from the antenna. In this case, the user would be required to ensure this minimum separation distance for all CMRS devices authorized for use with this booster.

1.2 Mobile Antenna Gain

Mobile Antenna Gain=0dBi

1.3 Indoor Cable Loss And Indoor Antenna Gain

Indoor Cable Loss and Indoor Antenna Gain are listed in the separate submitted file of Force 7 consumer Antenna Kitting.

1.4 Polarity Loss

$$\text{Polarity Loss dB} = 10\text{Log} (E1/E2)^2 \text{ dB} = \text{PL dB}$$

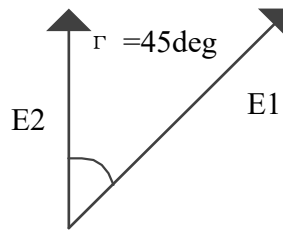
$$\text{PL dB} = 10\text{Log} (E1^2 / (E1\text{Sin} (45\text{deg}))^2) \text{ dB} = 20\text{Log} (1/\text{Sin} (45\text{deg})) \text{ dB} = 3.01\text{dB}$$

Where:

E1 = Maximum Possible Magnitude of the Electric Field from the Mobile Device.

E2 = Magnitude of the electric field from the Mobile device with a 45deg polarity mismatch = E1Sin (r).





2 MSCL Calculations

Fixed booster Force 7 consumer				
Indoor Antenna				
Indoor Antenna	Indoor Antenna Gain (dBi)			
	At 698-787MHz	At 800MHz	At 1900MHz	At 1700MHz
CM222W	3	3	6	6
MAX GAIN	3	3	6	6
Indoor Cable				
Indoor Cable	Indoor Cable Loss(dB)			
	At 698-787MHz	At 800MHz	At 1900MHz	At 1700MHz
CM400-75NN 75Feet	4.22	4.41	6.17	5.8
MIN LOSS	4.22	4.41	6.17	5.8

Path loss= $20Lgf+20LgD-27.55$				
Operation Frequency (MHz)	f(MHz)	D(m)	Constant(dB)	Path loss(dB)
PCS(1850-1915)	1850	2	27.55	43.8
Cellular(824-849)	824	2	27.55	36.8
LTE(698-716)	698	2	27.55	35.3
LTE(776-787)	776	2	27.55	36.3
AWS(1710-1755)	1710	2	27.55	43.1



MSCL Calculations of fixed booster Force 7 Consumer

MSCL					
Operation Frequency (MHz)	Path loss(dB)	Indoor Antenna Gain(dBi)	Indoor Cable Loss(dB)	Polarity Loss(dB)	MSCL(dB)
PCS(1850-1915)	43.8	6	6.17	3	46.97
Cellular(824-849)	36.8	3	4.41	3	41.21
LTE(698-716)	35.3	3	4.22	3	39.52
LTE(776-787)	36.3	3	4.22	3	40.52
AWS(1710-1755)	43.1	6	5.8	3	45.9



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