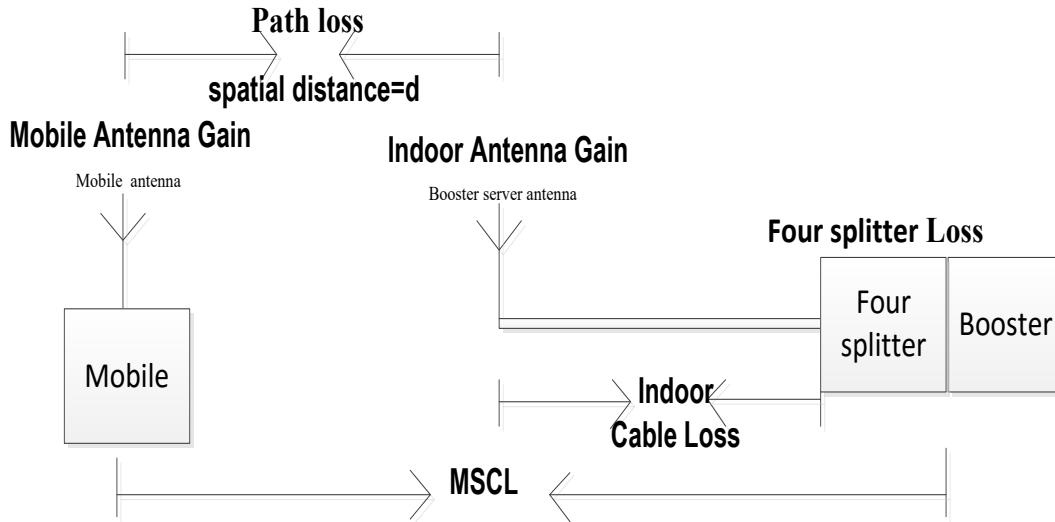


## 1 Explanation of MSCL



**Figure 1**

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

### 1.1 Decibel version of free-space propagation loss equation

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

$f$  (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 5S Antenna Kitting .

Worst case MSCL calculation with maximum allowed combination of antenna gain and Coaxial/ Splitter loss for Downlink EIRP not to exceed 16.5dBm

## 1.4 Polarity Loss

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

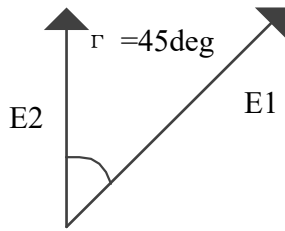
$$\text{PL dB} = 10\text{Log} (E1^2 / (E1\text{Sin} (45\text{deg}))^2) \text{ dB} = 20\text{Log} (1/\text{Sin} (45\text{deg})) \text{ dB} = 3.01\text{dB}$$

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 Fusion-5S V2.0					
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)
SC222W	3	3	6	6	6
SC228W	3.5	3.5	7.5	7.5	7.5
SC248W	7	7	10	10	10
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)
SC240-20FN 20Feet	2.06	2.29	3.56	3.36	3.76
SC400-20NN 20Feet	1.57	1.62	2.09	1.99	2.18
SC400-30NN 30Feet	2.05	2.12	2.83	2.68	2.98
SC400-50NN 50Feet	3.01	3.14	4.31	4.07	4.56
SC400-75NN 75Feet	4.22	4.41	6.17	5.8	6.54
splitter					
Indoor Splitter	splitter Loss				
	At LTE-A and LTE-V (698-787MHz)(dB)	At 800MHz(dB)	At 1900MHz(dB)	At 1700MHz(dB)	At 2100MHz(dB)
SC-WS-2	3.5	3.5	3.5	3.5	3.5



SC-WS-4	6.5	6.5	6.5	6.5	6.5
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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



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MSCL Calculations of fixed booster Fusion 5S V2.0					
MSCL (Note1)					
Band (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	3.0	47.0
Cellular(824-849)	36.8	3	4.41	3.0	41.2
LTE(698-716)	35.3	3	4.22	3.0	39.5
LTE(776-787)	36.3	3	4.22	3.0	40.5
AWS(1710-1755)	43.1	6	5.8	3.0	45.9

MSCL Calculations of fixed booster Fusion 5S V2.0							
MSCL (Note2) <b>Min MSCL</b>							
Band (MHz)	Path loss (dB)	Indoor Antenna Gain(dBi)	Indoor Cable Loss(dB)	Splitter Loss (dB)	Cable After Splitting Loss(dB)	Polarity Loss (dB)	MSCL (dB)
PCS(1850-1915)	43.8	10	2.09	3.5	4.31	3.0	46.7
Cellular(824-849)	36.8	7	1.62	3.5	3.14	3.0	41.1
LTE(698-716)	35.3	7	1.57	3.5	3.01	3.0	39.4
LTE(776-787)	36.3	7	1.57	3.5	3.01	3.0	40.4
AWS(1710-1755)	43.1	10	1.99	3.5	4.07	3.0	45.7



MSCL Calculations of fixed booster Fusion 5S V2.0							
MSCL (Note3)							
Band (MHz)	Path loss (dB)	Indoor Antenna Gain(dBi)	Indoor Cable Loss(dB)	Splitter Loss (dB)	Cable After Splitting Loss(dB)	Polarity Loss (dB)	MSCL (dB)
PCS(1850-1915)	43.8	10	2.09	6.5	4.31	3.0	49.7
Cellular(824-849)	36.8	7	1.62	6.5	3.14	3.0	44.1
LTE(698-716)	35.3	7	1.57	6.5	3.01	3.0	42.4
LTE(776-787)	36.3	7	1.57	6.5	3.01	3.0	43.4
AWS(1710-1755)	43.1	10	1.99	6.5	4.07	3.0	48.7



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