

# RF EXPOSURE EVALUATION REPORT

FCC ID : UZ7CC600  
Equipment : Customer Concierge  
Brand Name : ZEBRA  
Model Name : CC600  
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 this product in accordance with 47 CFR Part 2.1091 and it complies with applicable limit.

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

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Approved by: Cona Huang / Deputy Manager

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**  
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## History of this test report

Report No.	Version	Description	Issued Date
FA911110-03	Rev. 01	Initial issue of report	Nov. 25, 2019

**1. Description of Equipment Under Test (EUT)**

Product Feature & Specification	
EUT Type	Customer Concierge
Brand Name	ZEBRA
Model Name	CC600
FCC ID	UZ7CC600
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
Mode	WLAN: 802.11a/b/g/n/ac HT20 / HT40 / VHT20 / VHT40 / VHT80 Bluetooth BR/EDR/LE
HW Version	DV
SW Version	01-18-02.00-OG-U00-STD
FW Version	FUSION_QA_2_1.4.0.002_O
MFD	30JUL19
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.

Collocation information	
WWAN Module	Brand Name: SIERRA WIRELESS Model Name: MC7455 FCC ID: N7NMC7455
WLAN Module	Brand Name: Intel Model Name: 8265NGW FCC ID: PD98265NG

**Reviewed by: Jason Wang**

**Report Producer: Daisy Peng**

## **2. Maximum RF average output power among production units**

<MC7455>

Mode		Maximum Average power(dBm)
WCDMA	Band II	23.5
	Band IV	23.5
	Band V	24
LTE	Band 2	23.5
	Band 4	23.5
	Band 5	24
	Band 7	22.5
	Band 12	24
	Band 13	24
	Band 25	24
	Band 26	24
	Band 30	24
	Band 41	22.5

<8265NGW>

Mode	Maximum Average Power (dBm)
2.4GHz WLAN	20
5GHz WLAN	20
Bluetooth	12

**<CC600>**

Mode	Average power (dBm)		
	BR / EDR		
	1Mbps	2Mbps	3Mbps
Tune-up Limit	0	-3	-3

**<Non-beamforming mode>**

2.4GHz WLAN	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
	802.11b 1Mbps	1	2412	21.00	21.00	23.00
		6	2437	21.00	21.00	22.00
		11	2462	20.00	20.00	22.00
	802.11g 6Mbps	1	2412	19.00	18.00	20.00
		6	2437	18.00	19.00	22.00
		11	2462	17.00	17.00	19.00
	802.11n-HT20 MCS0	1	2412	17.00	17.00	19.00
		6	2437	18.00	19.00	21.00
		11	2462	16.00	16.00	18.00
	802.11n-HT40 MCS0	3	2422	16.00	15.00	17.00
		6	2437	15.00	16.00	18.00
		9	2452	14.00	15.00	16.00
	802.11ac-VHT20 MCS0	1	2412	17.00	17.00	19.00
		6	2437	18.00	18.00	21.00
		11	2462	16.00	17.00	18.00
	802.11ac-VHT40 MCS0	3	2422	16.00	15.00	17.00
		6	2437	15.00	16.00	18.00
		9	2452	14.00	15.00	16.00

	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
5.2GHz WLAN	802.11a 6Mbps	36	5180	20.00	19.00	20.00
		40	5200	19.00	19.00	20.00
		44	5220	19.00	19.00	20.00
		48	5240	19.00	19.00	20.00
	802.11n-HT20 MCS0	36	5180	19.00	18.00	21.00
		40	5200	19.00	19.00	21.00
		44	5220	19.00	19.00	21.00
		48	5240	19.00	18.00	21.00
	802.11n-HT40 MCS0	38	5190	16.00	18.00	19.00
		46	5230	19.00	19.00	22.00
	802.11ac-VHT20 MCS0	36	5180	18.00	18.00	21.00
		40	5200	18.00	18.00	21.00
		44	5220	18.00	18.00	21.00
		48	5240	18.00	18.00	21.00
	802.11ac-VHT40 MCS0	38	5190	16.00	18.00	19.00
		46	5230	19.00	19.00	22.00
	802.11ac-VHT80 MCS0	42	5210	15.00	18.00	16.00

	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
5.3GHz WLAN	802.11a 6Mbps	52	5260	19.00	19.00	20.00
		56	5280	19.00	19.00	20.00
		60	5300	19.00	19.00	20.00
		64	5320	19.00	20.00	20.00
	802.11n-HT20 MCS0	52	5260	19.00	19.00	21.00
		56	5280	19.00	19.00	21.00
		60	5300	19.00	19.00	20.00
		64	5320	19.00	19.00	21.00
	802.11n-HT40 MCS0	54	5270	19.00	19.00	23.00
		62	5310	15.00	15.00	17.00
	802.11ac-VHT20 MCS0	52	5260	19.00	19.00	21.00
		56	5280	19.00	19.00	20.00
		60	5300	19.00	18.00	20.00
		64	5320	19.00	18.00	21.00
	802.11ac-VHT40 MCS0	54	5270	19.00	19.00	23.00
		62	5310	15.00	15.00	17.00
	802.11ac-VHT80 MCS0	58	5290	14.00	13.00	11.00

	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
5.5GHz WLAN	802.11a 6Mbps	100	5500	20.00	19.00	19.00
		116	5580	20.00	20.00	19.00
		124	5620	20.00	20.00	19.00
		132	5660	20.00	20.00	19.00
		140	5700	20.00	21.00	19.00
		144	5720	20.00	20.00	19.00
	802.11n-HT20 MCS0	100	5500	18.00	19.00	19.00
		116	5580	20.00	20.00	19.00
		124	5620	20.00	20.00	19.00
		132	5660	20.00	20.00	19.00
		140	5700	18.00	18.00	19.00
		144	5720	20.00	20.00	19.00
	802.11n-HT40 MCS0	102	5510	19.00	17.00	20.00
		110	5550	21.00	20.00	22.00
		126	5630	21.00	20.00	22.00
		134	5670	21.00	20.00	22.00
		142	5710	21.00	20.00	22.00
	802.11ac-VHT20 MCS0	100	5500	18.00	18.00	19.00
		116	5580	20.00	19.00	19.00
		124	5620	20.00	19.00	19.00
		132	5660	20.00	19.00	19.00
		140	5700	18.00	18.00	19.00
		144	5720	20.00	20.00	19.00
	802.11ac-VHT40 MCS0	102	5510	19.00	17.00	20.00
		110	5550	21.00	20.00	22.00
		126	5630	21.00	20.00	22.00
		134	5670	21.00	20.00	22.00
		142	5710	20.00	20.00	22.00
	802.11ac-VHT80 MCS0	106	5530	19.00	14.00	18.00
		122	5610	20.00	20.00	22.00
		138	5690	20.00	19.00	22.00



5.8GHz WLAN	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
	802.11a 6Mbps	149	5745	21.00	20.00	23.00
		157	5785	21.00	20.00	23.00
		165	5825	21.00	21.00	23.00
	802.11n-HT20 MCS0	149	5745	21.00	20.00	23.00
		157	5785	21.00	20.00	22.00
		165	5825	21.00	20.00	23.00
	802.11n-HT40 MCS0	151	5755	21.00	20.00	23.00
		159	5795	21.00	20.00	23.00
	802.11ac-VHT20 MCS0	149	5745	21.00	20.00	23.00
		157	5785	21.00	20.00	22.00
		165	5825	21.00	20.00	23.00
	802.11ac-VHT40 MCS0	151	5755	21.00	20.00	23.00
		159	5795	21.00	20.00	23.00
	802.11ac-VHT80 MCS0	155	5775	21.00	19.00	23.00

**<Beamforming mode>**

	Mode	Channel	Frequency (MHz)	Ant 1+2 Tune-up Limit
2.4GHz WLAN	802.11ac-VHT20 MCS0	1	2412	21.00
		6	2437	21.00
		11	2462	20.00
	802.11ac-VHT40 MCS0	3	2422	16.00
		6	2437	19.00
		9	2452	17.00

	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
5.2GHz WLAN	802.11a 6Mbps	36	5180	20.00	19.00	20.00
		40	5200	19.00	19.00	20.00
		44	5220	19.00	19.00	20.00
		48	5240	19.00	19.00	20.00
	802.11n-HT20 MCS0	36	5180	19.00	18.00	21.00
		40	5200	19.00	18.00	21.00
		44	5220	19.00	19.00	21.00
		48	5240	19.00	18.00	21.00
	802.11n-HT40 MCS0	38	5190	16.00	18.00	19.00
		46	5230	19.00	19.00	22.00
	802.11ac-VHT20 MCS0	36	5180	18.00	18.00	19.00
		40	5200	18.00	18.00	19.00
		44	5220	18.00	18.00	19.00
		48	5240	18.00	18.00	15.00
	802.11ac-VHT40 MCS0	38	5190	16.00	18.00	21.00
		46	5230	19.00	19.00	22.00
	802.11ac-VHT80 MCS0	42	5210	15.00	18.00	19.00



5.3GHz WLAN	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
	802.11a 6Mbps	52	5260	19.00	19.00	20.00
		56	5280	19.00	19.00	20.00
		60	5300	19.00	19.00	20.00
		64	5320	19.00	20.00	20.00
	802.11n-HT20 MCS0	52	5260	19.00	19.00	21.00
		56	5280	19.00	19.00	21.00
		60	5300	19.00	19.00	20.00
		64	5320	19.00	19.00	21.00
	802.11n-HT40 MCS0	54	5270	19.00	19.00	23.00
		62	5310	15.00	18.00	17.00
	802.11ac-VHT20 MCS0	52	5260	19.00	19.00	18.00
		56	5280	19.00	19.00	18.00
		60	5300	19.00	18.00	18.00
		64	5320	19.00	18.00	18.00
	802.11ac-VHT40 MCS0	54	5270	19.00	19.00	20.00
		62	5310	15.00	18.00	19.00
	802.11ac-VHT80 MCS0	58	5290	15.00	16.00	16.00

5.5GHz WLAN	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
5.5GHz WLAN	802.11a 6Mbps	100	5500	20.00	20.00	19.00
		116	5580	20.00	20.00	19.00
		124	5620	20.00	20.00	19.00
		132	5660	20.00	20.00	19.00
		140	5700	20.00	21.00	19.00
		144	5720	20.00	20.00	19.00
	802.11n-HT20 MCS0	100	5500	20.00	20.00	19.00
		116	5580	20.00	20.00	19.00
		124	5620	20.00	20.00	19.00
		132	5660	20.00	20.00	19.00
		140	5700	18.00	20.00	19.00
		144	5720	20.00	20.00	19.00
	802.11n-HT40 MCS0	102	5510	19.00	19.00	20.00
		110	5550	21.00	20.00	22.00
		126	5630	21.00	20.00	22.00
		134	5670	21.00	20.00	22.00
		142	5710	21.00	20.00	22.00
		144	5720	20.00	20.00	19.00
	802.11ac-VHT20 MCS0	100	5500	20.00	20.00	18.00
		116	5580	20.00	19.00	18.00
		124	5620	20.00	20.00	19.00
		132	5660	20.00	20.00	19.00
		140	5700	18.00	20.00	19.00
		144	5720	20.00	20.00	19.00
	802.11ac-VHT40 MCS0	102	5510	19.00	19.00	20.00
		110	5550	21.00	20.00	21.00
		126	5630	21.00	20.00	20.00
		134	5670	21.00	20.00	20.00
		142	5710	20.00	20.00	20.00
		144	5720	20.00	20.00	19.00
	802.11ac-VHT80 MCS0	106	5530	19.00	19.00	19.00
		122	5610	20.00	20.00	21.00
		138	5690	20.00	19.00	19.00

5.8GHz WLAN	Mode	Channel	Frequency (MHz)	Ant 1 Tune-up Limit	Ant 2 Tune-up Limit	Ant 1+2 Tune-up Limit
	802.11a 6Mbps	149	5745	21.00	20.00	23.00
		157	5785	21.00	20.00	23.00
		165	5825	21.00	21.00	23.00
	802.11n-HT20 MCS0	149	5745	21.00	20.00	23.00
		157	5785	21.00	20.00	22.00
		165	5825	21.00	20.00	23.00
	802.11n-HT40 MCS0	151	5755	21.00	20.00	23.00
		159	5795	21.00	20.00	23.00
	802.11ac-VHT20 MCS0	149	5745	21.00	20.00	22.00
		157	5785	21.00	20.00	22.00
		165	5825	21.00	20.00	22.00
	802.11ac-VHT40 MCS0	151	5755	21.00	20.00	22.00
		159	5795	21.00	20.00	22.00
	802.11ac-VHT80 MCS0	155	5775	21.00	20.00	22.00

### **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 <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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

#### <MC7455>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
WCDMA Band 2	1852.4	3.00	23.50	26.500	0.447	446.684	0.089	1.000	0.0889
WCDMA Band 4	1712.4	3.00	23.50	26.500	0.447	446.684	0.089	1.000	0.0889
WCDMA Band 5	826.4	0.00	24.00	24.000	0.251	251.189	0.050	0.551	0.0908
LTE Band 2	1850.7	3.00	23.50	26.500	0.447	446.684	0.089	1.000	0.0889
LTE Band 4	1710.7	3.00	23.50	26.500	0.447	446.684	0.089	1.000	0.0889
LTE Band 5	824.7	0.00	24.00	24.000	0.251	251.189	0.050	0.550	0.0909
LTE Band 7	2500.0	3.00	22.50	25.500	0.355	354.813	0.071	1.000	0.0706
LTE Band 12	699.7	0.00	24.00	24.000	0.251	251.189	0.050	0.466	0.1072
LTE Band 13	779.5	0.00	24.00	24.000	0.251	251.189	0.050	0.520	0.0962
LTE Band 26	814.7	0.00	24.00	24.000	0.251	251.189	0.050	0.543	0.0921
LTE Band 25	1850.7	3.00	24.00	27.000	0.501	501.187	0.100	1.000	0.0998
LTE Band 30	2305.0	3.00	24.00	27.000	0.501	501.187	0.100	1.000	0.0998
LTE Band 41	2496.0	3.00	22.50	25.500	0.355	354.813	0.071	1.000	0.0706

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

#### <8265NGW>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
2.4GHz WLAN	2412.0	2.30	20.00	22.300	0.170	169.824	0.034	1.000	0.0338
5GHz WLAN	5180.0	2.30	20.00	22.300	0.170	169.824	0.034	1.000	0.0338
Bluetooth	2402.0	1.60	12.00	13.600	0.023	22.909	0.005	1.000	0.0046

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

#### <CC600>

##### <Non-beamforming mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
2.4GHz WLAN	2412.0	2.30	23.00	25.300	0.339	338.844	0.067	1.000	0.0674
5GHz WLAN	5180.0	2.30	23.00	25.300	0.339	338.844	0.067	1.000	0.0674
Bluetooth	2402.0	1.60	0.00	1.600	0.001	1.445	0.000	1.000	0.0003

**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 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
2.4GHz WLAN	2412.0	2.30	21.00	23.300	0.214	213.796	0.043	1.000	0.0426
5GHz WLAN	5180.0	2.30	23.00	25.300	0.339	338.844	0.067	1.000	0.0674

**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 a/n/ac HT20 / HT40 / VHT20 / VHT40 / VHT80 only; therefore, in the table above which consider maximum directional Gain 2.3dBi for WLAN 2.4GHz Beamforming mode and 2.3dBi for WLAN 5GHz Beamforming mode.

**4.2. Collocated Power Density Calculation**

WWAN Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	$\Sigma$ (Power Density / Limit) of WWAN+WLAN+Bluetooth
0.1072	0.0674	0.0046	0.1792

**Note:**

1. For colocation analysis, LTE Band 12 is chosen for summation due to the highest (power density/limit) among all WWAN wireless modes.
2.  $\Sigma$  (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.
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 3 collocated transmitters is compliant

**Conclusion:**

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