



RF EXPOSURE EVALUATION REPORT

FCC ID : J9CQGM8180X
Equipment : Module
Model Name : QGM8180X
Applicant : Qualcomm Inc
5775 Morehouse Dr.San Diego, CA 92121-1714 (USA)
Manufacturer : Universal Scientific Industrial (Shanghai) Co., Ltd.
No. 1558, Zhang Dong Road, Zhangjiang Hi-Tech Park,
Shanghai, P.R. China 201203
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.

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Approved by: Cona Huang / Deputy Manager

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History of this test report

Report No.	Version	Description	Issued Date
FA920117	Rev. 01	Initial issue of report	Jun. 27, 2019
FA920117	Rev. 02	Updated applicant address.	Jul. 15, 2019

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

Product Feature & Specification	
EUT Type	Module
Model Name	QGM8180X
FCC ID	J9CQGM8180X
Wireless Technology and Frequency Range	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 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz
Mode	RMC 12.2Kbps HSDPA HSUPA LTE: QPSK, 16QAM, 64QAM
HW Version	V1.0.1
SW Version	Meta Build: SM8150.LA.1.0.r1-67502-STD.PROD-1 MPSS: MPSS.HE.1.0.c1-00333-SM8150_GEN_PACK-1
EUT Stage	Identical Prototype

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		Maximum Average power(dBm)
WCDMA	Band II	24.5
	Band IV	24.5
	Band V	24.5
LTE	Band 2	24
	Band 4	24
	Band 5	24
	Band 7	24
	Band 12	24
	Band 13	24
	Band 14	24
	Band 25	24
	Band 26	24
	Band 30	24
	Band 38	24
	Band 41	24
	Band 48	23
	Band 66	24
	Band 77	24



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

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum ERP (dBm)	Maximum ERP (W)	Maximum EIRP (dBm)	Maximum EIRP (W)	Maximum Output Power Limit (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
WCDMA Band 2	1850	8.00	24.50	30.350	1.084	32.500	1.778	2.000	1778.279	0.354	1.000
WCDMA Band 4	1710	5.00	24.50	27.350	0.543	29.500	0.891	1.000	891.251	0.177	1.000
WCDMA Band 5	826	9.00	24.50	31.350	1.365	33.500	2.239	7.000	2238.721	0.446	0.551
LTE Band 2	1850	8.00	24.00	29.850	0.966	32.000	1.585	2.000	1584.893	0.315	1.000
LTE Band 4	1710	5.00	24.00	26.850	0.484	29.000	0.794	1.000	794.328	0.158	1.000
LTE Band 5	824	9.00	24.00	30.850	1.216	33.000	1.995	7.000	1995.262	0.397	0.549
LTE Band 7	2500	9.00	24.00	30.850	1.216	33.000	1.995	2.000	1995.262	0.397	1.000
LTE Band 12	699	9.00	24.00	30.850	1.216	33.000	1.995	3.000	1995.262	0.397	0.466
LTE Band 13	777	9.00	24.00	30.850	1.216	33.000	1.995	3.000	1995.262	0.397	0.518
LTE Band 14	788	9.00	24.00	30.850	1.216	33.000	1.995	3.000	1995.262	0.397	0.525
LTE Band 25	1850	8.00	24.00	29.850	0.966	32.000	1.585	2.000	1584.893	0.315	1.000
LTE Band 26	814	9.00	24.00	30.850	1.216	33.000	1.995	7.000	1995.262	0.397	0.543
LTE Band 30	2305	-1.00	24.00	20.850	0.122	23.000	0.200	0.250	199.526	0.040	1.000
LTE Band 38	2570	9.00	24.00	30.850	1.216	33.000	1.995	2.000	1995.262	0.397	1.000
LTE Band 41	2496	9.00	24.00	30.850	1.216	33.000	1.995	2.000	1995.262	0.397	1.000
LTE Band 48	3550	0.00	23.00	20.850	0.122	23.000	0.200	0.200	199.526	0.040	1.000
LTE Band 66	1710	5.00	24.00	26.850	0.484	29.000	0.794	1.000	794.328	0.158	1.000
LTE Band 71	663	9.00	24.00	30.850	1.216	33.000	1.995	3.000	1995.262	0.397	0.442

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

4.2. Collocated Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WCDMA Band 2	1850	8.00	24.50	32.5	1.78	1778.28	0.354	1.000	0.354
WCDMA Band 4	1710	5.00	24.50	29.5	0.89	891.25	0.177	1.000	0.177
WCDMA Band 5	804	8.00	24.50	32.5	1.78	1778.28	0.354	0.536	0.660
LTE Band 2	1850	8.00	24.00	32.0	1.58	1584.89	0.315	1.000	0.315
LTE Band 4	1710	5.00	24.00	29.0	0.79	794.33	0.158	1.000	0.158
LTE Band 5	824	8.00	24.00	32.0	1.58	1584.89	0.315	0.549	0.574
LTE Band 7	2500	9.00	24.00	33.0	2.00	1995.26	0.397	1.000	0.397
LTE Band 12	699	8.00	24.00	32.0	1.58	1584.89	0.315	0.466	0.677
LTE Band 13	777	8.00	24.00	32.0	1.58	1584.89	0.315	0.518	0.609
LTE Band 14	788	8.00	24.00	32.0	1.58	1584.89	0.315	0.525	0.601
LTE Band 25	1850	8.00	24.00	32.0	1.58	1584.89	0.315	1.000	0.315
LTE Band 26	814	8.00	24.00	32.0	1.58	1584.89	0.315	0.543	0.581
LTE Band 30	2305	-1.00	24.00	23.0	0.20	199.53	0.040	1.000	0.040
LTE Band 38	2570	9.00	24.00	33.0	2.00	1995.26	0.397	1.000	0.397
LTE Band 41	2496	9.00	24.00	33.0	2.00	1995.26	0.397	1.000	0.397
LTE Band 48	3550	0.00	23.00	23.0	0.20	199.53	0.040	1.000	0.040
LTE Band 66	1710	5.00	24.00	29.0	0.79	794.33	0.158	1.000	0.158
LTE Band 71	663	8.00	24.00	32.0	1.58	1584.89	0.315	0.442	0.714
WLAN2.4GHz Band	2412	5.0	26.0	31.0	1.26	1258.93	0.251	1.000	0.251
WLAN5GHz Band	5180	5.0	26.0	31.0	1.26	1258.93	0.251	1.000	0.251
Bluetooth	2402	5.0	15.0	20.0	0.10	100.00	0.020	1.000	0.020

Note:

1. This MPE analysis is applicable to any collocated transmitters with transmit power for WLAN is less than or equal to 26dBm and for Bluetooth is less than or equal to 15dBm.
2. A maximum antenna gain of 5 dBi for WLAN/BT has been assumed for all collocated antennas.

WWAN Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit) of WWAN+WLAN+Bluetooth
0.714	0.251	0.020	0.985

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:**

Based on FCC OET Bulletin 65 Supplement C and 47 CFR §2.1091, the analysis concludes that this product when transmitting in standalone within a host device, is compliant with the FCC RF exposure requirements in mobile exposure condition, provided the conducted power and antenna gain do not exceed the limits for each given frequency band per wireless technology as follow table:

Device	Technology	Band	Maximum Conducted Power (dBm)	Stanalone Maximum Antenna Gain (dBi)	Collocated Maximum Antenna Gain (dBi)
Module	UMTS	2	24.5	8.0	8.0
		4	24.5	5.0	5.0
		5	24.5	9.0	8.0
	LTE	2	24.0	8.0	8.0
		4	24.0	5.0	5.0
		5	24.0	9.0	8.0
		7	24.0	9.0	9.0
		12	24.0	9.0	8.0
		13	24.0	9.0	8.0
		14	24.0	9.0	8.0
		25	24.0	8.0	8.0
		26	24.0	9.0	8.0
		30	24.0	-1.0	-1.0
		38	24.0	9.0	9.0
		41	24.0	9.0	9.0
		48	23.0	0.0	0.0
		66	24.0	5.0	5.0
		71	24.0	9.0	8.0