RF Exposure Report

Report No.: SA191023E01

FCC ID: UDX-60094010

Test Model: MR86-HW

Received Date: Oct. 22, 2019

Test Date: Jan. 11, 2020

Issued Date: Mar. 02, 2020

Applicant: Cisco Systems, Inc.

Address: 170 West Tasman Drive, San Jose, CA 95134 USA

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan

FCC Registration / Designation Number: 723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
SA191023E01	Original release.	Mar. 02, 2020

1 Certificate of Conformity

Product:	4x4 WiFi6 Outdoor Access Point
Brand:	Cisco
Test Model:	MR86-HW
Sample Status:	ENGINEERING SAMPLE
Applicant:	Cisco Systems, Inc.
Test Date:	Jan. 11, 2020
Standards:	FCC Part 2 (Section 2.1091)
	IEEE C95.3 -2002
References Test Guidance:	KDB 447498 D01 General RF Exposure Guidance v06

The above equipment 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 : _Joyce Kuo_ , **Date:** Mar. 02, 2020

Joyce Kuo / Specialist

Approved by : _____ , **Date:** Mar. 02, 2020

Clark Lin / Technical 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				
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

2.2　MPE Calculation Formula

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

where

Pd = power density in mW/cm^2

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

For Antenna Model: AIR-ANT2513P4M-N

The antenna of this product, under normal use condition, is at least 54cm away from the body of the user. So, this device is classified as **Mobile Device**.

For Antenna Model: MA-ANT-20

The antenna of this product, under normal use condition, is at least 39cm away from the body of the user. So, this device is classified as **Mobile Device**.

For Antenna Model: MA-ANT-25

The antenna of this product, under normal use condition, is at least 40cm away from the body of the user. So, this device is classified as **Mobile Device**.

For Antenna Model: MA-ANT-27

The antenna of this product, under normal use condition, is at least 53cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4　Antenna Gain

Antenna set	Chain No.	Brand	Model	Antenna Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
WLAN 2.4GHz + WLAN 5GHz							
1	Chain 0/1 Chain 2/3	Cisco	AIR-ANT2513P4M-N	13	2.4~2.4835	Dual-Band Polarization Diverse Patch Array	R-N type(F)
				13	5.15~5.85		
2	Chain 0/1 Chain 2/3	Cisco	MA-ANT-20	4	2.4~2.4835	omni-directional	
				7	5.15~5.85		
3	Chain 0/1 Chain 2/3	Cisco	MA-ANT-25	8	2.4~2.4835	Patch Array	
				6.5	5.15~5.85		
4	Chain 0/1 Chain 2/3	Cisco	MA-ANT-27	9	2.4~2.4835	Sector	
				12	5.15~5.85		
Scanning Radio							
-	-	-	-	4	2.4~2.4835	PIFA	I-PEX
				6.63	5.15~5.85		
Bluetooth							
-	-	-	-	4.13	2.4~2.4835	PIFA	I-PEX

2.5 Calculation Result of Maximum Conducted Power (Mode 1)

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WLAN 2.4GHz	2437	198.326	19.02	54	0.43190	1
WLAN 5GHz U-NII-1	5200	6.013	19.02	54	0.01309	1
WLAN 5GHz U-NII-3	5745	196.2	19.02	54	0.42727	1
Bluettooth	2402	22.646	4.13	54	0.00160	1

NOTE:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2. 2.4GHz: Directional gain =13dBi + 10log(4) = 19.02dBi
   5GHz U-NII-1: Directional gain =13dBi + 10log(4) = 19.02dBi
   5GHz U-NII-3: Directional gain =13dBi + 10log(4) = 19.02dBi
   Bluettooth: Directional gain =4.13dBi + 10log(4) = 4.13dBi

Conclusion:

The formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz+ Bluettooth =0.43190 / 1 + 0.42727 / 1+0.00160 / 1= 0.86077

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

2.6 Calculation Result of Maximum Conducted Power (Mode 2)

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm²)	Limit (mW/cm²)
WLAN 2.4GHz	2437	577.777	10.02	39	0.30368	1
WLAN 5GHz U-NII-1	5180	24.06	13.02	39	0.02523	1
WLAN 5GHz U-NII-3	5795	529.361	13.02	39	0.55515	1
Bluettooth	2402	22.646	4.13	39	0.00307	1

NOTE:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2. 2.4GHz: Directional gain =4dBi + 10log(4) = 10.02dBi
   5GHz U-NII-1: Directional gain = 7dBi + 10log(4) == 13.02dBi
   5GHz U-NII-3: Directional gain 7dBi + 10log(4) = 13.02dBi
   Bluettooth: Directional gain =4.13dBi + 10log(4) = 4.13dBi

Conclusion:

The formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz+ Bluetooth =0.30368 / 1 + 0.55515 / 1+0.00307/1= 0.86190
Therefore the maximum calculations of above situations are less than the "1" limit.

2.7 Calculation Result of Maximum Conducted Power (Mode 3)

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm²)	Limit (mW/cm²)
WLAN 2.4GHz	2437	470.66	14.02	40	0.59071	1
WLAN 5GHz U-NII-1	5190	27.236	12.52	40	0.02420	1
WLAN 5GHz U-NII-3	5775	335.941	12.52	40	0.29849	1
Bluettooth	2402	22.646	4.13	40	0.00292	1

NOTE:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2. 2.4GHz: Directional gain =8dBi + 10log(4) = 14.02dBi
   5GHz U-NII-1: Directional gain =   6.5dBi + 10log(4) = 12.52dBi
   5GHz U-NII-3: Directional gain = 6.5dBi + 10log(4) = 12.52dBi
   Bluettooth: Directional gain 4.13dBi + 10log(4) = 4.13dBi

Conclusion:

The formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz+ Bluettooth=0.59071 / 1 + 0.29849 / 1 + 0.00292 / 1= 0.89212

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

2.8   Calculation Result of Maximum Conducted Power (Mode 4)

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WLAN 2.4GHz	2437	495.227	15.02	53	0.44570	1
WLAN 5GHz U-NII-1	5180	7.59	18.02	53	0.01363	1
WLAN 5GHz U-NII-3	5745	247.721	18.02	53	0.44484	1
Bluettooth	2402	22.646	4.13	53	0.00166	1

NOTE:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2. 2.4GHz: Directional gain =9dBi + 10log(4) = 15.02dBi
   5GHz U-NII-1: Directional gain = 12dBi + 10log(4) = 18.02dBi
   5GHz U-NII-3: Directional gain =12dBi + 10log(4) = 18.02dBi
   Bluettooth: Directional gain 4.13dBi + 10log(4) = 4.13dBi

Conclusion:

The formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz+ Bluetooth =0.44570 / 1 + 0.44484 / 1 + 0.00166 / 1= 0.89220

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

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