



FCC Part 1 Subpart I
FCC Part 2 Subpart J
INDUSTRY CANADA RSS 102 ISSUE 3

RF EXPOSURE REPORT

FOR

802.11 a/b/g/n 2X2 ACCESS POINT MODULE

MODEL NUMBER: AP802

FCC ID: LDKTG2050
IC: 2461B-TG2050

REPORT NUMBER: 12U14476-12

ISSUE DATE: SEPTEMBER 14, 2012

Prepared for
CISCO SYSTEMS, INC.
170 WEST TASMAN DRIVE
SAN JOSE, CA 95134, U.S.A.

Prepared by
UL CCS
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888



NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	09/14/12	Initial Issue	F. Ibrahim

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	4
2. TEST METHODOLOGY	5
3. REFERENCES	5
4. FACILITIES AND ACCREDITATION.....	5
5. MAXIMUM PERMISSIBLE EXPOSURE.....	6
5.1. <i>LIMITS APPLICABLE TO THE EUT.....</i>	<i>9</i>
5.2. <i>INDUSTRY CANADA EXEMPTION</i>	<i>9</i>
5.3. <i>RESULTS</i>	<i>10</i>

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: CISCO SYSTEMS, INC.
170 WEST TASMAN DRIVE
SAN JOSE, CA 95134

EUT DESCRIPTION: 802.11 a/b/g/n 2X2 ACCESS POINT MODULE

MODEL: AP802

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 1 SUBPART I & PART 2 SUBPART J	Pass
INDUSTRY CANADA RSS 102 ISSUE 3	Pass

UL CCS calculated the RF Exposure of the above equipment in accordance with the requirements set forth in the above standards, using test results reported in the test report documents referenced below and/or documentation furnished by the applicant. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations of these calculations. The results show that the equipment is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:



FRANK IBRAHIM
WiSE PROJECT LEADER
UL CCS

Tested By:



DAVID GARCIA
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

All calculations were made in accordance with FCC OET Bulletin 65 Edition 97-01 and IC Safety Code 6.

3. REFERENCES

All measurements were made as documented in test report UL CCS Document "12U14476-1B FCC IC DTS WLAN Report" for operation in the 2.4 GHz band and UL CCS Document "12U14476-2A FCC IC UNII WLAN Report" for operation in the 5 GHz bands.

For the licensed bands, measurements were made as documented in the following sheets:

Bills2_C819HG_4G_A_MC7710_MPE_Gain_TRP_EIRP_summary
Bills2_C819HG_4G_G_MC7700_MPE_Gain_TRP_EIRP_summary
Bills2_C819HG_4G_V_MC7750_MPE_Gain_TRP_EIRP_summary
Bills2_C819HGW_+7_A_MC8705_MPE_Gain_TRP_EIRP_summary
Bills2_C819HGW_+7_E_MC8705_MPE_Gain_TRP_EIRP_summary
Bills2_C819HGW_+7_V_MC5728V_MPE_Gain_TRP_EIRP_summary
EHWIC_4G_LTE_A_MC7700_MPE_Gain_TRP_EIRP_summary
EHWIC_4G_LTE_G_MC7710_MPE_Gain_TRP_EIRP_summary
EHWIC-4G_V_MC7750_MPE_Gain_TRP_EIRP_summary
Heroes_C812G_CiFi_+7_E_MC8705_MPE_Gain_TRP_EIRP_summary
Heroes_C812G_CiFi_+7_N_MC8705_MPE_Gain_TRP_EIRP_summary
Heroes_C812G_CiFi+7_V_MC5728V_MPE_Gain_TRP_EIRP_summary
McLaren2_C881GW_V_A_MC5728V_MPE_Gain_TRP_EIRP_summary
McLaren2_C887VAGW_+7_A_MC8705_MPE_Gain_TRP_EIRP_summary
McLaren2_C887VAGW+7_E_MC8705_MPE_Gain_TRP_EIRP_summary

Output power, Duty cycle and Antenna gain data is excerpted from the applicable test reports, and from product documentation provided by the applicant.

Antenna gain data is excerpted from the applicable test reports, and from product documentation provided by the applicant.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

5. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
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 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classified As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

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

Notes:

1. Frequency, f , is in MHz.
2. A power density of 10 W/m² is equivalent to 1 mW/cm².
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * D^2)$$

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m² is converted to units of mW/cm² by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m²

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

$$\text{Source-based time-averaged EIRP} = (\text{DC} / 100) * \text{EIRP}$$

where

DC = Duty Cycle in %, as applicable

EIRP = Equivalent Isotropic Radiated Power in W

For multiple chain devices, and colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

$$\text{Total EIRP} = (P_1 * G_1) + (P_2 * G_2) + \dots + (P_n * G_n)$$

where

P_x = Power of transmitter x

G_x = Numeric gain of antenna x

For multiple colocated transmitters operating simultaneously in frequency bands where different limits apply, either the lowest limit applicable to the co-located transmitters can be applied or a fraction of the exposure limit is established for each band, such that the sum of the fractions is less than or equal to one.

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

5.1. LIMITS APPLICABLE TO THE EUT

For mobile radio equipment operating in the cellular phone band, the lowest power density limit is calculated using the lowest frequency, as $824 \text{ MHz} / 1500 = 0.55 \text{ mW/cm}^2$ (FCC) and $824 \text{ MHz} / 150 = 5.5 \text{ W/m}^2$ (IC).

For operation in the PCS band, the 2.4 GHz band and the 5 GHz bands, from FCC §1.1310 Table 1 (B), the maximum value of $S = 1.0 \text{ mW/cm}^2$ and from IC Safety Code 6, Section 2.2 Table 5 Column 4, $S = 10 \text{ W/m}^2$.

From FCC §1.1310 Table 1 (B), the maximum value of $S = 1.0 \text{ mW/cm}^2$

From IC Safety Code 6, Section 2.2 Table 5 Column 4, $S = 10 \text{ W/m}^2$

5.2. INDUSTRY CANADA EXEMPTION

RSS-102 Clause 2.5.2 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.

5.3. RESULTS

Band	(GHz)	0.8	2.4	2.4	5	5
Mode		GSM	WLAN	WLAN	WLAN	WLAN
Transmitter		Cell	Chain 0	Chain 1	Chain 0	Chain 1
Separation Distance	(cm)	20	20	20	20	20
Output Power	(dBm)	33.9	20.5	20.2	22.2	22.1
Antenna Gain	(dBi)	4.1	4.0	4.0	6.0	6.0
Duty Cycle	(%)	25	100	100	100	100
Source Based EIRP	(mW)	1570.1	283.8	264.2	657.7	648.6
FCC Power Density	(mW/cm^2)	0.31	0.06	0.05	0.13	0.13
FCC Power Density Limit	(mW/cm^2)	0.53	1	1	1	1
IC Power Density	(W/m^2)	3.125	0.565	0.526	1.309	1.291
IC Power Density Limit	(W/m^2)	5.3	10	10	10	10
Fraction of Limit	(%)	59.0	5.6	5.3	13.1	12.9
Sum of Fractions (%)	95.9					

Band	(GHz)	1.9	2.4	2.4	5	5
Mode		GSM	WLAN	WLAN	WLAN	WLAN
Transmitter		Cell	Chain 0	Chain 1	Chain 0	Chain 1
Separation Distance	(cm)	20	20	20	20	20
Output Power	(dBm)	30.9	20.5	20.2	22.2	22.1
Antenna Gain	(dBi)	4.6	4.0	4.0	6.0	6.0
Duty Cycle	(%)	25	100	100	100	100
Source Based EIRP	(mW)	883.0	283.8	264.2	657.7	648.6
FCC Power Density	(mW/cm²)	0.18	0.06	0.05	0.13	0.13
FCC Power Density Limit	(mW/cm²)	1	1	1	1	1
IC Power Density	(W/m²)	1.757	0.565	0.526	1.309	1.291
IC Power Density Limit	(W/m²)	10	10	10	10	10
Fraction of Limit	(%)	17.6	5.6	5.3	13.1	12.9
Sum of Fractions (%)	54.5					

Band	(GHz)	0.8	2.4	2.4	5	5
Mode		CDMA	WLAN	WLAN	WLAN	WLAN
Transmitter		Cell	Chain 0	Chain 1	Chain 0	Chain 1
Separation Distance	(cm)	20	20	20	20	20
Output Power	(dBm)	25.0	20.5	20.2	22.2	22.1
Antenna Gain	(dBi)	4.5	4.0	4.0	6.0	6.0
Duty Cycle	(%)	100	100	100	100	100
Source Based EIRP	(mW)	889.2	283.8	264.2	657.7	648.6
FCC Power Density	(mW/cm²)	0.18	0.06	0.05	0.13	0.13
FCC Power Density Limit	(mW/cm²)	0.53	1	1	1	1
IC Power Density	(W/m²)	1.770	0.565	0.526	1.309	1.291
IC Power Density Limit	(W/m²)	5.3	10	10	10	10
Fraction of Limit	(%)	33.4	5.6	5.3	13.1	12.9
Sum of Fractions (%)	70.3					

Band	(GHz)	1.9	2.4	2.4	5	5
Mode		CDMA	WLAN	WLAN	WLAN	WLAN
Transmitter		Cell	Chain 0	Chain 1	Chain 0	Chain 1
Separation Distance	(cm)	20	20	20	20	20
Output Power	(dBm)	24.5	20.5	20.2	22.2	22.1
Antenna Gain	(dBi)	4.3	4.0	4.0	6.0	6.0
Duty Cycle	(%)	100	100	100	100	100
Source Based EIRP	(mW)	753.4	283.8	264.2	657.7	648.6
FCC Power Density	(mW/cm^2)	0.15	0.06	0.05	0.13	0.13
FCC Power Density Limit	(mW/cm^2)	1	1	1	1	1
IC Power Density	(W/m^2)	1.500	0.565	0.526	1.309	1.291
IC Power Density Limit	(W/m^2)	10	10	10	10	10
Fraction of Limit	(%)	15.0	5.6	5.3	13.1	12.9
Sum of Fractions (%)	51.9					

Band	(GHz)	0.8	2.4	2.4	5	5
Mode		WCDMA	WLAN	WLAN	WLAN	WLAN
Transmitter		Cell	Chain 0	Chain 1	Chain 0	Chain 1
Separation Distance	(cm)	20	20	20	20	20
Output Power	(dBm)	23.9	20.5	20.2	22.2	22.1
Antenna Gain	(dBi)	4.0	4.0	4.0	6.0	6.0
Duty Cycle	(%)	100	100	100	100	100
Source Based EIRP	(mW)	618.0	283.8	264.2	657.7	648.6
FCC Power Density	(mW/cm²)	0.12	0.06	0.05	0.13	0.13
FCC Power Density Limit	(mW/cm²)	0.533	1	1	1	1
IC Power Density	(W/m²)	1.230	0.565	0.526	1.309	1.291
IC Power Density Limit	(W/m²)	5.33	10	10	10	10
Fraction of Limit	(%)	23.1	5.6	5.3	13.1	12.9
Sum of Fractions (%)	60.0					

Band	(GHz)	1.9	2.4	2.4	5	5
Mode		WCDMA	WLAN	WLAN	WLAN	WLAN
Transmitter		Cell	Chain 0	Chain 1	Chain 0	Chain 1
Separation Distance	(cm)	20	20	20	20	20
Output Power	(dBm)	23.5	20.5	20.2	22.2	22.1
Antenna Gain	(dBi)	5.7	4.0	4.0	6.0	6.0
Duty Cycle	(%)	100	100	100	100	100
Source Based EIRP	(mW)	824.1	283.8	264.2	657.7	648.6
FCC Power Density	(mW/cm²)	0.16	0.06	0.05	0.13	0.13
FCC Power Density Limit	(mW/cm²)	1	1	1	1	1
IC Power Density	(W/m²)	1.640	0.565	0.526	1.309	1.291
IC Power Density Limit	(W/m²)	10	10	10	10	10
Fraction of Limit	(%)	16.4	5.6	5.3	13.1	12.9
Sum of Fractions (%)	53.3					

Band	(GHz)	0.8	2.4	2.4	5	5
Mode		LTE	WLAN	WLAN	WLAN	WLAN
Transmitter		Cell	Chain 0	Chain 1	Chain 0	Chain 1
Separation Distance	(cm)	20	20	20	20	20
Output Power	(dBm)	23.5	20.5	20.2	22.2	22.1
Antenna Gain	(dBi)	3.8	4.0	4.0	6.0	6.0
Duty Cycle	(%)	100	100	100	100	100
Source Based EIRP	(mW)	542.0	283.8	264.2	657.7	648.6
FCC Power Density	(mW/cm²)	0.11	0.06	0.05	0.13	0.13
FCC Power Density Limit	(mW/cm²)	0.53	1	1	1	1
IC Power Density	(W/m²)	1.079	0.565	0.526	1.309	1.291
IC Power Density Limit	(W/m²)	5.3	10	10	10	10
Fraction of Limit	(%)	20.4	5.6	5.3	13.1	12.9
Sum of Fractions (%)	57.3					

Band	(GHz)	1.7	2.4	2.4	5	5
Mode		LTE	WLAN	WLAN	WLAN	WLAN
Transmitter		Cell	Chain 0	Chain 1	Chain 0	Chain 1
Separation Distance	(cm)	20	20	20	20	20
Output Power	(dBm)	23.0	20.5	20.2	22.2	22.1
Antenna Gain	(dBi)	5.4	4.0	4.0	6.0	6.0
Duty Cycle	(%)	100	100	100	100	100
Source Based EIRP	(mW)	683.9	283.8	264.2	657.7	648.6
FCC Power Density	(mW/cm^2)	0.14	0.06	0.05	0.13	0.13
FCC Power Density Limit	(mW/cm^2)	1	1	1	1	1
IC Power Density	(W/m^2)	1.361	0.565	0.526	1.309	1.291
IC Power Density Limit	(W/m^2)	10	10	10	10	10
Fraction of Limit	(%)	13.6	5.6	5.3	13.1	12.9
Sum of Fractions (%)	50.5					

END OF REPORT