

1 Explanation of MSCL

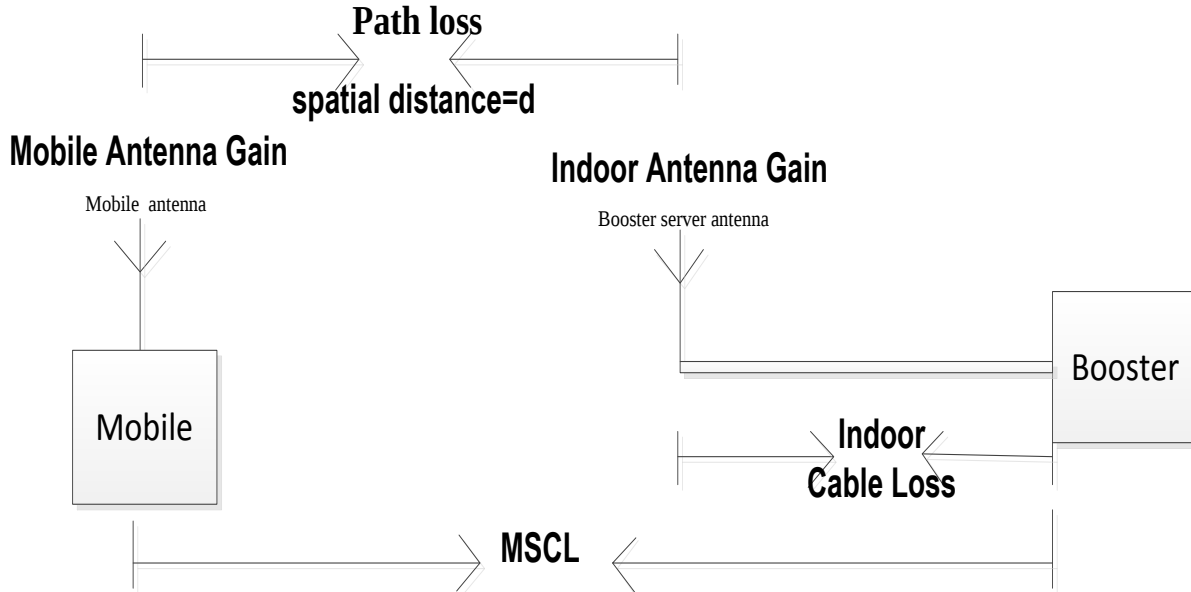


Figure 1

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

1.1 Decibel version of free-space propagation loss equation:

$$\text{Path loss (dB)} = 20\text{Lg}f + 20\text{Lg}D + 32.45 \dots\dots ② \text{ or } \text{Path loss (dB)} = 20\text{Lg}f + 20\text{Lg}d - 27.55 \dots\dots ③$$

f (MHz), D (m), d (km), D=1000d.

1.1.1 Operation Frequency

At PCS (1850-1915) f (MHz) =1850

At Cellular (824-849) f (MHz) =824

At LTE-A (698-716) f (MHz) =698

At LTE-V (776-787) f (MHz) =776

At AWS (2110-2155) f (MHz) =2110

1.1.2 Minimum Separation Distances for MSCL Calculation or Measurements 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
Wall Mounted (i.e., Panel or other type) Antennas	1
Table Top Antennas	1

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-550 Antenna Kitting.

1.4 Polarity Loss

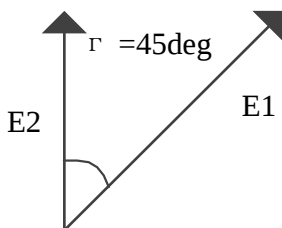
$$\text{Polarity Loss dB} = 10\log (E1/E2)^2 \text{ dB} = \text{PL dB}$$

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

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 = $E1 \sin (r)$.



2 MSCL Calculations

Force-550					
Outdoor Antenna					
Outdoor Antenna	Outdoor Antenna Gain				
	At LTE-A and LTE-V (698-787MHz) (dBi)	At 800MHz (dBi)	At 1900MHz (dBi)	At 1700MHz(dBi)	At 2100MHz (dBi)
CM200	3	3	5	5	5
CM288W or Galaxy 5412-P	3	3	4	4	4
CM288W	3	3	4	4	4
MAX GAIN	3	3	5	5	5
Outdoor Cable					
Outdoor Cable	Outdoor Cable Loss				
	At LTE-A and LTE-V (698-787MHz) (dBi)	At 800MHz (dBi)	At 1900MHz (dBi)	At 1700MHz(dBi)	At 2100MHz (dBi)
CM174- 10FT 10Feet	3.8	4.3	8.8	6.98	8.96
CM240- 40FN 40Feet	3.52	3.98	6.52	6.12	6.92
MIN LOSS	3.52	3.98	6.52	6.12	6.92
Indoor Antenna					
Indoor Antenna	Indoor Antenna Gain				
	At LTE-A and LTE-V (698-787MHz) (dBi)	At 800MHz (dBi)	At 1900MHz (dBi)	At 1700MHz(dBi)	At 2100MHz (dBi)
CM110W	1.1	1.1	3	3	3
CM248W	7	7	10	10	10
CM120W	1.2	1.2	3	3	3
MAX GAIN	7	7	10	10	10

Indoor Cable					
Indoor Cable	Indoor Cable Loss				
	At LTE-A and LTE-V (698-787MHz) (dBi)	At 800MHz (dBi)	At 1900MHz (dBi)	At 1700MHz (dBi)	At 2100MHz (dBi)
CM174- 10FT 10Feet	3.8	4.3	8.8	6.98	8.96
CM240- 20FN 20Feet	2.06	2.29	3.56	3.36	3.76
MIN LOSS	2.06	2.29	3.56	3.36	3.76

MSCL Calculations of Force-550					
MSCL					
Operation Frequency (MHz)	Path loss (dB)	Indoor Antenna Gain (dBi)	Indoor Cable Loss (dB)	Polarity Loss (dB)	MSCL (dB)
PCS (1850-1915)	37.8	10	3.56	3.0	34.3
Cellular (824-849)	30.8	7	2.29	3.0	29.0
LTE (698-716)	29.3	7	2.06	3.0	27.4
LTE (776-787)	30.2	7	2.06	3.0	28.3
AWS (1710-1755)	37.1	10	3.36	3.0	33.5
Separation Distances (m)		1			