



RF EXPOSURE EVALUATION REPORT

FCC ID : UZ7CC6000
Equipment : Customer Concierge
Brand Name : ZEBRA
Model Name : CC6000
Applicant : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Manufacturer : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
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 INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Cona Huang / Deputy Manager

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History of this test report

Report No.	Version	Description	Issued Date
FA911104	Rev. 01	Initial issue of report	Mar. 25, 2019



1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Customer Concierge
Brand Name	ZEBRA
Model Name	CC6000
FCC ID	UZ7CC6000
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK
HW Version	DV
SW Version	01-15-05.00.OG-U00-PRD
FW Version	FUSION_QA_2_1.4.0.002_O
MFD	21DEC18
EUT Stage	Engineering sample

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: Jason Wang

Report Producer: Wan Liu



2. Maximum RF average output power among production units

Mode	EIRP(mW)
NFC	0.010429

Remark: The measured NFC transmission field strength at 3 meter is 75.34dBuV/m and the equivalent EIRP is 0.010429mE and this value is used for MPE calculation

Band / Mode	Average Power (dBm)			
	BR / EDR			LE
	1M	2M	3M	GFSK
Bluetooth	3	0	0	2

<Non-beamforming mode>

2.4GHz WLAN	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit	SISO ANT 2 Tune-Up Limit	MIMO Tune-Up Limit
	802.11b		1	2412	21.50	15.00
6			2437	20.50	15.00	24.00
11			2462	20.50	14.50	23.00
802.11g		1	2412	18.50	15.00	21.00
		6	2437	18.00	15.00	21.00
		11	2462	18.00	15.00	19.50
802.11n-HT20		1	2412	18.00	15.00	19.00
		6	2437	18.00	15.00	21.00
		11	2462	17.50	14.50	19.00
802.11n-HT40		3	2422	19.00	15.00	17.00
		6	2437	17.50	17.50	19.50
		9	2452	15.00	14.00	16.50
802.11ac-VHT20		1	2412	18.00	17.50	19.00
		6	2437	18.00	18.00	21.50
		11	2462	17.50	16.00	19.00
802.11ac-VHT40		3	2422	19.50	15.00	17.00
		6	2437	17.50	17.50	19.50
		9	2452	15.00	14.50	17.00



5.2GHz WLAN	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit	SISO ANT 2 Tune-Up Limit	MIMO Tune-Up Limit
	802.11a	36	5180	19.00	18.50	22.00
		40	5200	19.00	18.50	22.00
		44	5220	19.00	18.50	22.00
		48	5240	19.00	18.50	22.00
	802.11n-HT20	36	5180	19.00	18.50	22.00
		40	5200	19.00	18.50	22.00
		44	5220	19.00	18.50	22.00
		48	5240	19.00	18.50	22.00
	802.11n-HT40	38	5190	16.00	18.50	19.00
46		5230	19.00	18.50	22.00	
802.11ac-VHT20	36	5180	19.00	18.50	22.00	
	40	5200	19.00	18.50	22.00	
	44	5220	19.00	18.50	22.00	
	48	5240	19.00	18.50	22.00	
802.11ac-VHT40	38	5190	16.00	18.50	19.00	
	46	5230	19.00	18.50	22.00	
802.11ac-VHT80	42	5210	16.00	18.50	16.00	

5.3GHz WLAN	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit	SISO ANT 2 Tune-Up Limit	MIMO Tune-Up Limit
	802.11a	52	5260	19.00	19.00	21.00
		56	5280	19.00	19.00	21.00
		60	5300	19.00	19.00	21.00
		64	5320	19.00	19.00	21.00
	802.11n-HT20	52	5260	19.00	19.00	21.00
		56	5280	19.00	19.00	21.00
		60	5300	19.00	19.00	21.00
		64	5320	19.00	18.50	22.00
	802.11n-HT40	54	5270	16.00	18.50	18.00
		62	5310	19.00	18.50	21.00
	802.11ac-VHT20	52	5260	19.00	18.50	21.00
		56	5280	19.00	18.50	21.00
		60	5300	19.00	18.50	21.00
64		5320	19.00	19.00	22.00	
802.11ac-VHT40	54	5270	16.00	19.00	18.00	
	62	5310	15.00	18.00	13.50	
802.11ac-VHT80	58	5290	15.00	18.00	13.50	



5.5GHz WLAN	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit	SISO ANT 2 Tune-Up Limit	MIMO Tune-Up Limit
	802.11a	100	5500	20.50	20.50	20.00
		116	5580	20.50	20.50	20.00
		124	5620	20.50	20.50	20.00
		132	5660	20.50	20.50	20.00
		140	5700	20.50	20.50	20.00
		144	5720	20.50	20.50	20.00
	802.11n-HT20	100	5500	20.50	20.50	20.00
		116	5580	20.50	20.50	20.00
		124	5620	20.50	20.50	20.00
		132	5660	20.50	20.50	20.00
		140	5700	20.50	20.50	20.00
		144	5720	20.50	20.50	20.00
	802.11n-HT40	102	5510	20.50	20.50	20.00
		110	5550	20.50	20.50	21.50
		126	5630	20.50	20.50	21.50
		134	5670	20.50	20.50	22.50
		142	5710	20.50	20.50	23.00
	802.11ac-VHT20	100	5500	20.50	20.50	20.00
		116	5580	20.50	20.50	20.00
124		5620	20.50	20.50	20.00	
132		5660	20.50	20.50	20.00	
140		5700	20.50	20.50	20.00	
144		5720	20.50	20.50	20.00	
802.11ac-VHT40	102	5510	20.50	20.50	20.00	
	110	5550	20.50	20.50	21.50	
	126	5630	20.50	20.50	21.50	
	134	5670	20.50	20.50	22.50	
	142	5710	20.50	20.50	23.00	
802.11ac-VHT80	106	5530	18.00	18.00	17.50	
	122	5610	20.50	20.50	23.00	
	138	5690	20.50	19.00	23.00	



5.8GHz WLAN	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit	SISO ANT 2 Tune-Up Limit	MIMO Tune-Up Limit
	802.11a	149	5745	21.00	21.00	24.00
		157	5785	21.00	21.00	22.50
		165	5825	21.00	21.00	24.00
	802.11n-HT20	149	5745	21.00	21.00	24.00
		157	5785	21.00	21.00	22.00
		165	5825	21.00	21.00	24.00
	802.11n-HT40	151	5755	21.00	21.00	24.50
		159	5795	21.00	21.00	24.50
	802.11ac-VHT20	149	5745	21.00	21.00	24.00
157		5785	21.00	21.00	22.00	
165		5825	21.00	21.00	24.00	
802.11ac-VHT40	151	5755	21.00	21.00	24.50	
	159	5795	21.00	21.00	24.50	
802.11ac-VHT80	155	5775	21.00	21.00	24.00	

<Beamforming mode>

2.4GHz WLAN	Mode	Channel	Frequency (MHz)	MIMO Tune-Up Limit
	802.11ac-VHT20	1	2412	21.50
		6	2437	21.50
		11	2462	21.50
	802.11ac -VHT40	3	2422	16.00
		6	2437	19.00
9		2452	17.00	

5.2GHz WLAN	Mode	Channel	Frequency (MHz)	MIMO Tune-Up Limit
	802.11ac-VHT20	36	5180	18.50
		40	5200	18.50
		44	5220	18.50
		48	5240	15.50
	802.11ac-VHT40	38	5190	20.50
		46	5230	21.50
	802.11ac-VHT80	42	5210	21.00



5.3GHz WLAN	Mode	Channel	Frequency (MHz)	MIMO Tune-Up Limit
	802.11ac-VHT20	52	5260	18.00
		56	5280	18.00
		60	5300	18.00
		64	5320	18.00
	802.11ac-VHT40	54	5270	20.50
		62	5310	20.50
802.11ac-VHT80	58	5290	18.50	

5.5GHz WLAN	Mode	Channel	Frequency (MHz)	MIMO Tune-Up Limit
	802.11ac-VHT20	100	5500	18.00
		116	5580	18.00
		124	5620	18.00
		132	5660	18.00
		140	5700	18.00
		144	5720	18.00
	802.11ac-VHT40	102	5510	20.00
		110	5550	20.00
		126	5630	20.00
		134	5670	20.00
		142	5710	21.00
	802.11ac-VHT80	106	5530	21.00
		122	5610	22.00
138		5690	22.00	

5.8GHz WLAN	Mode	Channel	Frequency (MHz)	MIMO Tune-Up Limit
	802.11ac-VHT20	149	5745	23.00
		157	5785	23.00
		165	5825	23.00
	802.11ac-VHT40	151	5755	23.00
		159	5795	23.00
802.11ac-VHT80	155	5775	23.00	



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 20 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)	Maximum Power (dBm)	Antenna Gain (dBi)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
NFC	13.56			-19.82	0.000	0.010	0.000002	0.978933	< 0.001
Bluetooth	2402.0	3.00	3.86	6.860	0.005	4.853	0.001	1.000	0.001
2.4GHz WLAN	2412.0	24.50	3.86	28.360	0.685	685.488	0.136	1.000	0.136
5GHz WLAN	5180.0	24.50	5.20	29.700	0.933	933.254	0.186	1.000	0.186

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

<Beamforming mode>

Band	Frequency (MHz)	Maximum Power (dBm)	Antenna Gain (dBi)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
2.4GHz WLAN	2412.0	21.50	4.52	26.020	0.400	399.945	0.080	1.000	0.080
5GHz WLAN	5180.0	23.00	6.32	29.320	0.855	855.067	0.170	1.000	0.170

Note:

- For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
- This device supports Beamforming for WLAN 2.4GHz VHT20/VHT40 and WLAN 5GHz VHT20/VHT40/VHT80 only; therefore, in the table above which consider maximum directional Gain 4.52dBi for WLAN 2.4GHz Beamforming mode and 6.32dBi for WLAN 5GHz Beamforming mode.

4.2. Collocated Power Density Calculation

WLAN Power Density / Limit	Bluetooth Power Density / Limit	NFC Power Density / Limit	Σ (Power Density / Limit) of WLAN+Bluetooth+NFC
0.186	0.001	< 0.001	0.188

Note:

- Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN + Bluetooth +NFC
- Considering the collocation with the WLAN/Bluetooth/NFC 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.