



RF Exposure Study - Engineering Analysis per

FCC 2.1093

Industry Canada RSS-102

WLAN Radio 802.11 b/g/n/ac

P/N : CP-8861

FCC ID: LDK88611057

IC ID : 2461B-88611057

Prepared By: Cisco Systems Inc
170 West Tasman
San Jose, CA 95134
USA

1.0: Attestation Statement of Compliance

The Cisco Systems CP-8861 ip phone, 802.11 b/g/n/ac client device
PID: CP-8861 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 afore mentioned report # EDCS# 1393340, EDCS-1391499, EDCS-1393321, EDCS-1393370

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 WLAN with Bluetooth

5GHz WLAN with 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.

Jose Aguirre
Cisco Systems Inc
Corporate Compliance and Certifications
125 West Tasman Drive
San Jose, CA 95134
Email: joaguirr@cisco.com

2.0 EUT Description.

CP-8861 2.4GHz & 5GHz WLAN Radio 802.1 b/g/n/ac ip phone
PID: CP-8861

3.0 Methodology

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

4.0 Technical Requirements

4.1 Single Band Operation – Limits

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 ²)	Averaging Time $ E ^2$, $ H ^2$ or S (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	1.0	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 ²)	Averaging Time $ E ^2$, $ H ^2$ or S (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

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

The Power Density (mW/cm²) 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/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)

6.0 Results

Test Reports used in evaluation are :

EDCS# 1393340, EDCS-1391499, EDCS-1393321, EDCS-1393370

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 ²)	Limit (mW/cm ²)	% of Std
Tx1	2402 -2480	20	5.55	3.55	3.11	1.19	1	0.0008	1	0.0008
Tx2	2412 – 2462	20	16.32	42.85	3.11	1.19	1	0.0101	1	0.0101
Tx3	5180 - 5240	20	13.7	23.44	3.8	2.39	1	0.0111	1	0.0111
Tx4	5260 - 5320	20	13.87	24.38	3.8	2.39	1	0.0116	1	0.0116
Tx5	5500 - 5700	20	13.28	21.28	3.8	2.39	1	0.0101	1	0.0101
Tx6	5745 - 5825	20	15.18	32.9	3.8	2.39	1	0.0156	1	0.0156

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

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

Calculations with additional transmitters

The CP-8861 IP phone operates with 2.4GHz Bluetooth radio and either 2.4GHz WLAN or 5GHz WLAN, but not both WLAN's at same time.

Scenerio 1 :

2.4GHz Bluetooth radio

2.4GHz WLAN

$$\begin{aligned} \text{TX1} + \text{TX2} &= \% \text{ of standard} \\ (0.0008) + (0.0101) &= 0.00109 \end{aligned}$$

$$\begin{aligned} D (\text{estimate}) &= 20 * \sqrt{\%} \\ D &= 0.66 \text{ cm which is less than 20cm recommended} \end{aligned}$$

Scenerio 2 :

2.4GHz Bluetooth radio

5GHz WLAN (Highest power)

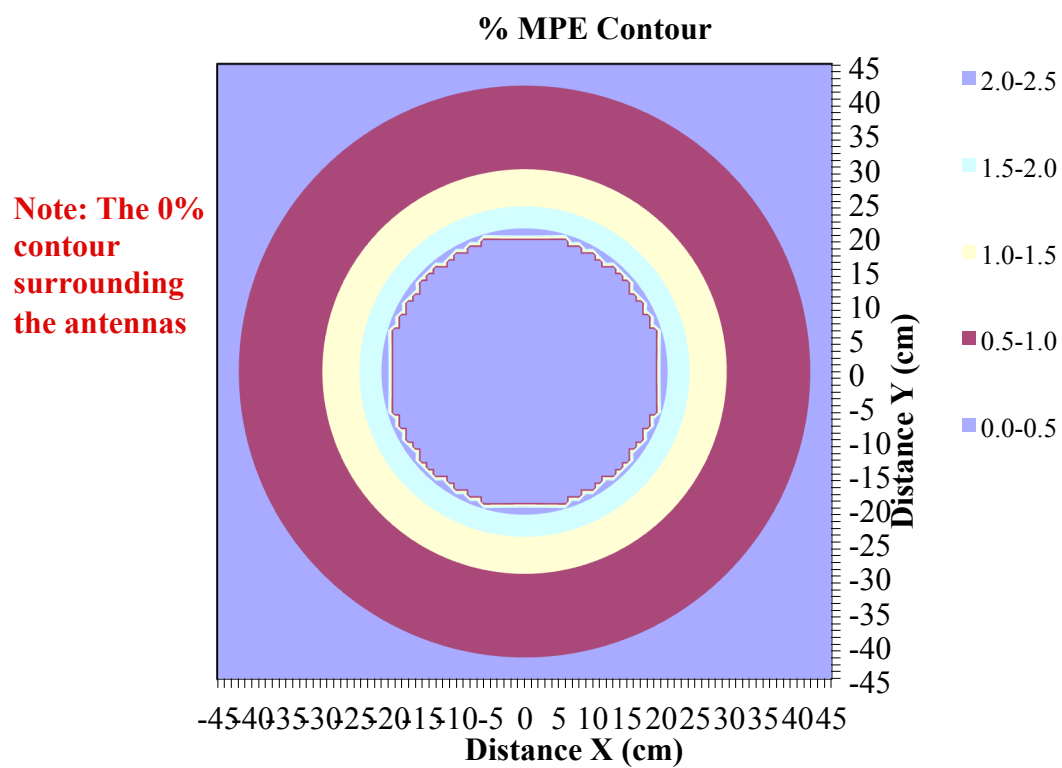
$$\begin{aligned} \text{TX1} + \text{TX6} &= \% \text{ of standard} \\ (0.0008) + (0.0156) &= 0.0164 \end{aligned}$$

$$\begin{aligned} D (\text{estimate}) &= 20 * \sqrt{\%} \\ D &= 2.56 \text{ cm which is less than 20cm recommended} \end{aligned}$$

The configuration above co-location calculation is for **General Population/Uncontrolled exposure**. The minimum distance recommended is **20cm (8 inches)** when all antennas are within 20cm of each other.

Below is %MPE contour map & Table using the MPE-mobile worksheet found on FCC website

(<http://transition.fcc.gov/oet/ea/presentations/files/oct05/MPE-mobile.xls>)



EDCS-1401304

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EDCS-1401304

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EDCS-1401304

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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