

### Mobile Station Coupling Losses (MSCL)

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 FCCID: PWO460060

The following formulas were used to calculate MSCL with a 2 m distance from transmitter to receiver antenna and a 45 degree polarity mismatch between the inside antenna and the mobile device for EUT model 460060 signal booster:

$$MSCL (dB) = Path Loss (dB) + Polarity Loss (dB) - G_t - G_r$$

$$Path Loss (dB) = 20 \log(d) + 20 \log(f) - 27.55$$

$f = \text{frequency MHz}$

$d = \text{Distance from transmitter to receiver antenna (meters)}$

$$Polarity Loss (dB) = 20 \log\left(\frac{E_1}{E_2}\right)$$

$$Polarity Loss = 20 \log\left(\frac{E_1}{E_1 \sin(\tau)}\right), \tau = 45^\circ$$

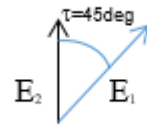
$E_1 = \text{Maximum possible magnitude of the Electric Field from Mobile Device}$

$E_2 = \text{Magnitude of the electric field from the Mobile Device with a } 45^\circ \text{ polarity mismatch}$

$$E_2 = E_1 \sin(\tau)$$

$G_t = \text{UE Transmitter Antenna Gain}$

$G_r = \text{Signal Booster Server Antenna Gain}$



### Path Loss Evaluation

$$Path Loss (dB) = 20 \log(d) + 20 \log(f) - 27.55$$

$f = \text{frequency in MHz}$

$d = \text{Distance from transmitter to receiver antenna (meters)}$

Frequency Range (MHz)	f (MHz)	d (m)	Constant (dB)	Path Loss (dB)
698-716	707	2	27.55	35.4
776-787	781.5	2	27.55	36.3
824-849	836.5	2	27.55	36.9
1710-1785	1747.5	2	27.55	43.3
1850-1915	1882.5	2	27.55	44.0

### Polarity Loss Evaluation

$$\text{Polarity Loss (dB)} = 20 \log \left( \frac{E_1}{E_2} \right)$$

$$\text{Polarity Loss (dB)} = 20 \log \left( \frac{E_1}{E_1 \sin(\tau)} \right), \quad \tau = 45^\circ$$

$E_1$  = Maximum possible magnitude of the Electric Field from Mobile Device  
 $E_2$  = Magnitude of the electric field from the Mobile Device with a 45° polarity mismatch  
 $E_2 = E_1 \sin(\tau)$

$$\text{Polarity Loss} = 20 \log \left( \frac{1}{\sin \left( \frac{\pi}{180} \right)} \right) = 3.01 \text{ dB}$$

### UE Transmitter Antenna Gain Evaluation

$$G_t = \text{UE Transmitter Antenna Gain} = 0 \text{ dBi}$$

### Signal Booster Server Antenna Gain Evaluation

Component	Type	Product Number	Gain (dBi) / Loss (dB)					
			B12 700 MHz	B13 700 MHz	B5 800 MHz	B4 1700 MHz	B2 1900 MHz	B4 2200 MHz
Server Cable	RG-11 (60ft)	951160	2.5	2.7	2.8	4.6	4.8	5.2
Server Antenna	Dome	304419	2	2	2	4	4	4
	Panel	301211	-0.8	-0.8	1.5	2.4	3.4	1.2
		314440	5.75	5.75	6	7.3	7.3	7.6
		314444	5.75	5.75	6	7.3	7.3	7.6



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### Minimum MSCL Evaluation

Maximum antenna gain and minimum coax loss was selected to calculate “worst case” limit for MSCL

	<b>B12 700 MHz</b>	<b>B13 700 MHz</b>	<b>B5 800 MHz</b>	<b>B4 1700 MHz</b>	<b>B2 1900 MHz</b>
Path Loss (dB)	35.4	36.3	36.9	43.3	44
Polarity Loss (dB)	3.01	3.01	3.01	3.01	3.01
UE Antenna Gain (dBi)	0	0	0	0	0
Server Antenna Gain (dBi)	5.75	5.75	6	7.3	7.3
Server Coax Loss (dB)	2.5	2.7	2.8	4.6	4.8
<b>Minimum MSCL (dB)</b>	<b>35.16</b>	<b>36.26</b>	<b>36.71</b>	<b>43.61</b>	<b>44.51</b>

**END OF REPORT**