

1 FCC § 1.1307 (b) (1) & § 2.1091-RF EXPOSURE

1.1 Applicable Standard

According to § 1.1310 and § 2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Power Density (mW/cm ²)
Limits for General Population/Uncontrolled Exposure	
0.3-1.34	*(100)
1.34-30	*(180/f ²)
30-300	0.2
300 - 1,500	f/1500
1,500 - 100,000	1

Note: f= frequency in MHz

*=Plane-wave equivalent power density

1.2 MPE Prediction

1.2.1 Calculation of MPE at 20 cm distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG / 4 \pi R^2$$

Where: S=power density

P=power input to antenna

G= maximum power gain of the antenna in the direction of interest relative to an isotropic radiator, subtract antenna's cable loss, (result is in numeric form)

R=distance to the center of radiation of the antenna (20cm in the following calculation)

1.2.2 Calculation formula of G (numeric)

$$G(\text{numeric}) = 10^{\frac{\{\text{Maximum Antenna Gain (dBi)} - \text{Cable Loss (dB)}\}}{10}}$$

Where: G (numeric) = Maximum power gain of the antenna in the direction of interest relative to an isotropic radiator, subtract antenna's cable loss, (result is converted from decibel into numeric form with above equation)

1.3 Test Result

Vehicle Kit

Outdoor Antenna					
Outdoor Antenna	Outdoor Antenna Gain				
	At LTE-A and LTE-V (698-787MHz)(dBi)	At 800MHz(dBi)	At 1900MHz(dBi)	At 1700MHz(dBi)	At 2100MHz(dBi)
CM200	3	3	5	5	5
Outdoor Cable					
Outdoor Cable	Outdoor Cable Loss				
	At LTE-A and LTE-V (698-787MHz)(dBi)	At 800MHz(dBi)	At 1900MHz(dBi)	At 1700MHz(dBi)	At 2100MHz(dBi)
CM174-10FT 10Feet	3.8	4.3	8.8	6.98	8.96
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)(dBi)	At 800MHz(dBi)	At 1900MHz(dBi)	At 1700MHz(dBi)	At 2100MHz(dBi)
CM174-10FT 10Feet	3.8	4.3	8.8	6.98	8.96

LET Band 707 UL:	
Maximum peak output power at antenna input terminal(dBm):	19.00
Maximum peak output power at antenna input terminal(mW):	79.43
Prediction distance(cm):	20
Prediction frequency(MHz):	708.40
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	3
G (numeric) :	0.83
Power density at predication frequency and distance(mW/cm ²):	0.0132
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.4723

LET Band 742 DL:	
Maximum peak output power at antenna input terminal(dBm):	-13.00
Maximum peak output power at antenna input terminal(mW):	0.05
Prediction distance(cm):	20
Prediction frequency(MHz):	743.18
Maximum Antenna Gain (dBi):	1.1
Cable Loss(dB):	3.8
G (numeric) :	0.54
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.4955

LTE Band 781 UL:	
Maximum peak output power at antenna input terminal(dBm):	18.00
Maximum peak output power at antenna input terminal(mW):	63.10
Prediction distance(cm):	20
Prediction frequency(MHz):	784.40
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	3.8
G (numeric) :	0.83
Power density at predication frequency and distance(mW/cm ²):	0.0104
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5229

Cellular Band UL:	
Maximum peak output power at antenna input terminal(dBm):	18.50
Maximum peak output power at antenna input terminal(mW):	70.79
Prediction distance(cm):	20
Prediction frequency(MHz):	831.42
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	4.3
G (numeric) :	0.74
Power density at predication frequency and distance(mW/cm ²):	0.0104
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5543

Cellular Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-18.20
Maximum peak output power at antenna input terminal(mW):	0.02
Prediction distance(cm):	20
Prediction frequency(MHz):	880.17
Maximum Antenna Gain (dBi):	1.1
Cable Loss(dB):	4.3
G (numeric) :	0.48
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5868

PCS Band UL:	
Maximum peak output power at antenna input terminal(dBm):	17.50
Maximum peak output power at antenna input terminal(mW):	56.23
Prediction distance(cm):	20
Prediction frequency(MHz):	1872.32
Maximum Antenna Gain (dBi):	5
Cable Loss(dB):	8.8
G (numeric) :	0.42
Power density at predication frequency and distance(mW/cm ²):	0.0047
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

PCS Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-12.80
Maximum peak output power at antenna input terminal(mW):	0.05
Prediction distance(cm):	20
Prediction frequency(MHz):	1960.77
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	8.8
G (numeric) :	0.26
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

AWS Band UL:	
Maximum peak output power at antenna input terminal(dBm):	17.40
Maximum peak output power at antenna input terminal(mW):	54.95
Prediction distance(cm):	20
Prediction frequency(MHz):	1717.05
Maximum Antenna Gain (dBi):	5
Cable Loss(dB):	6.98
G (numeric) :	0.63
Power density at predication frequency and distance(mW/cm ²):	0.0069
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

AWS Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-12.30
Maximum peak output power at antenna input terminal(mW):	0.06
Prediction distance(cm):	20
Prediction frequency(MHz):	2120.80
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	8.96
G (numeric) :	0.25
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

Marine Kit

Outdoor Antenna					
Outdoor Antenna	Outdoor Antenna Gain				
	At LTE-A and LTE-V (698-787MHz)(dBi)	At 800MHz(dBi)	At 1900MHz(dBi)	At 1700MHz(dBi)	At 2100MHz(dBi)
CM288W or Galaxy 5412-P	3	3	4	4	4
Outdoor Cable					
Outdoor Cable	Outdoor Cable Loss				
	At LTE-A and LTE-V (698-787MHz)(dBi)	At 800MHz(dBi)	At 1900MHz(dBi)	At 1700MHz(dBi)	At 2100MHz(dBi)
CM240-40FN 40Feet	3.52	3.98	6.52	6.12	6.92

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

LET Band 707 UL:	
Maximum peak output power at antenna input terminal(dBm):	19.00
Maximum peak output power at antenna input terminal(mW):	79.43
Prediction distance(cm):	20
Prediction frequency(MHz):	708.40
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	3.52
G (numeric) :	0.89
Power density at predication frequency and distance(mW/cm ²):	0.0140
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.4723

LTE Band 781 UL:	
Maximum peak output power at antenna input terminal(dBm):	18.00
Maximum peak output power at antenna input terminal(mW):	63.10
Prediction distance(cm):	20
Prediction frequency(MHz):	784.40
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	3.52
G (numeric) :	0.89
Power density at predication frequency and distance(mW/cm ²):	0.0111
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5229

LET Band 742 DL:	
Maximum peak output power at antenna input terminal(dBm):	-13.00
Maximum peak output power at antenna input terminal(mW):	0.05
Prediction distance(cm):	20
Prediction frequency(MHz):	743.18
Maximum Antenna Gain (dBi):	7
Cable Loss(dB):	2.06
G (numeric) :	3.12
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.4955

Cellular Band UL:	
Maximum peak output power at antenna input terminal(dBm):	18.50
Maximum peak output power at antenna input terminal(mW):	70.79
Prediction distance(cm):	20
Prediction frequency(MHz):	831.42
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	3.98
G (numeric) :	0.80
Power density at predication frequency and distance(mW/cm ²):	0.0112
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5543

Cellular Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-18.20
Maximum peak output power at antenna input terminal(mW):	0.02
Prediction distance(cm):	20
Prediction frequency(MHz):	880.17
Maximum Antenna Gain (dBi):	7
Cable Loss(dB):	2.29
G (numeric) :	2.96
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5868

PCS Band UL:	
Maximum peak output power at antenna input terminal(dBm):	17.50
Maximum peak output power at antenna input terminal(mW):	56.23
Prediction distance(cm):	20
Prediction frequency(MHz):	1872.32
Maximum Antenna Gain (dBi):	4
Cable Loss(dB):	6.52
G (numeric) :	0.56
Power density at predication frequency and distance(mW/cm ²):	0.0063
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

PCS Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-12.80
Maximum peak output power at antenna input terminal(mW):	0.05
Prediction distance(cm):	20
Prediction frequency(MHz):	1960.77
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	3.56
G (numeric) :	4.41
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

AWS Band UL:	
Maximum peak output power at antenna input terminal(dBm):	17.40
Maximum peak output power at antenna input terminal(mW):	54.95
Prediction distance(cm):	20
Prediction frequency(MHz):	1717.05
Maximum Antenna Gain (dBi):	4
Cable Loss(dB):	6.12
G (numeric) :	0.61
Power density at predication frequency and distance(mW/cm ²):	0.0067
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

AWS Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-12.30
Maximum peak output power at antenna input terminal(mW):	0.06
Prediction distance(cm):	20
Prediction frequency(MHz):	2120.80
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	3.76
G (numeric) :	4.21
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

Desk top RV Kit

Outdoor Antenna					
Outdoor Antenna	Outdoor Antenna Gain				
	At LTE-A and LTE-V (698-787MHz)(dBi)	At 800MHz(dBi)	At 1900MHz(dBi)	At 1700MHz(dBi)	At 2100MHz(dBi)
CM288W	3	3	4	4	4
Outdoor Cable					
Outdoor Cable	Outdoor 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	3.52	3.98	6.52	6.12	6.92
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)
No Cable	0.3	0.3	0.3	0.3	0.3

LET Band 707 UL:	
Maximum peak output power at antenna input terminal(dBm):	19.00
Maximum peak output power at antenna input terminal(mW):	79.43
Prediction distance(cm):	20
Prediction frequency(MHz):	708.40
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	3.52
G (numeric) :	0.89
Power density at predication frequency and distance(mW/cm ²):	0.0140
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.4723

LTE Band 781 UL:	
Maximum peak output power at antenna input terminal(dBm):	18.00
Maximum peak output power at antenna input terminal(mW):	63.10
Prediction distance(cm):	20
Prediction frequency(MHz):	784.40
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	3.52
G (numeric) :	0.89
Power density at predication frequency and distance(mW/cm ²):	0.0111
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5229

LET Band 742 DL:	
Maximum peak output power at antenna input terminal(dBm):	-13.00
Maximum peak output power at antenna input terminal(mW):	0.05
Prediction distance(cm):	20
Prediction frequency(MHz):	743.18
Maximum Antenna Gain (dBi):	1.2
Cable Loss(dB):	0.3
G (numeric) :	1.23
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.4955

Cellular Band UL:	
Maximum peak output power at antenna input terminal(dBm):	18.50
Maximum peak output power at antenna input terminal(mW):	70.79
Prediction distance(cm):	20
Prediction frequency(MHz):	831.42
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	3.98
G (numeric) :	0.80
Power density at predication frequency and distance(mW/cm ²):	0.0112
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5543

Cellular Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-18.20
Maximum peak output power at antenna input terminal(mW):	0.02
Prediction distance(cm):	20
Prediction frequency(MHz):	880.17
Maximum Antenna Gain (dBi):	1.2
Cable Loss(dB):	0.3
G (numeric) :	1.23
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	0.5868

PCS Band UL:	
Maximum peak output power at antenna input terminal(dBm):	17.50
Maximum peak output power at antenna input terminal(mW):	56.23
Prediction distance(cm):	20
Prediction frequency(MHz):	1872.32
Maximum Antenna Gain (dBi):	4
Cable Loss(dB):	6.52
G (numeric) :	0.56
Power density at predication frequency and distance(mW/cm ²):	0.0063
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

PCS Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-12.80
Maximum peak output power at antenna input terminal(mW):	0.05
Prediction distance(cm):	20
Prediction frequency(MHz):	1960.77
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	0.3
G (numeric) :	1.86
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

AWS Band UL:	
Maximum peak output power at antenna input terminal(dBm):	17.40
Maximum peak output power at antenna input terminal(mW):	54.95
Prediction distance(cm):	20
Prediction frequency(MHz):	1717.05
Maximum Antenna Gain (dBi):	4
Cable Loss(dB):	6.12
G (numeric) :	0.61
Power density at predication frequency and distance(mW/cm ²):	0.0067
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

AWS Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-12.30
Maximum peak output power at antenna input terminal(mW):	0.06
Prediction distance(cm):	20
Prediction frequency(MHz):	2120.80
Maximum Antenna Gain (dBi):	3
Cable Loss(dB):	0.3
G (numeric) :	1.86
Power density at predication frequency and distance(mW/cm ²):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm ²):	1.0000

