

RF EXPOSURE EVALUATION REPORT

FCC ID : UDX-60076027
Equipment : LTE & Wi-Fi Router
Brand Name : CISCO
Model Name : MX68CW-HW-NA
Applicant : Cisco Systems, Inc.
170 West Tasman Drive, San Jose, CA 95134
Manufacturer : Cisco Systems, Inc.
170 West Tasman Drive, San Jose, CA 95134
Standard : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part 2.1091 and it complies with applicable limit.

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC evaluation.

The results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full



Approved by: Cona Huang / Deputy Manager



SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



Table of Contents

1. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	4
2. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS	5
3. RF EXPOSURE LIMIT INTRODUCTION	7
4. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	8
4.1. Standalone Power Density Calculation	8
4.2. Collocated Power Density Calculation.....	8



History of this test report

Report No.	Version	Description	Issued Date
FA831635-03	Rev. 01	Initial issue of report	Dec. 28, 2020

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	LTE & Wi-Fi Router
Brand Name	CISCO
Model Name	MX68CW-HW-NA
FCC ID	UDX-60076027
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8GHz Band: 5725 MHz ~ 5825 MHz
Mode	GPRS/EGPRS RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80
HW Version	R3
SW Version	Meraki Cloud Controller Router-14
EUT Stage	Production Unit
Remark: 1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description. 2. Variant report to enable WLAN 5.3GHz & 5.6GHz.	

Reviewed by: Jason Wang

Report Producer: Daisy Peng



2. Maximum RF average output power among production units

<Non-beamforming mode>

Mode		Maximum Average Power (dBm)		
		Ant 1	Ant 2	MIMO
5 GHz Band II WLAN	11a	16.50	16.50	19.5
	11a	16.50	16.50	19.5
	11a	17.00	17.00	20.0
	HT20	17.00	17.00	20.0
	HT20	17.00	17.00	20.0
	HT20	17.00	17.00	20.0
	HT40	19.00	19.00	22.0
	HT40	17.00	17.00	20.0
	VHT20	16.50	16.50	19.5
	VHT20	17.00	17.00	20.0
	VHT20	17.00	17.00	20.0
	VHT40	19.00	19.00	22.0
	VHT40	17.00	17.00	20.0
	VHT80	15.50	15.50	18.5

Mode		Maximum Average Power (dBm)		
		Ant 1	Ant 2	MIMO
5 GHz Band III WLAN	11a	16.50	16.50	19.5
	11a	16.00	16.00	19.0
	11a	17.00	17.00	20.0
	11a	17.50	17.50	20.5
	HT20	16.50	16.50	19.5
	HT20	16.00	16.00	19.0
	HT20	17.50	17.50	20.5
	HT20	17.00	17.00	20.0
	HT40	17.50	17.50	20.5
	HT40	18.50	18.50	21.5
	HT40	18.50	18.50	21.5
	HT40	19.00	19.00	22.0
	VHT20	16.50	16.50	19.5
	VHT20	16.00	16.00	19.0
	VHT20	17.50	17.50	20.5
	VHT20	17.00	17.00	20.0
	VHT40	17.50	17.50	20.5
	VHT40	18.50	18.50	21.5
	VHT40	18.50	18.50	21.5
	VHT40	19.00	19.00	22.0
	VHT80	17.50	17.50	20.5
	VHT80	18.50	18.50	21.5
	VHT80	18.50	18.50	21.5

<Beamforming mode>

Mode		Maximum Average Power (dBm)		
		Ant 1	Ant 2	MIMO
5 GHz Band II WLAN	HT20	14.00	14.00	17.00
	HT20	14.00	14.00	17.00
	HT20	14.00	14.00	17.00
	HT40	16.00	16.00	19.00
	HT40	14.00	14.00	17.00
	VHT20	14.00	14.00	17.00
	VHT20	14.00	14.00	17.00
	VHT20	14.00	14.00	17.00
	VHT40	16.00	16.00	19.00
	VHT40	14.00	14.00	17.00
	VHT80	12.50	12.50	15.50

Mode		Maximum Average Power (dBm)		
		Ant 1	Ant 2	MIMO
5 GHz Band III WLAN	HT20	13.50	13.50	16.50
	HT20	13.00	13.00	16.00
	HT20	14.50	14.50	17.50
	HT20	14.00	14.00	17.00
	HT40	14.50	14.50	17.50
	HT40	15.50	15.50	18.50
	HT40	15.50	15.50	18.50
	HT40	16.00	16.00	19.00
	VHT20	13.50	13.50	16.50
	VHT20	13.00	13.00	16.00
	VHT20	14.50	14.50	17.50
	VHT20	14.00	14.00	17.00
	VHT40	14.50	14.50	17.50
	VHT40	15.50	15.50	18.50
	VHT40	15.50	15.50	18.50
	VHT40	16.00	16.00	19.00
	VHT80	13.50	13.50	16.50
	VHT80	15.50	15.50	18.50
	VHT80	15.50	15.50	18.50

3. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, 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 §1.1310.

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
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 31 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



4. Radio Frequency Radiation Exposure Evaluation

4.1. Standalone Power Density Calculation

<Non-beamforming mode>

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 31cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WLAN5GHz Band	5.84	22.00	27.84	0.61	608.14	0.050	1.000	0.050

<Beamforming mode>

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 31cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WLAN5GHz Band	8.12	19.00	27.12	0.52	515.23	0.043	1.000	0.043

Note:

1. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
2. For this device supports Beamforming for WLAN 5GHz HT20/HT40/VHT20/VHT40/VHT80; therefore, in the table above which consider maximum directional gain 6.76dBi for WLAN5GHz Beamforming mode.

4.2. Collocated Power Density Calculation

WWAN Power Density / Limit	WLAN Power Density / Limit	Σ (Power Density / Limit) of WWAN+WLAN
0.413	0.050	0.463

Note:

1. The table above has considered the collocation of power density for all radio transmitters, for WLAN2.4GHz / WLAN5.2GHz / WLAN 5.8GHz / WWAN power density can refer to Sporton RF Exposure Evaluation Original Report, Report No: FA831635 (FCC ID: UDX-60076027).
2. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN.
3. Considering the WWAN module collocation with the WLAN and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.