

EDCS- 1404607



RF Exposure Study - Engineering Analysis per

**FCC 2.1093**

**Industry Canada RSS-102**

**CP-8851 Bluetooth IP Phone**

FCC ID: LDK88511056

IC ID: 2461B-88511056

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**1.0: Attestation Statement of Compliance**

The Cisco Systems CP-8851 IP phone with 2.4GHz Bluetooth has been evaluated for Maximum Permissible Exposure in compliance with 47 Code of Federal Regulations 2.1093. The evaluation was in accordance with methodology as referenced in FCC Bulletin OET 65C (rev 01-01) by Compliance Certification Services. This report serves as the additional technical analysis of the Cisco radio modules.

This study addresses the addition of an additional pair of transmitters using the data derived in the aforementioned report # EDCS# 1403542.

The limits used for this evaluation are in line with the recommendations of the World Health Organizations (WHO) International Committee on Non Ionizing Radiation Protection (ICNIRP) as well as the American National Standards Institute (ANSI) C95.1.

The limits chosen are of **General Population/Uncontrolled Exposure**.

This analysis also complies with the requirements stated in Industry Canada RSS-102 as well as the applicable Australian and New Zealand regulations.

the following case scenarios were used :

**2.4GHz Bluetooth**

This device must be installed to provide a separation distance of at least 20 cm from all persons. Installers must be provided with antenna installation and transmitter operating conditions for satisfying RF exposure compliance.

Based on the study this case scenario, the General Population/Uncontrolled Exposure and the minimum recommended distance is around 20cm (8 inches) from the antenna.

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## 2.0 EUT Description.

CP-8851 2.4GHz Bluetooth IP phone

## 3.0 Methodology

All calculations were made in accordance with ANSI C95.1, and FCC OET 65C.

## 4.0 Technical Requirements

### RSS-102 — Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)

#### 2.5.2 Exemption from Routine Evaluation Limits – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

#### 4.2 RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Averaging Time (minutes)
0.003-1	280	2.19	-	6
1-10	280/ <i>f</i>	2.19/ <i>f</i>	-	6
10-30	28	2.19/ <i>f</i>	-	6
30-300	28	0.073	2*	6
300-1500	1.585 <i>f</i> <sup>0.5</sup>	0.0042 <i>f</i> <sup>0.5</sup>	<i>f</i> /150	6
1500-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> <sup>1.2</sup>
150000-300000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616000/ <i>f</i> <sup>1.2</sup>

**Note:** *f* is frequency in MHz.

\* Power density limit is applicable at frequencies greater than 100 MHz.

**FCC Limits for Maximum Permissible Exposure (MPE)****(A) Limits for Occupational/Controlled Exposure**

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

**(B) Limits for General Population/Uncontrolled Exposure**

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
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
1500-100,000	--	--	1.0	30

f = frequency in MHz

\*Plane-wave equivalent power density

**NOTE 1: See Section 1 for discussion of exposure categories.****NOTE 2: The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters. See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirements for mobile and portable transmitters.**

## 5.0 Calculations

### 5.1 The Power Density

Power Density (mW/cm<sup>2</sup>) is calculated as follows:

$$S = PG(\text{Duty Cycle}) / 4\pi R^2 \quad (\text{Equation 1})$$

Solve for R

$$R = \sqrt{\frac{PG(\text{duty cycle})}{4\pi S}} \quad (\text{Equation 2})$$

Where:

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

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)

### 5.2 Maximum EIRP

For RSS102 section 2.5.2 an evaluation of the maximum EIRP is required

The calculation used to determine EIRP is as follows:

$$\text{EIRP} = PG \quad (\text{Equation 4})$$

Where:

EIRP = equivalent isotropic radiated power

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

## 6.0 Results

Test Reports used in evaluation are :

EDCS# 1403542

### Calculated EIRP

Tx	Frequency (MHz)	Peak Tx Power (dBm)	Radio Power (mW)	Ant Gain (dBi)	Ant Gain (mW eq)	EIRP mW	EIRP W	Limit W
Tx1	2402 -2480	4.31	2.70	3.11	2.05	5.53	<b>0.0055</b>	< 5

### MPE Calculations

Tx	Frequency (MHz)	MPE Distance (cm)	Peak Tx Power (dBm)	Radio Power (mW)	Ant Gain (dBi)	Ant Gain (mW eq)	Duty Cycle	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	% of Std
Tx1	2402 -2480	20	4.31	2.70	3.11	2.05	1	<b>0.0011</b>	1	<b>0.11</b>

Note 1 – WLAN radio assume worst case 100% duty cycle.

Using Equation 2 to determine the MPE distance

Tx	Frequency (MHz)	Power Density (mW/cm <sup>2</sup> )	Peak Tx Power (dBm)	Radio Power (mW)	Ant Gain (dBi)	Ant Gain (mW eq)	Duty Cycle	MPE Distance (cm)	Limit (cm)	Margin (cm)
Tx1	2402 -2480	1	4.31	2.70	3.11	2.05	1	<b>0.66</b>	20	-19.33

The calculation is for **General Population/Uncontrolled exposure**. The minimum distance recommended is **20cm (8 inches)**.

To maintain compliance, installations will assure a separation distance of at least 20cm.

**References**

**American National Standards Institute (ANSI), "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1-1992 (previously issued as IEEE C95.1-1991). Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc. (IEEE), New York, N.Y. 10017. For copies contact the IEEE: 1-800-678-4333 or 1-908-981-1393.**

**American National Standards Institute (ANSI), "Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave". ANSI/IEEE C95.3-1992. Copyright 1992, The Institute of Electrical and Electronics Engineers, Inc. (IEEE), New York, NY 10017. For copies contact the IEEE: 1-800-678-4333 or 1-908-981-1393.**

**FCC OET 65C Evaluating Compliance with FCC Guidelines for Human Exposure to RF Fields from 9KHz to 40 Ghz**