9 FCC §1.1307(B)(1) & §2.1091 - RF Exposure

9.1 Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f^2)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz
  * = Plane-wave equivalent power density

9.2 MPE Prediction

Predication of MPE limit at a given 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 = power gain of the antenna in the direction of interest relative to an isotropic radiator
  R = distance to the center of radiation of the antenna

9.3 Test Result

Cellular Band UL:

Maximum peak output power at antenna input terminal (dBm):	26.06
Maximum peak output power at antenna input terminal (mW):	403.65
Prediction distance (cm):	20
Prediction frequency (MHz):	836.6
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	1.8
Maximum Antenna Gain+ Cable Loss (numeric):	5.2481
Power density at predication frequency and distance (mW/cm^2):	0.4214
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5577

Cellular Band DL:

Maximum peak output power at antenna input terminal (dBm):	23.57
Maximum peak output power at antenna input terminal (mW):	227.51
Prediction distance (cm):	20
Prediction frequency (MHz):	869.2
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	1.8
Maximum Antenna Gain+ Cable Loss (numeric):	5.2481
Power density at predication frequency and distance (mW/cm^2):	0.2375
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5795

PCS Band UL:

Maximum peak output power at antenna input terminal (dBm):	26.86
Maximum peak output power at antenna input terminal (mW):	485.29
Prediction distance (cm):	20
Prediction frequency (MHz):	1880
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	3
Maximum Antenna Gain+ Cable Loss (numeric):	3.9811
Power density at predication frequency and distance (mW/cm^2):	0.3844
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

PCS Band DL:

Maximum peak output power at antenna input terminal (dBm):	22.83
Maximum peak output power at antenna input terminal (mW):	191.87
Prediction distance (cm):	20
Prediction frequency (MHz):	1960
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	3
Maximum Antenna Gain+ Cable Loss (numeric):	3.9811
Power density at predication frequency and distance (mW/cm^2):	0.1520
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Note: To meet 33 dBm (2 watts) EIRP limit in PCS band, the gain of antenna used with this booster must be offset by coaxial cable loss such that the antenna gain less cable loss does not exceed 6 dBi.

Lower LTE Band UL:

Maximum peak output power at antenna input terminal (dBm):	23.05
Maximum peak output power at antenna input terminal (mW):	201.84
Prediction distance (cm):	20
Prediction frequency (MHz):	709
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	1.8
Maximum Antenna Gain+ Cable Loss (numeric):	5.2481
Power density at predication frequency and distance (mW/cm^2):	0.2107
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.4727

Lower LTE Band DL:

Maximum peak output power at antenna input terminal (dBm):	20.23
Maximum peak output power at antenna input terminal (mW):	105.44
Prediction distance (cm):	20
Prediction frequency (MHz):	743
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	1.8
Maximum Antenna Gain+ Cable Loss (numeric):	5.2481
Power density at predication frequency and distance (mW/cm^2):	0.1101
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.4953

Upper LTE Band UL:

Maximum peak output power at antenna input terminal (dBm):	23.91
Maximum peak output power at antenna input terminal (mW):	246.04
Prediction distance (cm):	20
Prediction frequency (MHz):	779
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	1.8
Maximum Antenna Gain+ Cable Loss (numeric):	5.2481
Power density at predication frequency and distance (mW/cm^2):	0.2569
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5193

Upper LTE Band DL:

Maximum peak output power at antenna input terminal (dBm):	19.90
Maximum peak output power at antenna input terminal (mW):	97.72
Prediction distance (cm):	20
Prediction frequency (MHz):	754
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	1.8
Maximum Antenna Gain+ Cable Loss (numeric):	5.2481
Power density at predication frequency and distance (mW/cm^2):	0.1020
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5027

AWS Band UL:

Maximum peak output power at antenna input terminal (dBm):	23.40
Maximum peak output power at antenna input terminal (mW):	218.78
Prediction distance (cm):	20
Prediction frequency (MHz):	1732.4
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	4
Maximum Antenna Gain+ Cable Loss (numeric):	3.1623
Power density at predication frequency and distance (mW/cm^2):	0.1376
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

AWS Band DL:

Maximum peak output power at antenna input terminal (dBm):	22.02
Maximum peak output power at antenna input terminal (mW):	159.22
Prediction distance (cm):	20
Prediction frequency (MHz):	2112.4
Antenna Gain, typical (dBi):	9
Cable Loss (dB)	4
Maximum Antenna Gain+ Cable Loss (numeric):	3.1623
Power density at predication frequency and distance (mW/cm^2):	0.1002
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Note: To meet 30 dBm (1watts) EIRP limit in AWS band, the gain of antenna used with this booster must be offset by coaxial cable loss such that the antenna gain less cable loss does not exceed 5 dBi.

Results

For uplink and downlink, the highest power density levels at 20 cm are below the MPE uncontrolled exposure limit.