

RF EXPOSURE REPORT

REPORT NO.: SA141029C03

MODEL NO.: MR72-HW

FCC ID: UDX-60033010

RECEIVED: Oct. 07, 2014

TESTED: Oct. 07 ~ Dec. 10, 2014

ISSUED: Dec. 22, 2014

APPLICANT: Cisco Systems, Inc.

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ISSUED BY: Bureau Veritas Consumer Products Services
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TABLE OF CONTENTS

RELEASE CONTROL RECORD..... 3

1. CERTIFICATION..... 4

2. RF EXPOSURE 5

2.1 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE) 5

2.2 MPE CALCULATION FORMULA..... 5

2.3 CLASSIFICATION..... 5

2.4 CALCULATION RESULT OF MAXIMUM CONDUCTED POWER 6



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RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|-------------|-------------------|---------------|
| SA141029C03 | Original release | Dec. 22, 2014 |



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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.

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APPROVED BY : Ken Liu , **DATE** : Dec. 22, 2014
Ken Liu / Senior Manager

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 ²) | AVERAGE TIME (minutes) |
|---|-------------------------------|-------------------------------|-------------------------------------|------------------------|
| LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE | | | | |
| 300-1500 | ... | ... | F/1500 | 30 |
| 1500-100,000 | ... | ... | 1.0 | 30 |

F = Frequency in MHz

2.2 MPE CALCULATION FORMULA

$$P_d = (P_{out} * G) / (4 * \pi * r^2)$$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 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 ²) | LIMIT (mW/cm ²) |
|-------|---------|----------------------|-----------------|--------------------|---------------|-------------------------------------|-----------------------------|
| 1 | Dipole | 2412-2462 | 27.97 | 7.01 | 22 | 0.518 | 1 |
| 2 | Dipole | 5180-5240 | 21.59 | 10.01 | 22 | 0.238 | 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 |
| | | 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 |
| 5745-5825MHz | - | 22.31 | 21.62 | - | 24.99 | 30 |

CONCLUSION:

The formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1$$

CPD = Calculation power density

LPD = Limit of power density

$$\text{Radio 1} + \text{Radio 2} + \text{Radio 3 (2.4G)} + \text{Radio 3 (5GHz)} + \text{Radio 4} \\ = 0.518 + 0.281 + 0.056 + 0.107 + 0.0008 = 0.962$$

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 ²) | LIMIT (mW/cm ²) |
|-------|---------|----------------------|-----------------|--------------------|---------------|-------------------------------------|-----------------------------|
| 1 | Patch | 2412-2462 | 27.82 | 11.11 | 34 | 0.538 | 1 |
| 2 | Patch | 5180-5240 | 19.16 | 10.11 | 34 | 0.058 | 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 |
| | | 5745-5825 | 21.62 | 6.5 | 34 | 0.045 | 1 |
| 4 | PIFA | 2402-2480 | 2.54 | 4.2 | 34 | 0.0003 | 1 |

NOTE:

- Radio 1: Patch antenna: Directional gain = 8.1dBi + 10log(2) = 11.11dBi
- 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 |
| 5745-5825MHz | - | 26.90 | 21.62 | - | 28.03 | 30 |

CONCLUSION:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1

CPD = Calculation power density

LPD = Limit of power density

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

= 0.538 + 0.346 + 0.024 + 0.045 + 0.0003 = 0.952

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 ²) | LIMIT (mW/cm ²) |
|-------|---------|----------------------|-----------------|--------------------|---------------|-------------------------------------|-----------------------------|
| 1 | Sector | 2412-2462 | 24.99 | 14.01 | 33 | 0.580 | 1 |
| 2 | Sector | 5180-5240 | 7.96 | 16.01 | 33 | 0.018 | 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 |
| | | 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 |
| 5745-5825MHz | - | 20.50 | 21.62 | - | 24.11 | 30 |

CONCLUSION:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1

CPD = Calculation power density

LPD = Limit of power density

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

= 0.580 + 0.327 + 0.025 + 0.047 + 0.0003 = 0.9793

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