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# RF EXPOSURE REPORT

**REPORT NO.:** SA141029C03A

**MODEL NO.:** MR72-HW

**FCC ID:** UDX-60033010

**RECEIVED:** Oct. 07, 2014

**TESTED:** Oct. 07 ~ Dec. 10, 2014

**ISSUED:** Dec. 25, 2014

**APPLICANT:** Cisco Systems, Inc.

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**ISSUED BY:** Bureau Veritas Consumer Products Services  
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## RELEASE CONTROL RECORD


ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
SA141029C03A	Original release	Dec. 25, 2014



# 1. CERTIFICATION

**PRODUCT:** 802.11 abgn/ac device  
**MODEL NO.:** MR72-HW  
**BRAND:** Cisco  
**APPLICANT:** Cisco Systems, Inc.  
**TESTED:** Oct. 07 ~ Dec. 10, 2014  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**STANDARDS:** **FCC Part 2 (Section 2.1091)**  
**KDB 447498 D03**  
IEEE C95.1

The above equipment (model: MR72-HW) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**PREPARED BY :**  , **DATE :** Dec. 25, 2014  
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**APPROVED BY :**  , **DATE :** Dec. 25, 2014  
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## 2. RF EXPOSURE

### 2.1 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

FREQUENCY RANGE (MHz)	ELECTRIC FIELD STRENGTH (V/m)	MAGNETIC FIELD STRENGTH (A/m)	POWER DENSITY (mW/cm <sup>2</sup> )	AVERAGE TIME (minutes)
<b>LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE</b>				
300-1500	...	...	F/1500	30
1500-100,000	...	...	1.0	30

F = Frequency in MHz

### 2.2 MPE CALCULATION FORMULA

$$Pd = (Pout * G) / (4 * \pi * r^2)$$

where

Pd = power density in mW/cm<sup>2</sup>

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

### 2.3 CLASSIFICATION

The antenna of this product, under normal use condition, is at least 22cm away or farther depends on the antenna type used as evaluated in following section. So, this device is classified as **Mobile Device**.

## 2.4 CALCULATION RESULT OF MAXIMUM CONDUCTED POWER

### For Dipole antenna (Radio 1 & 2) + PIFA antenna (Radio 3 & 4):

RADIO	ANTENNA	FREQUENCY BAND (MHz)	MAX POWER (dBm)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT (mW/cm <sup>2</sup> )
1	Dipole	2412-2462	27.97	7.01	22	0.518	1
2	Dipole	5180-5240	21.59	10.01	22	0.238	1
		5260-5320	22.21	10.01	22	0.274	1
		5500-5700	22.32	10.01	22	0.281	1
		5745-5825	22.31	10.01	22	0.281	1
3	PIFA	2412-2462	19.64	5.7	22	0.056	1
		5180-5240	13.98	6.5	22	0.018	1
		5260-5320	21.94	6.5	22	0.115	1
		5500-5700	21.48	6.5	22	0.103	1
		5745-5825	21.62	6.5	22	0.107	1
4	PIFA	2402-2480	2.54	4.2	22	0.0008	1

#### NOTE:

- Radio 1: Dipole antenna: Directional gain = 4dBi + 10log(2) = 7.01dBi
  - Radio 2: Dipole antenna: Directional gain = 7dBi + 10log(2) = 10.01dBi
- \*Antenna gains were calculated for coherent signals per KDB 662911 D01

FREQUENCY BAND	MAX POWER (dBm)				TOTAL POWER (dBm)	POWER LIMIT (dBm)
	RADIO 1	RADIO 2	RADIO 3	RADIO 4		
2.4GHz	27.97	-	19.64	2.54	28.58	30
5180-5240MHz	-	21.59	13.98	-	22.28	30
5260-5320MHz	-	22.21	21.94	-	25.09	30
5500-5700MHz	-	22.32	21.48	-	24.92	30
5745-5825MHz	-	22.31	21.62	-	24.99	30

#### CONCLUSION:

The formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Radio 1 + Radio 2 + Radio 3 (2.4G) + Radio 3 (5GHz) + Radio 4

$$= 0.518 + 0.281 + 0.056 + 0.115 + 0.0008 = 0.9708$$

Therefore the maximum calculations of above situations are less than the "1" limit.



**For Patch antenna (Radio 1 & 2) + PIFA antenna (Radio 3 & 4):**

RADIO	ANTENNA	FREQUENCY BAND (MHz)	MAX POWER (dBm)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT (mW/cm <sup>2</sup> )
1	Patch	2412-2462	27.82	11.11	34	0.538	1
2	Patch	5180-5240	19.16	10.11	34	0.058	1
		5260-5320	22.68	10.11	34	0.131	1
		5500-5700	22.57	10.11	34	0.128	1
		5745-5825	26.90	10.11	34	0.346	1
3	PIFA	2412-2462	19.64	5.7	34	0.024	1
		5180-5240	13.98	6.5	34	0.008	1
		5260-5320	21.94	6.5	34	0.048	1
		5500-5700	21.48	6.5	34	0.043	1
		5745-5825	21.62	6.5	34	0.045	1
4	PIFA	2402-2480	2.54	4.2	34	0.0003	1

**NOTE:**

1. Radio 1: Patch antenna: Directional gain = 8.1dBi + 10log(2) = 11.11dBi
  2. Radio 2: Patch antenna: Directional gain = 7.1dBi + 10log(2) = 10.11dBi
- \*Antenna gains were calculated for coherent signals per KDB 662911 D01

FREQUENCY BAND	MAX POWER (dBm)				TOTAL POWER (dBm)	POWER LIMIT (dBm)
	RADIO 1	RADIO 2	RADIO 3	RADIO 4		
2.4GHz	27.82	-	19.64	2.54	28.45	30
5180-5240MHz	-	19.16	13.98	-	20.31	30
5260-5320MHz	-	22.68	21.94	-	25.34	30
5500-5700MHz	-	22.57	21.48	-	25.06	30
5745-5825MHz	-	26.90	21.62	-	28.03	30

**CONCLUSION:**

The formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

$$\text{Radio 1} + \text{Radio 2} + \text{Radio 3 (2.4G)} + \text{Radio 3 (5GHz)} + \text{Radio 4} \\ = 0.538 + 0.346 + 0.024 + 0.048 + 0.0003 = 0.9563$$

Therefore the maximum calculations of above situations are less than the "1" limit.



**For Sector antenna (Radio 1 & 2) + PIFA antenna (Radio 3 & 4):**

RADIO	ANTENNA	FREQUENCY BAND (MHz)	MAX POWER (dBm)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT (mW/cm <sup>2</sup> )
1	Sector	2412-2462	24.99	14.01	33	0.580	1
2	Sector	5180-5240	7.96	16.01	33	0.018	1
		5260-5320	16.98	16.01	33	0.145	1
		5500-5700	16.84	16.01	33	0.141	1
		5745-5825	20.50	16.01	33	0.327	1
3	PIFA	2412-2462	19.64	5.7	33	0.025	1
		5180-5240	13.98	6.5	33	0.008	1
		5260-5320	21.94	6.5	33	0.051	1
		5500-5700	21.48	6.5	33	0.046	1
		5745-5825	21.62	6.5	33	0.047	1
4	PIFA	2402-2480	2.54	4.2	33	0.0003	1

**NOTE:**

1. Radio 1: Sector antenna: Directional gain = 11dBi + 10log(2) = 14.01dBi
2. Radio 2: Sector antenna: Directional gain = 13dBi + 10log(2) = 16.01dBi

\*Antenna gains were calculated for coherent signals per KDB 662911 D01

FREQUENCY BAND	MAX POWER (dBm)				TOTAL POWER (dBm)	POWER LIMIT (dBm)
	RADIO 1	RADIO 2	RADIO 3	RADIO 4		
2.4GHz	24.99	-	19.64	2.54	26.12	30
5180-5240MHz	-	7.96	13.98	-	14.95	30
5260-5320MHz	-	16.98	21.94	-	23.14	30
5500-5700MHz	-	16.84	21.48	-	22.74	30
5745-5825MHz	-	20.50	21.62	-	24.11	30

**CONCLUSION:**

The formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

$$\text{Radio 1} + \text{Radio 2} + \text{Radio 3 (2.4G)} + \text{Radio 3 (5GHz)} + \text{Radio 4} \\ = 0.580 + 0.327 + 0.025 + 0.051 + 0.0003 = 0.9833$$

Therefore the maximum calculations of above situations are less than the "1" limit.