

RADIO FREQUENCY EXPOSURE REPORT

FOR THE

**Smart Networked Energy Saving Lighting Systems
Model: SU-2-00**

Report No.: 92667-21

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Purpose:

To demonstrate compliance with United States, Canada and/or European Union RF Exposure requirements for Portable equipment (devices used $\leq 20\text{cm}$ from the body) or Mobile equipment (devices used $> 20\text{cm}$ from the body) with power output below exemption levels and Mobile equipment, where Maximum Permissible Exposure (MPE) Calculations apply.

United States Compliance Requirements (1.1310):

RF Exposure Evaluation Limits Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-3.0	614	1.63	*(100)	6
3.0-30	$1842/f$	$4.89/f$	*($900/f^2$)	6
30-300	61.4	0.163	1	6
300-1500	---	---	$f/300$	6
1500-100,000	---	---	5.0	6

RF Exposure Evaluation Limits 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)
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

* Plane wave equivalent power density

Limit is calculated based on the mid-band frequency used in the operating frequency range.

Exemption Level: Power output $< 60/f_{\text{GHz}}$ (mW) = 25mW

Canadian Compliance Requirements (RSS-102):

RF Exposure Evaluation Limits Occupational / Controlled Exposure:

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)	Averaging Time (minutes)
0.003-1.0	600	4.9	---	6
1.0-10	600/f	4.9/f	---	6
10-30	60	4.9/f	---	6
30-300	60	0.163	10	6
300-1500	$3.54 f^{0.5}$	$0.0094 * f^{0.5}$	f/3	6
1500-15,000	137	0.364	50	6
15,000-150,000	137	0.364	50	$616000/f^{1.2}$

RF Exposure Evaluation Limits General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)	Averaging Time (minutes)
0.003-1.0	280	2.19	---	6
1.0-10	280/f	2.19/f	---	6
10-30	28	2.19/f	---	6
30-300	28	0.073	2	6
300-1500	$1.585 * f^{0.5}$	$0.0042 * f^{0.5}$	f/150	6
1500-15,000	61.4	0.163	10	6
15,000-150,000	61.4	0.163	10	$616000/f^{1.2}$

**Power density limit applicable >100MHz*

Exemption Level:

Frequency Range (MHz)	Maximum Output Power (Conducted or EIRP)
0.003-1000	≤ 200 mW
1000-2200	≤ 100 mW
2200-3000	≤ 20 mW
3000-6000	≤ 10 mW

European Union Compliance Requirements (ICNIRP):

RF Exposure Evaluation Limits Occupational / Controlled Exposure:

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)	Averaging Time (minutes)
0.00082-0.065	610	24.4	---	6
0.065-1.0	610	1.6/f	---	
1.0-10	610/f	1.6/f	---	6
10-400	61	0.16	10	6
400-2000	$3.0 * f^{0.5}$	$0.008 * f^{0.5}$	f/40	6
2000-300,000	137	0.36	50	6

RF Exposure Evaluation Limits General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)	Averaging Time (minutes)
0.003-0.150	87	5.0	---	6
0.150-1.0	87	0.73/f	--	6
1.0-10	$87/f^{0.5}$	0.73/f	---	6
10-400	28	0.073	2	6
400-2000	$1.375 f^{0.5}$	$0.0037 * f^{0.5}$	f/200	6
2000-300,000	61	0.16	10	6

**Power density limit applicable >100MHz*

Exemption Level: Power output < 20mW¹

¹ May vary by product type

Device and Antenna Operating Configuration:

EUT is in continuous transmit mode.
The EUT has 16 channels, 1 through 15.
EUT is setup in typical mounting configuration.

Test Procedure:

This equipment is evaluated in accordance with the guidelines set forth in OET Guide 65 & ANSI C95.1 for the US and Health Canada Safety Code 6 & RSS 102 for Canada.

Other Considerations:

None

MPE Calculations

Applicability:

<i>Limit Used</i>	X	General Population / Uncontrolled Exposure
		Occupational / Controlled Exposure
<i>RF Exposure Exemption</i>	Yes	United States
	Yes	Canada

Measured power = 0.00789W=7.89mW.

Exemption limit =60/2.4GHz=25mW

Equipment operational details:

<i>Config #</i>	<i>Operating Frequency (MHz)</i>	<i>Measured Output Power (dBm)</i>	<i>Antenna Gain (dBi)</i>	<i>Antenna Type / Configuration</i>	<i>EIRP (dBm)</i>
1	2404.56 MHz	NA	NA	integral	8.97

Measurements based from EMC Test Report(s): 92667-7, 0.0078908 w

MPE Calculation:

$$\text{Power Density} = \frac{\text{EIRP}}{4\pi d^2} \quad \text{Given: EIRP in mW or W and d in cm or m}$$

<i>Config #</i>	<i>Distance (cm)</i>	<i>US (1.1310)</i>		<i>Canada (RSS-102)</i>		<i>EU (ICNIRP)</i>	
		<i>Power Density (mW/cm²)</i>	<i>Limit (mW/cm²)</i>	<i>Power Density (W/m²)</i>	<i>Limit (W/m²)</i>	<i>Power Density (W/m²)</i>	<i>Limit (W/m²)</i>
1	20	Exempt	--	Exempt	--	Exempt	--

Exemptions:

In the case the equipment meets compliance requirements by exemption the product is approved for use under mobile or portable conditions without further testing under the condition that any additional collocation or simultaneous transmission requirements (including necessary separation distances) have been met.

MPE Calculation Results:

In the case the equipment meets compliance by MPE Calculations the product is approved for use under mobile conditions without further testing under the condition that any additional collocation or simultaneous transmission requirements (including necessary separation distances) have been met. It is assumed that the manufacturer shall design the equipment such that the minimum separation distance of 20cm (or greater, as listed above) is met or that the manufacturer provides a protection guide (or installation instructions) to the end user such that the antenna(s) may be installed in accordance with the manufacturer's instructions in such a manner to maintain the minimum separation distance.

The Absorption and distribution of Electromagnetic energy in the body is a very complex phenomena that depends on the mass, shape and physiological condition of the body; the orientation of the body with respect to the fields; and, the electrical properties of the body and the environment. Variables that may play a substantial role in possible biological effects are those that characterize the environment (including but not limited to: ambient temperature, air velocity, relative humidity and body insulation); and those that characterize the individual (including but not limited to: age, gender, activity level and existing debilitation or disease). Because innumerable factors may interact to determine specific biological effects of exposure to electromagnetic fields, any protection guide should consider both intended and unintended operational environments and provide guidance for installation and use of the product such that proper separation distances can be maintained. (ANSI C95.1)