

## 12 ANTENNA REQUIREMENT

### 12.1 Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

### 12.2 Antenna Connected Construction:

An embedded-in antenna design is used.

The internal antenna is designed as permanently attached and the external one is designed with a unique connector. There is no consideration of replacement. Please see EUT photo and antenna spec. for details.

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## 13 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### 13.1 Standard Applicable

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

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	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 <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

\* = Plane-wave equipment power density

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## 13.2 Maximum Permissible Exposure (MPE) Evaluation

Measurement Result:

**Zigbee mode:**

CH	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
11	2405	3.52	1 Watt = 30 dBm
19	2440	3.55	1 Watt = 30 dBm
26	2480	<b>3.56</b>	1 Watt = 30 dBm

**Zigbee mode:**

CH	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Required Limit
11	2405	0.01	1 Watt = 30 dBm
19	2440	0.35	1 Watt = 30 dBm
26	2480	0.80	1 Watt = 30 dBm

*\*Note: Measured by power meter, cable loss as 0.45 dB that offsets on the power meter*

*\*Note: Measured by power meter, as cable loss+ Duty cycle factor that offsets on the*

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### MPE Prediction (802.11b 2412~2462)

Prediction of MPE limit at a given distance

Equation from page 18 of 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

Max. output power including tune-up tolerancel:	0.80	(dBm)
Max. output power including tune-up tolerancel:	1.2022644	(mW)
Duty cycle:	58.5	(%)
Maximum Pav :	0.7033247	(mW)
Peak Antenna gain (Maximum):	2.8	(dBi)
Peak Antenna gain (linear):	1.9054607	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2480	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.000	(mW/cm <sup>2</sup> )

#### Measurement Result

The predicted power density level at 20 cm is 0 mW/cm<sup>2</sup>.

This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 2480MHz.

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