

1 Explanation of MSCL

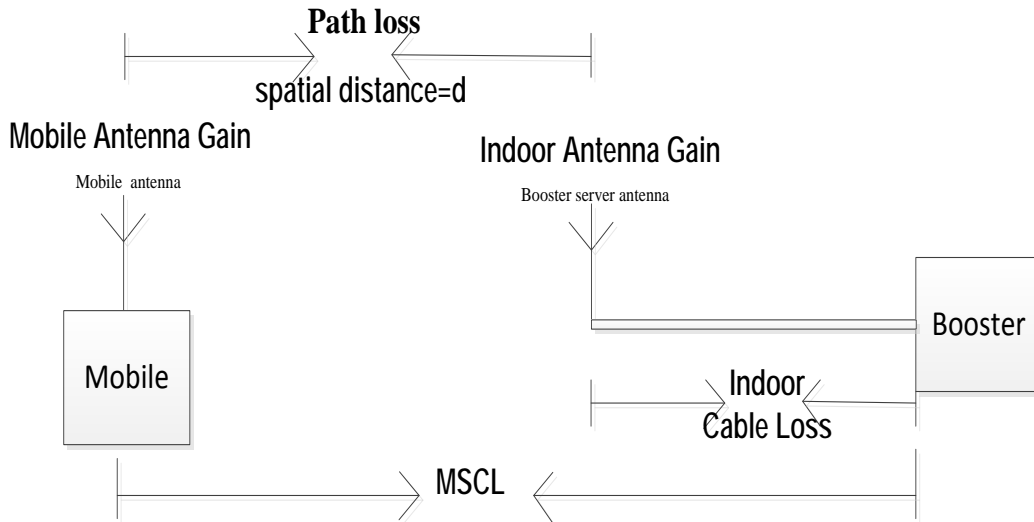


Figure 1

MSCL= Path loss + Indoor Cable Loss - Mobile Antenna Gain- Indoor Antenna Gain+ Polarity Loss.....①

1.1 Decibel version of free-space propagation loss equation

Path loss (dB) =20Lgf+20Lgd+32.45② or Path loss (dB) =20Lgf+20LgD-27.55③

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

1.1.1 Operation Frequency

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

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

At AWS (1710-1755MHz) f =1710 MHz

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

At LTE(776-787MHz) f =776 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 Fusion4Home RT V1.0 Antenna Kitting .

1.4 Polarity Loss

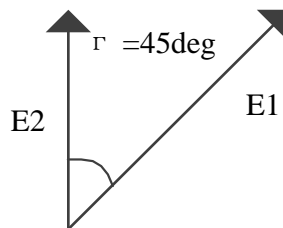
$$\text{Polarity Loss dB} = 10\text{Log} (E1/E2)^2 \text{ dB} = \text{PL dB}$$

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

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 = $E1\text{Sin} (\gamma)$.



2 MSCL Calculations

Antenna Kitting Information

Fusion4Home RT V1.0					
Indoor Antenna					
Indoor Antenna	Indoor Antenna Gain				
	At LTE-A<E-V (698-787MHz) (dBi)	At 800MHz (dBi)	At 1900MHz (dBi)	At 1700MHz (dBi)	At 2100MHz (dBi)
SC248W	7	7	10	10	10
SC222W	3	3	6	6	6
SC121W	1.2	1.2	3	3	3
SC302W	2.5	3	5	4	5
SC323W	2.5	3	4	4	4
MAX GAIN	7	7	10	10	10
Indoor Cable					
Indoor Cable	Indoor Cable Loss				
	At LTE-A<E-V (698-787MHz) (dBi)	At 800MHz (dBi)	At 1900MHz (dBi)	At 1700MHz (dBi)	At 2100MHz (dBi)
SC240-20NN 20Feet	2.06	2.29	3.56	3.36	3.76
MIN LOSS	2.06	2.29	3.56	3.36	3.76

Path loss=20Lgf+20LgD-27.56				
Operation Frequency (MHz)	f (MHz)	D(m)	Constant (dB)	Path loss (dB)
PCS (1850-1915)	1850	2	27.56	43.8
Cellular (824-849)	824	2	27.56	36.8
LTE (698-716)	698	2	27.56	35.3
LTE (776-787)	776	2	27.56	36.3
AWS (1710-1755)	1710	2	27.56	43.1

MSCL Calculations of fixed booster Fusion4Home RT V1.0					
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	10	3.56	3	40.4
Cellular (824-849)	36.8	7	2.29	3	35.1
LTE (698-716)	35.3	7	2.06	3	33.4
LTE (776-787)	36.3	7	2.06	3	34.3
AWS (1710-1755)	43.1	10	3.36	3	39.5



MSCL presented in test report 102129-30, 102129-31 resent worse case MSCL when Panel Antenna is installed in one of the several possible configuration , ie non-indoor cable configuration.

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	10	0.2	3	37.0
Cellular (824-849)	36.8	7	0.2	3	33.0
LTE (698-716)	35.3	7	0.2	3	31.5
LTE (776-787)	36.3	7	0.2	3	32.5
AWS (1710-1755)	43.1	10	0.2	3	36.3

Non indoor cable configuration

