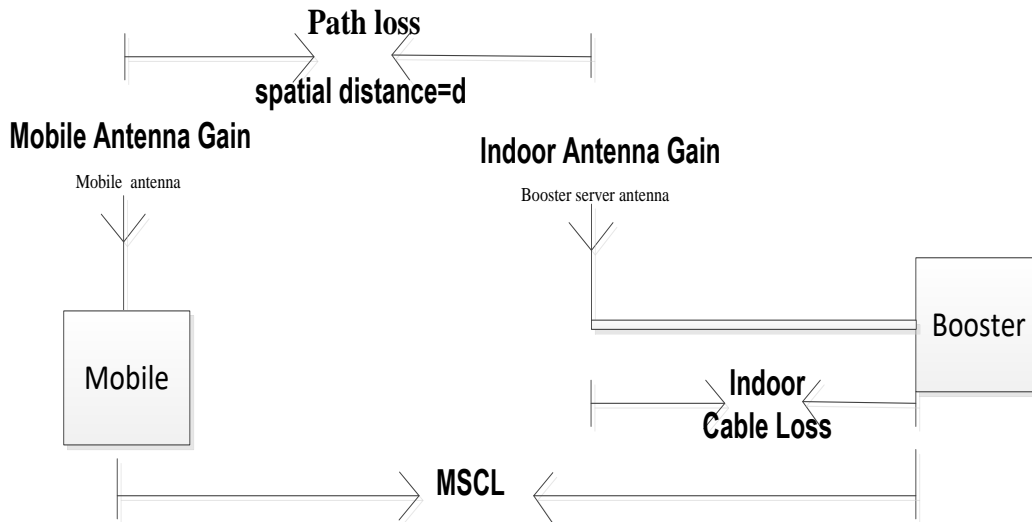


## 1 Explanation of MSCL



**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) =  $20Lgf + 20Lgd + 32.45$  .....② or Path loss (dB) =  $20Lgf + 20LgD - 27.55$  .....③

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

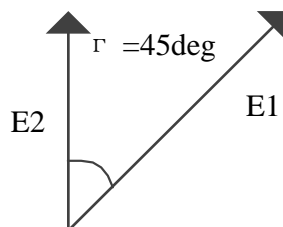
Polarity Loss dB =  $10\log\left(\frac{E1}{E2}\right)^2$  dB = PL dB

PL dB=  $10\log\left(\frac{E1^2}{(E1\sin(45\text{deg}))^2}\right)$  dB =  $20\log\left(\frac{1}{\sin(45\text{deg})}\right)$  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 =  $E1\sin(\theta)$ .



## 2 MSCL Calculations

### Antenna Kitting Information

Fusion4Home RT V1.0					
Indoor Antenna					
Indoor Antenna	Indoor Antenna Gain				
	At LTE-A&LTE-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&LTE-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	<b>37.0</b>
Cellular (824-849)	36.8	7	0.2	3	<b>33.0</b>
LTE (698-716)	35.3	7	0.2	3	<b>31.5</b>
LTE (776-787)	36.3	7	0.2	3	<b>32.5</b>
AWS (1710-1755)	43.1	10	0.2	3	<b>36.3</b>

Non indoor cable configuration

