

RF Exposure Report

Report No.: SA191023E01D

FCC ID: UDX-60094010

Test Model: MR86-HW

Received Date: Oct. 22, 2019

Test Date: Jan. 11 to Mar. 26, 2020

Issued Date: Apr. 24, 2020

Applicant: Cisco Systems, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
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**FCC Registration /
Designation Number:** 723255 / TW2022

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Table of Contents

Release Control Record	3
1 Certificate of Conformity.....	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 Antenna Gain	6
2.5 Calculation Result of Maximum Conducted Power (Antenna Model: AIR-ANT2513P4M-N)	7
2.6 Calculation Result of Maximum Conducted Power (Antenna Model: MA-ANT-20)	8
2.7 Calculation Result of Maximum Conducted Power (Antenna Model: MA-ANT-25)	9
2.8 Calculation Result of Maximum Conducted Power (Antenna Model: MA-ANT-27)	10

Release Control Record

Issue No.	Description	Date Issued
SA191023E01D	Original release.	Apr. 24, 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 to Mar. 26, 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:** Apr. 24, 2020
Joyce Kuo / Specialist

Approved by : Clark Lin , **Date:** Apr. 24, 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

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

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

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

WLAN 2.4GHz + WLAN 5GHz							
Antenna set	Chain No.	Brand	Model	Antenna Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
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 (Antenna Model: AIR-ANT2513P4M-N)

For 2.4GHz, 5GHz (U-NII-1 & U-NII-3 band) and Bluetooth datas were copied from the original test report (Report No.: SA191023E01)

Operation Mode	Evaluation Frequency (MHz)	Max Average 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-2A)	5290	49.113	19.02	54	0.10695	1
WLAN 5GHz (U-NII-2C)	5610	49.555	19.02	54	0.10792	1
WLAN 5GHz (U-NII-3)	5745	196.2	19.02	54	0.42727	1
Bluetooth	2402	22.646	4.13	54	0.00160	1

NOTE:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 2.4GHz: Directional gain = 13dBi + 10log(4) = 19.02dBi
5GHz (U-NII-1): Directional gain = 13dBi + 10log(4) = 19.02dBi
5GHz (U-NII-2A): Directional gain = 13dBi + 10log(4) = 19.02dBi
5GHz (U-NII-2C): Directional gain = 13dBi + 10log(4) = 19.02dBi
5GHz (U-NII-3): Directional gain = 13dBi + 10log(4) = 19.02dBi

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

$$WLAN\ 2.4GHz + WLAN\ 5GHz + Bluetooth = 0.43190 / 1 + 0.42727 / 1 + 0.00160 / 1 = 0.86077$$

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

2.6 Calculation Result of Maximum Conducted Power (Antenna Model: MA-ANT-20)

For 2.4GHz, 5GHz (U-NII-1 & U-NII-3 band) and Bluetooth datas were copied from the original test report (Report No.: SA191023E01)

Operation Mode	Evaluation Frequency (MHz)	Max Average Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
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-2A)	5290	191.391	13.02	39	0.20072	1
WLAN 5GHz (U-NII-2C)	5610	192.472	13.02	39	0.20185	1
WLAN 5GHz (U-NII-3)	5795	529.361	13.02	39	0.55515	1
Bluetooth	2402	22.646	4.13	39	0.00307	1

NOTE:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 2.4GHz: Directional gain = 4dBi + 10log(4) = 10.02dBi
5GHz (U-NII-1): Directional gain = 7dBi + 10log(4) = 13.02dBi
5GHz (U-NII-2A): Directional gain = 7dBi + 10log(4) = 13.02dBi
5GHz (U-NII-2C): Directional gain = 7dBi + 10log(4) = 13.02dBi
5GHz (U-NII-3): Directional gain = 7dBi + 10log(4) = 13.02dBi

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

$$WLAN\ 2.4GHz + WLAN\ 5GHz + Bluetooth = 0.30368 / 1 + 0.55515 / 1 + 0.00307 / 1 = 0.86190$$

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

2.7 Calculation Result of Maximum Conducted Power (Antenna Model: MA-ANT-25)

For 2.4GHz, 5GHz (U-NII-1 & U-NII-3 band) and Bluetooth datas were copied from the original test report (Report No.: SA191023E01)

Operation Mode	Evaluation Frequency (MHz)	Max Average Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
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-2A)	5290	155.307	12.52	40	0.13799	1
WLAN 5GHz (U-NII-2C)	5690	215.436	12.52	40	0.19142	1
WLAN 5GHz (U-NII-3)	5775	335.941	12.52	40	0.29849	1
Bluetooth	2402	22.646	4.13	40	0.00292	1

NOTE:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 2.4GHz: Directional gain = 8dBi + 10log(4) = 14.02dBi
 5GHz (U-NII-1): Directional gain = 6.5dBi + 10log(4) = 12.52dBi
 5GHz (U-NII-2A): Directional gain = 6.5dBi + 10log(4) = 12.52dBi
 5GHz (U-NII-2C): Directional gain = 6.5dBi + 10log(4) = 12.52dBi
 5GHz (U-NII-3): Directional gain = 6.5dBi + 10log(4) = 12.52dBi

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

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

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

2.8 Calculation Result of Maximum Conducted Power (Antenna Model: MA-ANT-27)

For 2.4GHz, 5GHz (U-NII-1 & U-NII-3 band) and Bluetooth datas were copied from the original test report (Report No.: SA191023E01)

Operation Mode	Evaluation Frequency (MHz)	Max Average 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-2A)	5290	62.054	18.02	53	0.11143	1
WLAN 5GHz (U-NII-2C)	5610	62.592	18.02	53	0.1124	1
WLAN 5GHz (U-NII-3)	5745	247.721	18.02	53	0.44484	1
Bluetooth	2402	22.646	4.13	53	0.00166	1

NOTE:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 2.4GHz: Directional gain = 9dBi + 10log(4) = 15.02dBi
5GHz U-NII-1: Directional gain = 12dBi + 10log(4) = 18.02dBi
5GHz (U-NII-2A): Directional gain = 12dBi + 10log(4) = 18.02dBi
5GHz (U-NII-2C): Directional gain = 12dBi + 10log(4) = 18.02dBi
5GHz U-NII-3: Directional gain = 12dBi + 10log(4) = 18.02dBi

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

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

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

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