

# 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 <sup>2</sup> )
Limits for General Population/Uncontrolled Exposure	
0.3-1.34	*(100)
1.34-30	*(180/f <sup>2</sup> )
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

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)
CM230W	10	10	10	10	10
CM288W	3	3	4	4	4
CM500W	4	6	7	7	8.5
MAX GAIN	10	10	10	10	10

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
CM400-75NN 75Feet	4.22	4.41	6.17	5.8	6.54
MIN LOSS	3.52	3.98	6.17	5.8	6.54

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)
CM222W	3	3	6	6	6
CM248W	7	7	10	10	10
CM302W	2.5	3	5	4	5
MAX GAIN	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
CM400-30NN 30Feet	2.05	2.12	2.83	2.68	2.98
CM240-50NN 50Feet	4.26	4.83	8	7.5	8.5
MIN LOSS	2.05	2.12	2.83	2.68	2.98

LET Band 707 UL:	
Maximum peak output power at antenna input terminal(dBm):	21.70
Maximum peak output power at antenna input terminal(mW):	147.91
Prediction distance(cm):	20
Prediction frequency(MHz):	705.90
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	3.52
G ( numeric ) :	4.45
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.1309
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	0.4706

LTE Band 781 UL:	
Maximum peak output power at antenna input terminal(dBm):	19.41
Maximum peak output power at antenna input terminal(mW):	87.30
Prediction distance(cm):	20
Prediction frequency(MHz):	785.13
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	3.52
G ( numeric ) :	4.45
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.0773
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	0.5234

LET Band 742 DL:	
Maximum peak output power at antenna input terminal(dBm):	-8.80
Maximum peak output power at antenna input terminal(mW):	0.13
Prediction distance(cm):	20
Prediction frequency(MHz):	743.00
Maximum Antenna Gain (dBi):	7
Cable Loss(dB):	2.05
G (numeric) :	3.13
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.0001
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	0.4953

Cellular Band UL:	
Maximum peak output power at antenna input terminal(dBm):	19.57
Maximum peak output power at antenna input terminal(mW):	90.57
Prediction distance(cm):	20
Prediction frequency(MHz):	837.40
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	3.98
G (numeric) :	4.00
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.0721
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	0.5583

Cellular Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-8.34
Maximum peak output power at antenna input terminal(mW):	0.15
Prediction distance(cm):	20
Prediction frequency(MHz):	878.00
Maximum Antenna Gain (dBi):	7
Cable Loss(dB):	2.12
G (numeric) :	3.08
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.0001
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	0.5853

PCS Band UL:	
Maximum peak output power at antenna input terminal(dBm):	19.53
Maximum peak output power at antenna input terminal(mW):	89.74
Prediction distance(cm):	20
Prediction frequency(MHz):	1865.00
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	6.17
G (numeric) :	2.42
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.0431
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	1.0000

PCS Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-12.67
Maximum peak output power at antenna input terminal(mW):	0.05
Prediction distance(cm):	20
Prediction frequency(MHz):	1956.00
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	2.83
G ( numeric ) :	5.21
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.0001
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	1.0000

AWS Band UL:	
Maximum peak output power at antenna input terminal(dBm):	20.44
Maximum peak output power at antenna input terminal(mW):	110.66
Prediction distance(cm):	20
Prediction frequency(MHz):	1741.00
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	5.8
G ( numeric ) :	2.63
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.0579
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	1.0000

AWS Band DL:	
Maximum peak output power at antenna input terminal(dBm):	-15.28
Maximum peak output power at antenna input terminal(mW):	0.03
Prediction distance(cm):	20
Prediction frequency(MHz):	2119.00
Maximum Antenna Gain (dBi):	10
Cable Loss(dB):	2.98
G ( numeric ) :	5.04
Power density at predication frequency and distance(mW/cm <sup>2</sup> ):	0.0000
MPE limit for uncontrolled exposure at predication frequency(mW/cm <sup>2</sup> ):	1.0000