

1 Explanation of MSCL

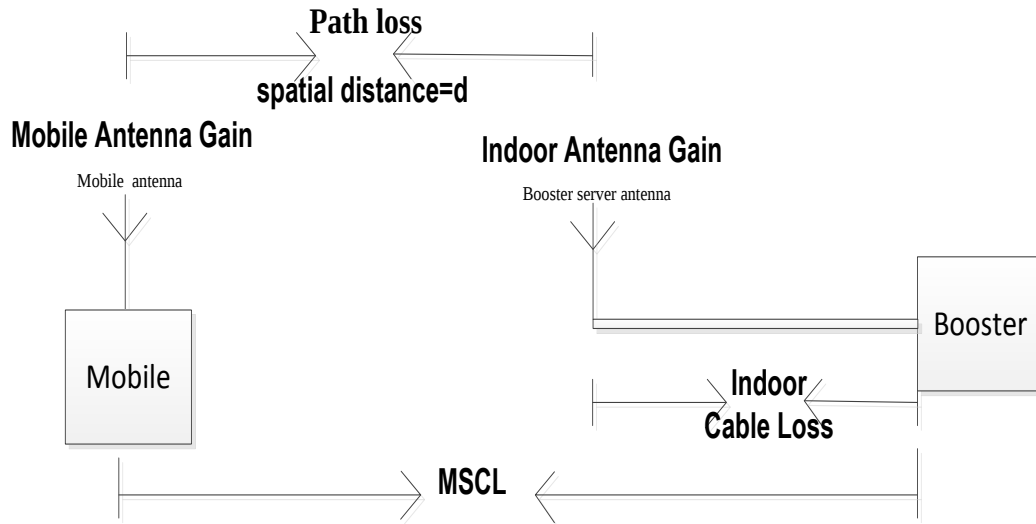


Figure 1

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

1.1 Decibel version of free-space propagation loss equation

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

f (MHz), d (km), D (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 Fusion 5C-2Go Antenna Kitting .

1.4 Polarity Loss

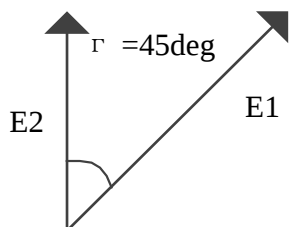
Polarity Loss dB = $10\log(E1/E2)^2$ dB = PL dB

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

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

Vehicle Kit

Fusion 5C-2Go Vehicle Kit					
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
Indoor Cable					
Indoor Cable	Indoor Cable Loss				
	At LTE-A and LTE-V (698-787MHz)(dB)	At 800MHz(dB)	At 1900MHz(dB)	At 1700MHz(dB)	At 2100MHz(dB)
CM174- 10FT 10Feet	3.8	4.3	8.8	6.98	8.96

Path loss=20Lgf+20LgD-27.55					
Operation Frequency (MHz)	f(MHz)	D(m)	Constant(dB)	Path loss(dB)	
PCS(1850-1915)	1850	0.4	27.55	29.8	
Cellular(824-849)	824	0.4	27.55	22.8	
LTE(698-716)	698	0.4	27.55	21.4	
LTE(776-787)	776	0.4	27.55	22.3	
AWS(1710-1755)	1710	0.4	27.55	29.1	
MSCL Calculations of Fusion 5C-2Go					
MSCL					
Band (MHz)	Path loss (dB)	Indoor Antenna Gain (dBi)	Indoor Cable Loss (dB)	Polarity Loss(dB)	MSCL(dB)
PCS(1850-1915)	29.8	3	8.8	3	38.6
Cellular(824-849)	22.8	1.1	4.3	3	29.0
LTE(698-716)	21.4	1.1	3.8	3	27.1
LTE(776-787)	22.3	1.1	3.8	3	28.0
AWS(1710-1755)	29.1	3	6.98	3	36.1



Marine-1 Kit

Fusion 5C-2Go Marine-1 Kit					
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)
CM248W	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)
CM240- 20FN 20Feet	2.06	2.29	3.56	3.36	3.76

Path loss=20Lgf+20LgD-27.55					
Operation Frequency (MHz)	f(MHz)	D(m)	Constant(dB)	Path loss(dB)	
PCS(1850-1915)	1850	0.9	27.55	36.9	
Cellular(824-849)	824	0.9	27.55	29.8	
LTE(698-716)	698	0.9	27.55	28.4	
LTE(776-787)	776	0.9	27.55	29.3	
AWS(1710-1755)	1710	0.9	27.55	36.2	
MSCL Calculations of Fusion 5C-2Go					
MSCL					
Band (MHz)	Path loss (dB)	Indoor Antenna Gain (dBi)	Indoor Cable Loss (dB)	Polarity Loss(dB)	MSCL(dB)
PCS(1850-1915)	36.9	10	3.56	3	33.4
Cellular(824-849)	29.8	7	2.29	3	28.1
LTE(698-716)	28.4	7	2.06	3	26.5
LTE(776-787)	29.3	7	2.06	3	27.4
AWS(1710-1755)	36.2	10	3.36	3	32.5



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Marine-2 Kit

Fusion 5C-2Go Marine-2 Kit					
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)
CM302W	2.5	3	4	5	5
Indoor Cable					
Indoor Cable	Indoor Cable Loss				
	At LTE-A and LTE-V (698-787MHz)(dB)	At 800MHz(dB)	At 1900MHz(dB)	At 1700MHz(dB)	At 2100MHz(dB)
CM240- 20FN 20Feet	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	0.9	27.56	36.9	
Cellular(824-849)	824	0.9	27.56	29.8	
LTE(698-716)	698	0.9	27.56	28.4	
LTE(776-787)	776	0.9	27.56	29.3	
AWS(1710-1755)	1710	0.9	27.56	36.2	
MSCL Calculations of Fusion 5C-2Go					
MSCL					
Operation Frequency (MHz)	Path loss (dB)	Indoor Antenna Gain(dBi)	Indoor Cable Loss(dB)	Polarity Loss(dB)	MSCL(dB)
PCS(1850-1915)	33.3	4	3.56	3	39.4
Cellular(824-849)	26.3	3	2.29	3	32.1
LTE(698-716)	24.9	2.5	2.06	3	31.0
LTE(776-787)	25.8	2.5	2.06	3	31.9
AWS(1710-1755)	32.7	5	3.36	3	37.5



Desk top RV-1 Kit

Fusion 5C-2Go Desk top RV-1 Kit					
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)
CM120W	1.2	1.2	3	3	3
Indoor Cable					
Indoor Cable	Indoor Cable Loss				
	At LTE-A and LTE-V (698-787MHz)(dB)	At 800MHz(dB)	At 1900MHz(dB)	At 1700MHz(dB)	At 2100MHz(dB)
	0.3	0.3	0.3	0.3	0.3

Path loss=20Lgf+20LgD-27.55					
Operation Frequency (MHz)		f(MHz)	D(m)	Constant(dB)	Path loss(dB)
PCS(1850-1915)		1850	0.6	27.55	33.3
Cellular(824-849)		824	0.6	27.55	26.3
LTE(698-716)		698	0.6	27.55	24.9
LTE(776-787)		776	0.6	27.55	25.8
AWS(1710-1755)		1710	0.6	27.55	32.7
MSCL Calculations of Fusion 5C-2Go					
MSCL					
Band (MHz)	Path loss (dB)	Indoor Antenna Gain (dBi)	Indoor Cable Loss (dB)	Polarity Loss(dB)	MSCL(dB)
PCS(1850-1915)	33.3	3	0.3	3	33.6
Cellular(824-849)	26.3	1.2	0.3	3	28.4
LTE(698-716)	24.9	1.2	0.3	3	27.0
LTE(776-787)	25.8	1.2	0.3	3	27.9
AWS(1710-1755)	32.7	3	0.3	3	33.0



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Desk top RV-2 Kit

Fusion 5C-2Go Desk top RV-2 Kit					
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)
CM302W	2.5	3	4	5	5
Indoor Cable					
Indoor Cable	Indoor Cable Loss				
	At LTE-A and LTE-V (698-787MHz)(dB)	At 800MHz(dB)	At 1900MHz(dB)	At 1700MHz(dB)	At 2100MHz(dB)
CM240-20FN 20Feet	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	0.6	27.56	33.3	
Cellular(824-849)	824	0.6	27.56	26.3	
LTE(698-716)	698	0.6	27.56	24.9	
LTE(776-787)	776	0.6	27.56	25.8	
AWS(1710-1755)	1710	0.6	27.56	32.7	
MSCL Calculations of Fusion 5C-2Go					
MSCL					
Operation Frequency (MHz)	Path loss (dB)	Indoor Antenna Gain(dBi)	Indoor Cable Loss(dB)	Polarity Loss(dB)	MSCL(dB)
PCS(1850-1915)	33.3	4	3.56	3	35.9
Cellular(824-849)	26.3	3	2.29	3	28.6
LTE(698-716)	24.9	2.5	2.06	3	27.4
LTE(776-787)	25.8	2.5	2.06	3	28.4
AWS(1710-1755)	32.7	5	3.36	3	34.0



3 Min MSCL

MSCL Calculations of Fusion 5C-2Go	
MSCL	
Band (MHz)	MSCL(dB)
PCS(1850-1915)	33.4
Cellular(824-849)	28.1
LTE(698-716)	26.5
LTE(776-787)	27.4
AWS(1710-1755)	32.5

