

Mobile Station Coupling Losses (MSCL)

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FCCID: PWO086

The following formulas were used to calculate MSCL with a 0.46 m distance from transmitter to receiver antenna and a 45 degree polarity mismatch between the inside antenna and the mobile device for EUT model 470086 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 = frequency MHz

d = 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 = 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

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

G_t = UE Transmitter Antenna Gain

G_r = Signal Booster Server Antenna Gain



Path Loss Evaluation

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

f = frequency in MHz

d = Distance from transmitter to receiver antenna (meters)

Frequency Range (MHz)	f (MHz)	d (m)	Constant (dB)	Path Loss (dB)
1850-1915	1882.5	0.46	27.55	31.2

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

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

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

UE Transmitter Antenna Gain Evaluation

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

Signal Booster Server Antenna Gain Evaluation

Component	Type	Product Number	Gain (dBi) / Loss (dB)
			B25 1900 MHz
Server Cable	N/A	N/A	0
Server Antenna	Omni	CBL000151	1.7

Minimum MSCL Evaluation

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

	B25 1900 MHz
Path Loss (dB)	31.2
Polarity Loss (dB)	3.01
UE Antenna Gain (dBi)	0
Server Antenna Gain (dBi)	1.7
Server Coax Loss (dB)	0
Minimum MSCL (dB)	29.9

END OF REPORT