

FCC-ID	QHC-I2103G
IC-ID (Industry Canada)	4393B-I2103G



MPE Prediction

Calculations can be made to predict RF field strength and power density levels around typical RF sources using the general equations (3) and (4) on page 19 of the following FCC document:
 “OET Bulletin 65, Edition 97-01 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”.

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

Based on the above table the limits are:

For 850 MHz frequency band device: 0.57 mW/cm²
 For 1900 MHz frequency band device: 1 mW/cm²

Using the equation from page 19 of OET Bulletin 65, Edition 97-01:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm²)
 P = power input to the antenna (in appropriate units, e.g., 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 (appropriate units, e.g., cm)

Note:

This device is intended to be used only for fixed and mobile applications.

§ 2.1091:

The limit for 850 MHz mobile operations where no routine evaluation is required is: 1.5W ERP

The limit for 1700 / 1900 MHz mobile operations where no routine evaluation is required is: 3W EIRP

Max permissive power according to §24.232 : 2W EIRP

Max permissive power according to §§22.913 (a): 7W ERP

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For the unit tested by Cetecom Inc., the power density at a distance of 20cm can be deducted as follows-

Operation in cellular band (824-849 MHz)

$$\text{EIRP} = 30.3 + 2.14 = 32.44 \text{ dBm} = 1753.9 \text{ mW}$$

$$\begin{aligned} \text{Power density} &= \text{EIRP} * \text{DutyCycle} / (4\pi R^2) \\ &= 1753.9 * 0.25 / (4 * \pi * 20^2) \\ &= 0.09 \text{ mW/cm}^2 \end{aligned}$$

where duty cycle is 0.25 (Multislot Class 10) and R is 20cm.

The power density limit for 850 band operation is 0.55 mW/cm^2 . Hence the device is compliant with the rules on RF exposure.

Operation in PCS band (1850-1910 MHz)

$$\text{EIRP} = 30.39 \text{ dBm} = 1094 \text{ mW}$$

$$\begin{aligned} \text{Power density} &= \text{EIRP} * \text{DutyCycle} / (4\pi R^2) \\ &= 1094 * 0.25 / (4 * \pi * 20^2) \\ &= 0.05 \text{ mW/cm}^2 \end{aligned}$$

where duty cycle is 0.25 (Multislot Class 10) and R is 20cm.

The power density limit for 1900 band operation is 1 mW/cm^2 . Hence the device is compliant with the rules on RF exposure.

Operation in Zigbee mode (2.4GHz)

$$\text{EIRP} = 19.1 \text{ dBm} = 81.28 \text{ mW}$$

$$\begin{aligned} \text{Power density} &= \text{EIRP} / (4\pi R^2) \\ &= 81.28 / (4 * \pi * 20^2) \\ &= 0.016 \text{ mW/cm}^2 \end{aligned}$$

R is 20cm.

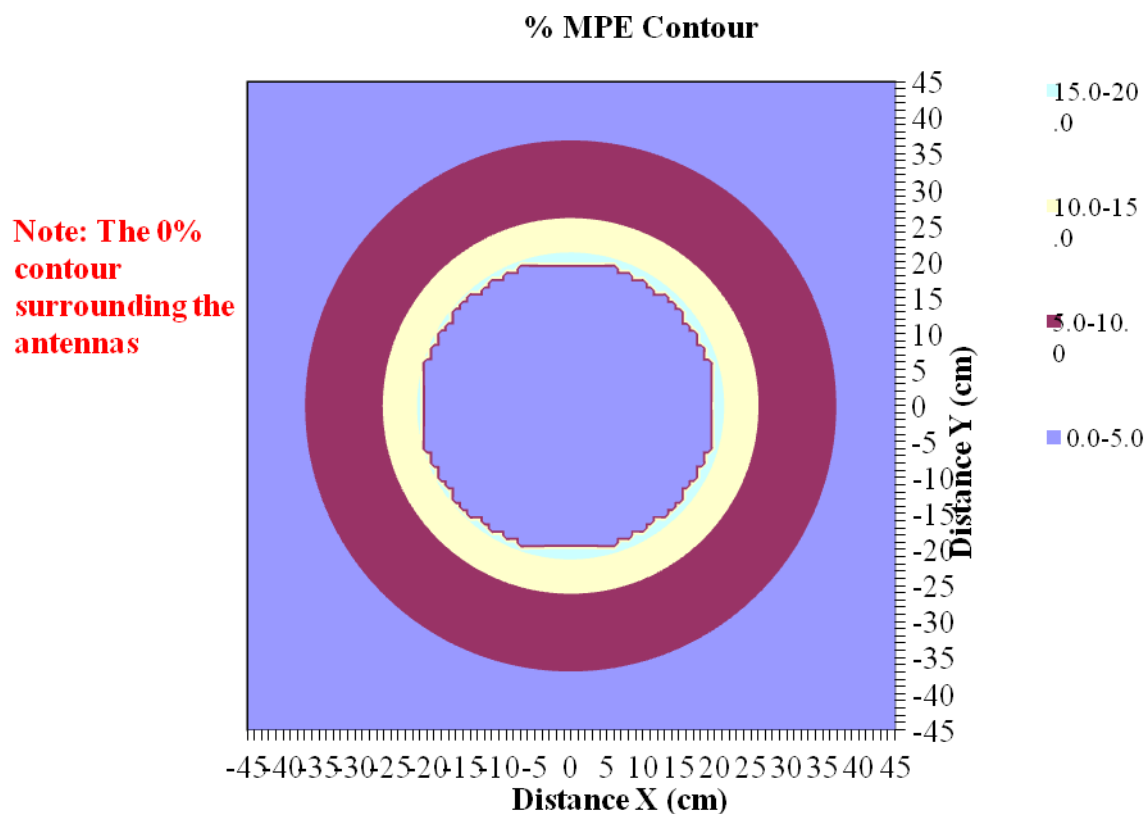
The power density limit for 2.4Ghz band operation is 1 mW/cm^2 . Hence the device is compliant with the rules on RF exposure.

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Prediction for Simultaneous Transmission

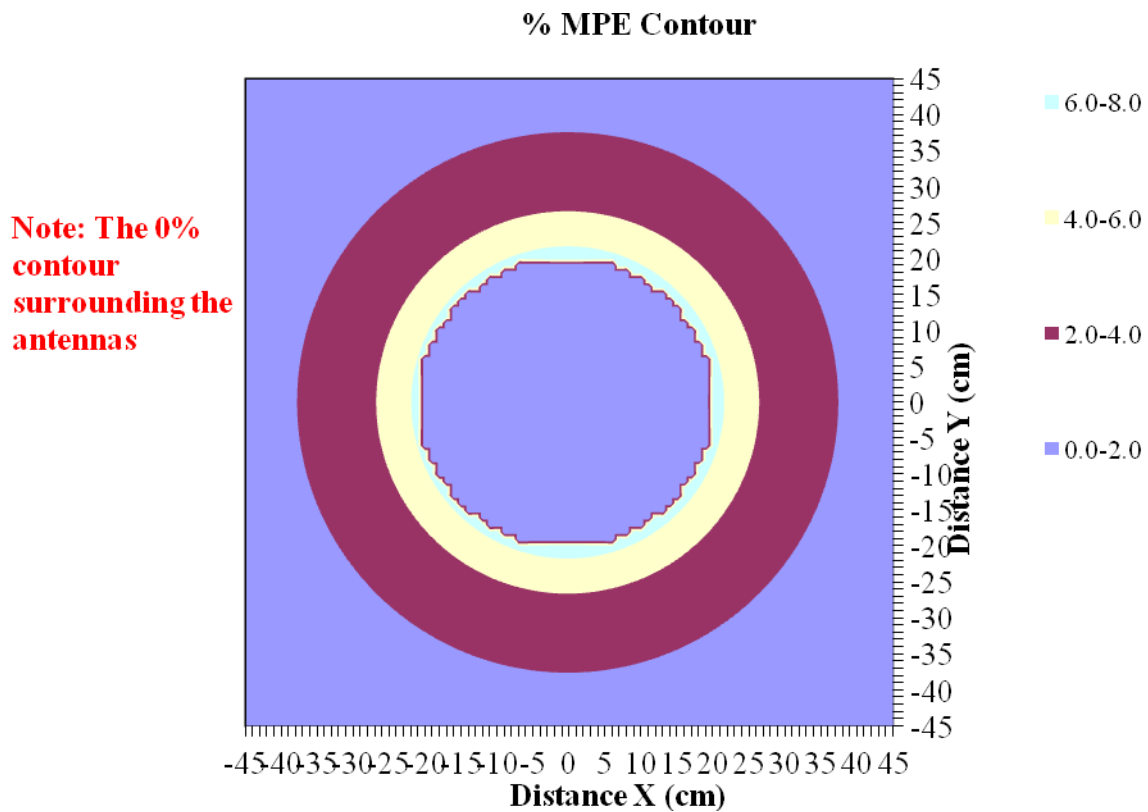
The MPE limit was made using a separation distance of 1 cm to represent the worse case. Output power listed below is for 25% duty cycle in GSM mode.

Antenna No.		Total	1	2
Tx Status			On	On
Frequency	MHz		2400	850
MPE Limit	mW/cm ²		1.00	0.57
Max % MPE	%	63.2	1.6	15.4
Power	(W)	1.836	0.082	0.438
Antenna Gain	dBi		0.00	0.00
EIRP	(W)	1.84	0.082	0.438
X	(cm)		-1.0	0.0
Y	(cm)		0.0	0.0
Sector			FALSE	FALSE
Arc			FALSE	FALSE
θ ₁	degs	input	-120	-120
θ ₂			60	60
θ ₁		actual	-120	-120
θ ₂			60	60



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Antenna No.		Total	1	2
Tx Status			On	On
Frequency	MHz		2400	1900
MPE Limit	mW/cm ²		1.00	1.00
Max % MPE	%	23.4	1.6	5.4
Power	(W)	1.176	0.082	0.273
Antenna Gain	dBi		0.00	0.00
EIRP	(W)	1.18	0.082	0.273
X	(cm)		-1.0	0.0
Y	(cm)		0.0	0.0
Sector			FALSE	FALSE
Arc			FALSE	FALSE
θ_1	degs	input	-120	-120
θ_2			60	60
θ_1		actual	-120	-120
θ_2			60	60



This report is prepared by

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 Date: Dec 7, 2011