



RF EXPOSURE EVALUATION REPORT

FCC ID : COF-MS01PRO
Equipment : LTE SOM Module
Brand Name : USI
Model Name : MS-01 PRO, MS-01 PRO-V
Applicant : Universal Global Scientific Industrial Co., Ltd
141, Lane 351, Sec. 1, Taiping Road, Tsaotuen, Nantou 54261, Taiwan
Manufacturer : Universal Global Scientific Industrial Co., Ltd
141, Lane 351, Sec. 1, Taiping Road, Tsaotuen, Nantou 54261, Taiwan
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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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	6
4. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	7



History of this test report

Report No.	Version	Description	Issued Date
FA922713	Rev. 01	Initial issue of report	Apr. 26, 2019

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

Product Feature & Specification	
EUT Type	LTE SOM Module
Brand Name	USI
Model Name	MS-01 PRO, MS-01 PRO-V
FCC ID	COF-MS01PRO
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 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2472 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	GPRS/EGPRS RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	V2.2
SW Version	MS-01 PRO: sdm660_64-userdebug 9 MS01Pro-P-DO-V1.00 MS-01 PRO-V: sdm660_64-userdebug 9 MS01Pro-P-V1.00
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: Daisy Peng

2. Maximum RF average output power among production units

Mode	Burst Average Power (dBm)	
	GSM 850	GSM 1900
Output Power Status	Default Power mode	Default Power mode
GPRS/EDGE (GMSK, 1 Tx slot)	34.5	30.5
GPRS/EDGE (GMSK, 2 Tx slots)	31.5	27.5
GPRS/EDGE (GMSK, 3 Tx slots)	29.5	25.5
GPRS/EDGE (GMSK, 4 Tx slots)	27.5	23.5
EDGE (8PSK, 1 Tx slot)	27.5	26.5
EDGE (8PSK, 2 Tx slots)	25.5	23.5
EDGE (8PSK, 3 Tx slots)	23.5	21.5
EDGE (8PSK, 4 Tx slots)	21.5	19.5

Mode		Maximum Average power(dBm)
WCDMA	Band II	25.0
	Band IV	25.0
	Band V	25.0
LTE	Band 2	25.0
	Band 4	25.0
	Band 5	25.0
	Band 7	24.5
	Band 12	25.0
	Band 13	25.0
	Band 17	25.0
	Band 26	25.0
	Band 38	24.5
	Band 41	24.5

Mode		Maximum Average power(dBm)
BT	v2.0 BR/EDR	8.5
	v4.0 1Mbps	3
	v5.0 2Mbps	3
2.4GHz WLAN	11b	21.5
	11g	21.5
	11n-HT20	20.5
	11n-HT40	20.5
5GHz WLAN	11a	21.5
	11n-HT20 / 11ac-VHT20	20.5
	11n-HT40 / 11ac-VHT40	20.5
	11ac-VHT80	20.5

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

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
GPRS 850 (1 Tx slot)	824	2.00	34.50	36.5	4.47	562.34	0.112	0.549	0.204
GPRS 850 (2 Tx slots)	824	2.00	31.50	33.5	2.24	559.68	0.111	0.549	0.203
GPRS 850 (3 Tx slots)	824	2.00	29.50	31.5	1.41	529.66	0.105	0.549	0.192
GPRS 850 (4 Tx slots)	824	2.00	27.50	29.5	0.89	446.68	0.089	0.549	0.162
EGPRS 850 (1 Tx slot)	824	2.00	27.50	29.5	0.89	112.20	0.022	0.549	0.041
EGPRS 850 (2 Tx slots)	824	2.00	25.50	27.5	0.56	140.59	0.028	0.549	0.051
EGPRS 850 (3 Tx slots)	824	2.00	23.50	25.5	0.35	133.06	0.026	0.549	0.048
EGPRS 850 (4 Tx slots)	824	2.00	21.50	23.5	0.22	111.94	0.022	0.549	0.041
GPRS 1900 (1 Tx slot)	1850	3.00	30.50	33.5	2.24	281.84	0.056	1.000	0.056
GPRS 1900 (2 Tx slots)	1850	3.00	27.50	30.5	1.12	280.50	0.056	1.000	0.056
GPRS 1900 (3 Tx slots)	1850	3.00	25.50	28.5	0.71	265.46	0.053	1.000	0.053
GPRS 1900 (4 Tx slots)	1850	3.00	23.50	26.5	0.45	223.87	0.045	1.000	0.045
EGPRS 1900 (1 Tx slot)	1850	3.00	26.50	29.5	0.89	112.20	0.022	1.000	0.022
EGPRS 1900 (2 Tx slots)	1850	3.00	23.50	26.5	0.45	111.67	0.022	1.000	0.022
EGPRS 1900 (3 Tx slots)	1850	3.00	21.50	24.5	0.28	105.69	0.021	1.000	0.021
EGPRS 1900 (4 Tx slots)	1850	3.00	19.50	22.5	0.18	88.91	0.018	1.000	0.018
WCDMA Band 2	1850	3.00	25.00	28.0	0.63	630.96	0.126	1.000	0.126
WCDMA Band 4	1710	3.00	25.00	28.0	0.63	630.96	0.126	1.000	0.126
WCDMA Band 5	804	2.00	25.00	27.0	0.50	501.19	0.100	0.536	0.186
LTE Band 2	1850	3.00	25.00	28.0	0.63	630.96	0.126	1.000	0.126
LTE Band 4	1710	3.00	25.00	28.0	0.63	630.96	0.126	1.000	0.126
LTE Band 5	824	2.00	25.00	27.0	0.50	501.19	0.100	0.549	0.182
LTE Band 7	2500	1.50	24.50	26.0	0.40	398.11	0.079	1.000	0.079
LTE Band 12	699	2.00	25.00	27.0	0.50	501.19	0.100	0.466	0.214
LTE Band 13	777	2.00	25.00	27.0	0.50	501.19	0.100	0.518	0.193
LTE Band 17	704	2.00	25.00	27.0	0.50	501.19	0.100	0.469	0.213
LTE Band 26	814	2.00	25.00	27.0	0.50	501.19	0.100	0.543	0.184
LTE Band 38	2570	1.50	24.50	26.0	0.40	398.11	0.079	1.000	0.079
LTE Band 41	2496	1.50	24.50	26.0	0.40	398.11	0.079	1.000	0.079
WLAN2.4GHz Band	2412	1.44	21.50	22.9	0.20	196.79	0.039	1.000	0.039
WLAN5GHz Band	5180	2.16	21.50	23.7	0.23	232.27	0.046	1.000	0.046
Bluetooth	2402	1.44	8.50	9.9	0.01	9.86	0.002	1.000	0.002

WWAN Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit) of WWAN+WLAN+Bluetooth
0.214	0.039	0.002	0.255

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 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