5.7 RF Exposure

5.7.1 Regulation

According to §15.247(i), 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 levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Limits for Maximum Permissive Exposure: RF exposure is calculated.

Frequency Range	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 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1.0	30

*f=frequency in MHz, *= plane-wave equivalent power density*

MPE (Maximum Permissive Exposure) Prediction
Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad \left(\Rightarrow R = \sqrt{PG/4\pi S} \right)$$

S = power density [mW/cm^2]
P = Power input to antenna [mW]
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 [cm]

EUT: Maximum peak output power = 233.88 [mW] (23.69 dBm) Antenna gain = 1.38 (1.4 [dBi])	
100 mW, at 20 cm from an antenna 6 [dBi]	S = PG/4πR² = 100 × 3.98 / (4 × π × 400) = 0.079 18 [mW/cm^2] < 1.0 [mW/cm^2]
43.954 mW, at 20 cm from an antenna 1.4 [dBi]	S = PG/4πR² = 0.064 23 [mW/cm^2] < 1.0 [mW/cm^2]

* In addition, It is complied with the 1-g SAR test exclusion thresholds for 100MHz – 6GHz and > 50 mm according to KDB 447498 clause 4.3.1

5.7.2 RF Exposure Compliance Issue

The information should be included in the user's manual:
This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.
This device is a handheld type and does not require SAR since the unit is only used while at arms length with a communications interval that is very short the commission considers the application to be a mobile device.

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5.7.3 Calculation Result of RF Exposure

* 802.11b

Channel	Frequency [MHz]	Ant Gain [mW]	power [dBm]	power [mW]	Power Density at 20 cm [mW/cm^2]
Lowest	2 412	1.38	13.72	23.55	0.006 47
Middle	2 437	1.38	13.37	21.73	0.005 97
Highest	2 462	1.38	13.29	21.33	0.005 86

* 802.11g

Channel	Frequency [MHz]	Ant Gain [mW]	power [dBm]	power [mW]	Power Density at 20 cm [mW/cm^2]
Lowest	2 412	1.38	23.69	233.88	0.064 23
Middle	2 437	1.38	23.07	202.77	0.055 68
Highest	2 462	1.38	22.45	175.79	0.048 28

* 802.11n HT20

Channel	Frequency [MHz]	Ant Gain [mW]	power [dBm]	power [mW]	Power Density at 20 cm [mW/cm^2]
Lowest	2 412	1.38	21.30	134.90	0.037 05
Middle	2 437	1.38	20.84	121.34	0.033 32
Highest	2 462	1.38	20.74	118.58	0.032 56