RF EXPOSURE EVALUATION REPORT

FCC ID	:	**UDX-60053020**
Equipment	:	**LTE & Wi-Fi Router**
Brand Name	:	**CISCO**
Model Name	:	**Z3C-HW-NA**
Applicant	:	**Cisco Systems, Inc.** **170 West Tasman Drive, San Jose, CA 95134**
Standard	:	**47 CFR Part 2.1091**

We, SPORTON INTERNATIONAL INC has been evaluated in accordance with 47 CFR Part 2.1091 for the device and pass the limit.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

Jones Tsai

Approved by: Jones Tsai / Manager

SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory

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History of this test report

Report No.	Version	Description	Issued Date
FA811724	Rev. 01	Initial issue of report	Jul. 26, 2018

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	LTE & Wi-Fi Router
Brand Name	CISCO
Model Name	Z3C-HW-NA
FCC ID	UDX-60053020
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 13: 777 MHz ~ 787 MHz LTE Band 17: 704 MHz ~ 716 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	GPRS/EGPRS RMC12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth LE
HW Version	R1
SW Version	Wired-14
EUT Stage	Production Unit

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Reviewed by: Eric Huang

Report Producer: Wan Liu

2. Maximum RF average output power among production units

Mode	Burst average power(dBm)	
	GSM 850	GSM 1900
GPRS (GMSK, 1 Tx slot)	33.5	30.5
GPRS (GMSK, 2 Tx slots)	33.5	30.5
GPRS (GMSK, 3 Tx slots)	33.5	30.5
GPRS (GMSK, 4 Tx slots)	33.5	30.5
EDGE (8PSK, 1 Tx slot)	27.5	26.5
EDGE (8PSK, 2 Tx slots)	27.5	26.5
EDGE (8PSK, 3 Tx slots)	27.5	26.5
EDGE (8PSK, 4 Tx slots)	27.5	26.5

Mode		Maximum Average power(dBm)
WCDMA	Band II	24.5
	Band IV	24.5
	Band V	24.5
LTE	Band 2	23.5
	Band 4	23.5
	Band 5	23.5
	Band 13	23.5
	Band 17	23.5

<For non-beamforming mode>

Mode		Maximum Average Power (dBm)
2.4GHz WLAN	802.11b	25.5
	802.11g	25.0
	802.11n-HT20	25.0
	802.11n-HT40	19.5
5GHz WLAN	802.11a	25.0
	802.11n-HT20	25.0
	802.11n-HT40	25.0
	802.11ac-VHT20	25.0
	802.11ac-VHT40	25.0
	802.11ac-VHT80	22.0
Bluetooth LE		4.5

<For beamforming mode>

Mode		Maximum Average Power (dBm)
2.4GHz WLAN	802.11n-HT20	25.0
	802.11n-HT40	19.5
5GHz WLAN	802.11n-HT20	25.0
	802.11n-HT40	25.0
	802.11ac-VHT20	25.0
	802.11ac-VHT40	25.0
	802.11ac-VHT80	22.0

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/f2)	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/f2)	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	Frequency (MHz)	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
GPRS 850 (1 Tx slot)	824.2	3.53	33.5	37.030	5.047	635.331	0.053	0.549	0.0958
GPRS 850 (2 Tx slots)	824.2	3.53	33.5	37.030	5.047	1267.652	0.105	0.549	0.1911
GPRS 850 (3 Tx slots)	824.2	3.53	33.5	37.030	5.047	1892.344	0.157	0.549	0.2853
GPRS 850 (4 Tx slots)	824.2	3.53	33.5	37.030	5.047	2529.298	0.210	0.549	0.3814
EGPRS 850 (1 Tx slot)	824.2	3.53	27.5	31.030	1.268	159.588	0.013	0.549	0.0241
EGPRS 850 (2 Tx slots)	824.2	3.53	27.5	31.030	1.268	318.420	0.026	0.549	0.0480
EGPRS 850 (3 Tx slots)	824.2	3.53	27.5	31.030	1.268	475.335	0.039	0.549	0.0717
EGPRS 850 (4 Tx slots)	824.2	3.53	27.5	31.030	1.268	635.331	0.053	0.549	0.0958
GPRS 1900 (1 Tx slot)	1850.2	3.83	30.5	34.330	2.710	341.193	0.028	1.000	0.0283
GPRS 1900 (2 Tx slots)	1850.2	3.83	30.5	34.330	2.710	680.769	0.056	1.000	0.0564
GPRS 1900 (3 Tx slots)	1850.2	3.83	30.5	34.330	2.710	1016.249	0.084	1.000	0.0842
GPRS 1900 (4 Tx slots)	1850.2	3.83	30.5	34.330	2.710	1358.313	0.113	1.000	0.1125
EGPRS 1900 (1 Tx slot)	1850.2	3.83	26.5	30.330	1.079	135.831	0.011	1.000	0.0113
EGPRS 1900 (2 Tx slots)	1850.2	3.83	26.5	30.330	1.079	271.019	0.022	1.000	0.0225
EGPRS 1900 (3 Tx slots)	1850.2	3.83	26.5	30.330	1.079	404.576	0.034	1.000	0.0335
EGPRS 1900 (4 Tx slots)	1850.2	3.83	26.5	30.330	1.079	540.754	0.045	1.000	0.0448
WCDMA Band 2	1852.4	3.83	24.5	28.330	0.681	680.769	0.056	1.000	0.0564
WCDMA Band 4	1712.4	3.83	24.5	28.330	0.681	680.769	0.056	1.000	0.0564
WCDMA Band 5	826.4	3.53	24.5	28.030	0.635	635.331	0.053	0.551	0.0955
LTE Band 2	1850.7	3.83	23.5	27.330	0.541	540.754	0.045	1.000	0.0448
LTE Band 4	1710.7	3.83	23.5	27.330	0.541	540.754	0.045	1.000	0.0448
LTE Band 5	824.7	3.53	23.5	27.030	0.505	504.661	0.042	0.550	0.0760
LTE Band 13	779.5	3.53	23.5	27.030	0.505	504.661	0.042	0.520	0.0805
LTE Band 17	706.5	3.53	23.5	27.030	0.505	504.661	0.042	0.471	0.0888
Bluetooth	2402.0	0.36	4.50	4.860	0.003	3.062	0.000	1.000	0.0003
2.4GHz WLAN	2412.0	1.39	25.50	26.890	0.489	488.652	0.040	1.000	0.0405
5GHz WLAN	5180.0	4.00	25.00	29.000	0.794	794.328	0.066	1.000	0.0658

Note: For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band

<Beamforming mode>

Band	Frequency (MHz)	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
2.4GHz WLAN	2412.0	4.08	25.00	29.080	0.809	809.096	0.067	1.000	0.0670
5GHz WLAN	5180.0	6.76	25.00	31.760	1.500	1499.685	0.124	1.000	0.1242

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 2.4GHz HT20/HT40 and WLAN 5GHz HT20/HT40/VHT20/VHT40/VHT80; therefore, in the table above which consider maximum directional Gain 4.08dBi for WLAN2.4GHz and 6.76dBI for WLAN5GHz Beamforming mode.

4.2. Collocated Power Density Calculation

WWAN Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) of WWAN+WLAN+Bluetooth
0.3814	0.1242	0.0003	0.5059

Note:

1. 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 + Bluetooth.
2. 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 3 collocated transmitters is compliant

Conclusion:

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