4 FCC §2.1091 & §15.407(f) IC RSS-102 - RF Exposure

4.1 Applicable Standard

According to FCC §15.407(f) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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 (minutes)
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

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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF field

According to IC RSS-102 Issue 5 section 4, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
$0.003\text{-}10^{21}$	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

4.2 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

4.3 MPE Results

Case 1

Maximum peak output power at antenna input terminal (dBm):	17.95
Maximum peak output power at antenna input terminal (mW):	62.3735
Prediction distance (cm):	20
Prediction frequency (MHz):	5785
Maximum Antenna Gain, typical (dBi):	18
Maximum Antenna Gain (numeric):	63.09573
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.783
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
Power density of prediction frequency at 20.0 cm (W/m^2):	7.83
IC MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	9.76

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.783 mW/cm^2 and 7.83 W/m^2. Limit is 1.0 mW/cm^2 for FCC and 9.76 W/m^2 for IC.

Case 2

Maximum peak output power at antenna input terminal (dBm):	20.85
Maximum peak output power at antenna input terminal (mW):	121.6186
Prediction distance (cm):	20
Prediction frequency (MHz):	5755
Maximum Antenna Gain, typical (dBi):	15
Maximum Antenna Gain (numeric):	31.623
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.765
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
Power density of prediction frequency at 20.0 cm (W/m^2):	7.65
IC MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	9.72

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.765 mW/cm^2 and 7.65 W/m^2. Limit is 1.0 mW/cm^2 for FCC and 9.72 W/m^2 for IC.

Case 3

Maximum peak output power at antenna input terminal (dBm):	20.36
Maximum peak output power at antenna input terminal (mW):	108.64
Prediction distance (cm):	20
Prediction frequency (MHz):	5785
Maximum Antenna Gain, typical (dBi):	15
Maximum Antenna Gain (numeric):	31.623
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.684
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
Power density of prediction frequency at 20.0 cm (W/m^2):	6.84
IC MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	9.8

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.684 mW/cm^2 and 6.84 W/m^2. Limit is 1.0 mW/cm^2 for FCC and 9.8 W/m^2 for IC.