

RF Exposure Evaluation

(Mobile Condition)

FCC ID : A4RG4S1M
Equipment : Phone
Model Name : GR0M2, G4S1M
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
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 results in this 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



SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



Table of Contents

1. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	4
2. MAXIMUM TUNE-UP LIMIT	5
3. RF EXPOSURE LIMIT INTRODUCTION	10
4. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	11
4.1. Power Density Calculation.....	11



History of this test report

Report No.	Version	Description	Issued Date
FA001508-01B	Rev. 01	Initial issue of report	Apr. 07, 2021



1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
Equipment Name	Phone
Model Name	GR0M2, G4S1M
FCC ID	A4RG4S1M
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 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 17: 704 MHz ~ 716 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 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n77: 3700 MHz ~ 3980 MHz 5G NR n78: 3700 MHz ~ 3800 MHz WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN U-NII 1: 5150 MHz ~ 5250 MHz WLAN U-NII 2: 5250 MHz ~ 5350 MHz WLAN U-NII 3: 5470 MHz ~ 5725 MHz WLAN U-NII 4: 5725 MHz ~ 5825 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC : 13.56 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM WLAN: 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK

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: Carlie Tsai



2. Maximum Tune-up Limit

General Note:

- For each cellular band, the device has 5 antennas, the antenna selection is based on the connection quality condition, and only one antenna will transmit at a time.
- The maximum power of the WWAN antenna will be selected to evaluate the power density

<WWAN Maximum Power>

Config 0			Maximum Transmit Power Level (dBm)
Radio Tech	Band Number	Antenna name	DSI_0
			Default
GSM/GPRS 1TX	850	ANT0	33.5
GPRS2TX	850	ANT0	32.5
GPRS3TX	850	ANT0	30.5
GPRS4TX	850	ANT0	29.5
EGPRS 1TX	850	ANT0	27.5
EGPRS 2TX	850	ANT0	27
EGPRS 3TX	850	ANT0	25
EGPRS 4TX	850	ANT0	23
GSM/GPRS 1TX	1900	ANT2	30.5
GPRS2TX	1900	ANT2	29.7
GPRS3TX	1900	ANT2	28
GPRS4TX	1900	ANT2	27
EGPRS 1TX	1900	ANT2	26.5
EGPRS 2TX	1900	ANT2	26
EGPRS 3TX	1900	ANT2	25
EGPRS 4TX	1900	ANT2	24
WCDMA AMR/RMC	B2	ANT2	25.7
WCDMA HSDPA/HSPA	B2	ANT2	24.7
WCDMA AMR/RMC	B4	ANT2	25.7
WCDMA HSDPA/HSPA	B4	ANT2	24.7
WCDMA AMR/RMC	B5	ANT0	25
WCDMA HSDPA/HSPA	B5	ANT0	24
LTE	B2	ANT2	25.7
LTE	B4	ANT2	25.7
LTE	B5	ANT0	25.7
LTE	B7	ANT2	25.7
LTE	B12	ANT0	25.7
LTE	B13	ANT0	25.2
LTE	B14	ANT0	25.7
LTE	B17	ANT0	25.7
LTE	B25	ANT2	25.7
LTE	B26	ANT0	25.7
LTE	B30	ANT2	24.2
LTE	B38	ANT2	25.7
LTE	B38 HPUE	ANT2	27.5
LTE	B41	ANT2	25.7
LTE	B48	ANT7	25.7
LTE	B66	ANT2	25.7
LTE	B71	ANT0	25.7
5G FR1	n5	ANT0	25
5G FR1	n77	ANT7	25.7



FCC RF EXPOSURE REPORT

Report No. : FA001508-01B

5G FR1	n78	ANT7	25
5G FR1	n78 HPUE	ANT7	26.5

Config 1			Maximum Transmit Power Level (dBm)
Radio Tech	Band Number	Antenna name	DSL_0
			Default
GSM/GPRS 1TX	850	ANT1	32.2
GPRS2TX	850	ANT1	31.2
GPRS3TX	850	ANT1	29.2
GPRS4TX	850	ANT1	28.2
EGPRS 1TX	850	ANT1	26.5
EGPRS 2TX	850	ANT1	26
EGPRS 3TX	850	ANT1	24
EGPRS 4TX	850	ANT1	22
GSM/GPRS 1TX	1900	ANT0	30.2
GPRS2TX	1900	ANT0	29.7
GPRS3TX	1900	ANT0	27.7
GPRS4TX	1900	ANT0	26.7
EGPRS 1TX	1900	ANT0	26.5
EGPRS 2TX	1900	ANT0	26
EGPRS 3TX	1900	ANT0	25
EGPRS 4TX	1900	ANT0	24
WCDMA AMR/RMC	B2	ANT0	25.5
WCDMA HSDPA/HSPA	B2	ANT0	24.5
WCDMA AMR/RMC	B4	ANT0	25.5
WCDMA HSDPA/HSPA	B4	ANT0	24.5
WCDMA AMR/RMC	B5	ANT1	25
WCDMA HSDPA/HSPA	B5	ANT1	24
LTE	B2	ANT0	25.5
LTE	B4	ANT0	25.5
LTE	B5	ANT1	25
LTE	B7	ANT0	25.5
LTE	B12	ANT1	25.7
LTE	B13	ANT1	25
LTE	B14	ANT1	25
LTE	B17	ANT1	25
LTE	B25	ANT0	25.5
LTE	B26	ANT1	25
LTE	B30	ANT0	25.7
LTE	B38	ANT0	25.2
LTE	B38 HPUE	ANT0	26.7
LTE	B41	ANT0	25.5
LTE	B48	ANT2	25.7
LTE	B66	ANT0	25.5
LTE	B71	ANT1	25
5G FR1	n5	ANT1	25
5G FR1	n77	ANT2	25.5
5G FR1	n78	ANT2	25.5
5G FR1	n78 HPUE	ANT2	26



<WLAN Maximum Power>

<2.4GHz WLAN>

	Transmit Antenna			SISO	SISO	MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4 Tune-Up Limit	Ant 3 Tune-Up Limit	Ant 4+3(4) Tune-Up Limit	Ant 4+3(3) Tune-Up Limit	Ant 4+3 Tune-Up Limit
2.4GHz WLAN	802.11b 1Mbps	1	2412	20.00	20.00	20.00	20.00	23.0
		6	2437	20.00	20.00	20.00	20.00	23.0
		11	2462	20.00	20.00	20.00	20.00	23.0
	802.11g 6Mbps	1	2412	17.50	17.50	17.50	17.50	20.5
		6	2437	20.00	20.00	20.00	20.00	23.0
		11	2462	18.00	18.00	18.00	18.00	21.0
	802.11n-HT20 MCS0	1	2412	17.50	17.50	17.50	17.50	20.5
		6	2437	19.50	19.50	19.50	19.50	22.5
		11	2462	16.00	16.00	16.00	16.00	19.0
	802.11ac-VHT20 MCS0	1	2412	17.50	17.50	17.50	17.50	20.5
		6	2437	19.50	19.50	19.50	19.50	22.5
		11	2462	16.00	16.00	16.00	16.00	19.0

<5GHz WLAN>

	Transmit Antenna			SISO	SISO	MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4 Tune-Up Limit	Ant 3 Tune-Up Limit	Ant 4+3(4) Tune-Up Limit	Ant 4+3(3) Tune-Up Limit	Ant 4+3 Tune-Up Limit
5.2GHz WLAN	802.11a 6Mbps	36	5180	17.50	17.50	17.50	17.50	20.5
		40	5200	17.50	17.50	17.50	17.50	20.5
		44	5220	17.50	17.50	17.50	17.50	20.5
		48	5240	17.50	17.50	17.50	17.50	20.5
	802.11n-HT20 MCS0	36	5180	17.50	17.50	17.50	17.50	20.5
		40	5200	17.50	17.50	17.50	17.50	20.5
		44	5220	17.50	17.50	17.50	17.50	20.5
	802.11n-HT40 MCS0	48	5240	17.50	17.50	17.50	17.50	20.5
		38	5190	17.00	17.00	17.00	17.00	20.0
		46	5230	17.50	17.50	17.50	17.50	20.5
	802.11ac-VHT20 MCS0	36	5180	17.50	17.50	17.50	17.50	20.5
		40	5200	17.50	17.50	17.50	17.50	20.5
		44	5220	17.50	17.50	17.50	17.50	20.5
		48	5240	17.50	17.50	17.50	17.50	20.5
	802.11ac-VHT40 MCS0	38	5190	17.00	17.00	17.00	17.00	20.0
		46	5230	17.50	17.50	17.50	17.50	20.5
	802.11ac-VHT80 MCS0	42	5210	16.50	16.50	16.50	16.50	19.5



	Transmit Antenna			SISO	SISO	MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4 Tune-Up Limit	Ant 3 Tune-Up Limit	Ant 4+3(4) Tune-Up Limit	Ant 4+3(3) Tune-Up Limit	Ant 4+3 Tune-Up Limit
5.3GHz WLAN	802.11a 6Mbps	52	5260	17.50	17.50	17.50	17.50	20.5
		56	5280	17.50	17.50	17.50	17.50	20.5
		60	5300	17.50	17.50	17.50	17.50	20.5
		64	5320	17.50	17.50	17.50	17.50	20.5
	802.11n-HT20 MCS0	52	5260	17.50	17.50	17.50	17.50	20.5
		56	5280	17.50	17.50	17.50	17.50	20.5
		60	5300	17.50	17.50	17.50	17.50	20.5
	802.11n-HT40 MCS0	54	5270	17.50	17.50	17.50	17.50	20.5
		62	5310	17.00	17.00	17.00	17.00	20.0
	802.11ac-VHT20 MCS0	52	5260	17.50	17.50	17.50	17.50	20.5
		56	5280	17.50	17.50	17.50	17.50	20.5
		60	5300	17.50	17.50	17.50	17.50	20.5
	802.11ac-VHT40 MCS0	54	5270	17.50	17.50	17.50	17.50	20.5
		62	5310	17.00	17.00	17.00	17.00	20.0
	802.11ac-VHT80 MCS0	58	5290	16.00	16.00	16.00	16.00	19.0

	Transmit Antenna			SISO	SISO	MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4 Tune-Up Limit	Ant 3 Tune-Up Limit	Ant 4+3(4) Tune-Up Limit	Ant 4+3(3) Tune-Up Limit	Ant 4+3 Tune-Up Limit
5.5GHz WLAN	802.11a 6Mbps	100	5500	17.50	17.50	17.50	17.50	20.5
		116	5580	17.50	17.50	17.50	17.50	20.5
		124	5620	17.50	17.50	17.50	17.50	20.5
		132	5660	17.50	17.50	17.50	17.50	20.5
		140	5700	17.50	17.50	17.50	17.50	20.5
		144	5720	17.50	17.50	17.50	17.50	20.5
	802.11n-HT20 MCS0	100	5500	17.50	17.50	17.50	17.50	20.5
		116	5580	17.50	17.50	17.50	17.50	20.5
		124	5620	17.50	17.50	17.50	17.50	20.5
		132	5660	17.50	17.50	17.50	17.50	20.5
		140	5700	17.50	17.50	17.50	17.50	20.5
	802.11n-HT40 MCS0	102	5510	16.00	16.00	16.00	16.00	19.0
		110	5550	17.50	17.50	17.50	17.50	20.5
		126	5630	17.50	17.50	17.50	17.50	20.5
		134	5670	17.50	17.50	17.50	17.50	20.5
		142	5710	17.50	17.50	17.50	17.50	20.5
	802.11ac-VHT20 MCS0	100	5500	17.50	17.50	17.50	17.50	20.5
		116	5580	17.50	17.50	17.50	17.50	20.5
		124	5620	17.50	17.50	17.50	17.50	20.5
		132	5660	17.50	17.50	17.50	17.50	20.5
		140	5700	17.50	17.50	17.50	17.50	20.5
	802.11ac-VHT40 MCS0	102	5510	16.00	16.00	16.00	16.00	19.0
		110	5550	17.50	17.50	17.50	17.50	20.5
		126	5630	17.50	17.50	17.50	17.50	20.5
		134	5670	17.50	17.50	17.50	17.50	20.5
	802.11ac-VHT80 MCS0	106	5530	14.50	14.50	14.50	14.50	17.5
		122	5610	17.00	17.00	17.00	17.00	20.0
		138	5690	17.00	17.00	17.00	17.00	20.0



5.8GHz WLAN	Transmit Antenna			SISO	SISO	MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4 Tune-Up Limit	Ant 3 Tune-Up Limit	Ant 4+3(4) Tune-Up Limit	Ant 4+3(3) Tune-Up Limit	Ant 4+3 Tune-Up Limit
802.11a 6Mbps		149	5745	19.50	19.50	19.50	19.50	22.5
		157	5785	19.50	19.50	19.50	19.50	22.5
		165	5825	19.50	19.50	19.50	19.50	22.5
802.11n-HT20 MCS0		149	5745	19.50	19.50	19.50	19.50	22.5
		157	5785	19.50	19.50	19.50	19.50	22.5
		165	5825	19.50	19.50	19.50	19.50	22.5
802.11n-HT40 MCS0		151	5755	17.50	17.50	17.50	17.50	20.5
		159	5795	17.50	17.50	17.50	17.50	20.5
802.11ac-VHT20 MCS0		149	5745	19.50	19.50	19.50	19.50	22.5
		157	5785	19.50	19.50	19.50	19.50	22.5
		165	5825	19.50	19.50	19.50	19.50	22.5
802.11ac-VHT40 MCS0		151	5755	17.50	17.50	17.50	17.50	20.5
		159	5795	17.50	17.50	17.50	17.50	20.5
802.11ac-VHT80 MCS0		155	5775	17.00	17.00	17.00	17.00	20.0

<Bluetooth Maximum Power>

Mode	Average power (dBm)				
	BR / EDR			LE	
	1Mbps	2Mbps	3Mbps	1Mbps	2Mbps
Tune-up Limit	18	18	18	18	18



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. 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
GSM/GPRS 850 (1 Tx slot)	824	-5.70	33.50	27.8	0.60	75.86	0.015	0.549	0.027
GPRS 850 (2 Tx slots)	824	-5.70	32.50	26.8	0.48	119.66	0.024	0.549	0.043
GPRS 850 (3 Tx slots)	824	-5.70	30.50	24.8	0.30	113.24	0.023	0.549	0.041
GPRS 850 (4 Tx slots)	824	-5.70	29.50	23.8	0.24	120.23	0.024	0.549	0.044
EGPRS 850 (1 Tx slot)	824	-5.70	27.50	21.8	0.15	19.05	0.004	0.549	0.007
EGPRS 850 (2 Tx slots)	824	-5.70	27.00	21.3	0.13	33.72	0.007	0.549	0.012
EGPRS 850 (3 Tx slots)	824	-5.70	25.00	19.3	0.09	31.92	0.006	0.549	0.012
EGPRS 850 (4 Tx slots)	824	-5.70	23.00	17.3	0.05	26.85	0.005	0.549	0.010
GSM/GPRS 1900 (1 Tx slot)	1850	1.00	30.50	31.5	1.41	177.83	0.035	1.000	0.035
GPRS 1900 (2 Tx slots)	1850	1.00	29.70	30.7	1.17	293.72	0.058	1.000	0.058
GPRS 1900 (3 Tx slots)	1850	1.00	28.00	29.0	0.79	297.85	0.059	1.000	0.059
GPRS 1900 (4 Tx slots)	1850	1.00	27.00	28.0	0.63	316.23	0.063	1.000	0.063
EGPRS 1900 (1 Tx slot)	1850	1.00	26.50	27.5	0.56	70.79	0.014	1.000	0.014
EGPRS 1900 (2 Tx slots)	1850	1.00	26.00	27.0	0.50	125.30	0.025	1.000	0.025
EGPRS 1900 (3 Tx slots)	1850	1.00	25.00	26.0	0.40	149.29	0.030	1.000	0.030
EGPRS 1900 (4 Tx slots)	1850	1.00	24.00	25.0	0.32	158.11	0.031	1.000	0.031
WCDMA Band 2	1850	1.00	25.70	26.7	0.47	467.74	0.093	1.000	0.093
WCDMA Band 4	1710	-0.60	25.70	25.1	0.32	323.59	0.064	1.000	0.064
WCDMA Band 5	804	-5.70	25.00	19.3	0.09	85.11	0.017	0.536	0.032
LTE Band 2	1850	1.00	25.70	26.7	0.47	467.74	0.093	1.000	0.093
LTE Band 4	1710	-0.60	25.70	25.1	0.32	323.59	0.064	1.000	0.064
LTE Band 5	824	-5.70	25.70	20.0	0.10	100.00	0.020	0.549	0.036
LTE Band 7	2500	0.20	25.70	25.9	0.39	389.05	0.077	1.000	0.077
LTE Band 12	699	-6.70	25.70	19.0	0.08	79.43	0.016	0.466	0.034
LTE Band 13	777	-6.00	25.20	19.2	0.08	83.18	0.017	0.518	0.032
LTE Band 14	788	-5.90	25.70	19.8	0.10	95.50	0.019	0.525	0.036
LTE Band 17	704	-6.60	25.70	19.1	0.08	81.28	0.016	0.469	0.034
LTE Band 25	1850	1.00	25.70	26.7	0.47	467.74	0.093	1.000	0.093
LTE Band 26	814	-5.70	25.70	20.0	0.10	100.00	0.020	0.543	0.037
LTE Band 30	2305	-1.10	25.70	24.6	0.29	288.40	0.057	1.000	0.057
LTE Band 38	2570	-0.10	27.50	27.4	0.55	549.54	0.109	1.000	0.109
LTE Band 41	2496	0.20	25.70	25.9	0.39	389.05	0.077	1.000	0.077
LTE Band 48	3550	-2.80	25.70	22.9	0.19	194.98	0.039	1.000	0.039
LTE Band 66	1710	-0.60	25.70	25.1	0.32	323.59	0.064	1.000	0.064
LTE Band 71	663	-7.20	25.70	18.5	0.07	70.79	0.014	0.442	0.032
5G FR1 n5	824	-5.70	25.00	19.3	0.09	85.11	0.017	0.549	0.031
5G FR1 n77	3700	-2.80	25.70	22.9	0.19	194.98	0.039	1.000	0.039
5G FR1 n78	3700	-2.80	26.50	23.7	0.23	234.42	0.047	1.000	0.047
WLAN2.4GHz Band	2400	-2.0	20.0	18.0	0.06	63.10	0.013	1.000	0.013
WLAN5GHz Band	5150	0.0	19.5	19.5	0.09	89.13	0.018	1.000	0.018
Bluetooth	2400	-4.7	18.0	13.3	0.02	21.38	0.004	1.000	0.004



WWAN Power Density / Limit	2.4GHz WLAN Power Density / Limit	5GHz WLAN Power Density / Limit	Σ (Power Density / Limit)
0.109	0.013	0.018	0.140
WWAN Power Density / Limit	5GHz WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit)
0.109	0.018	0.004	0.131

Note:

1. For collocation analysis, the highest (power density/limit) among all WWAN wireless modes is chosen for summation.
2. 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 + 2.4GHz WLAN + 5GHz WLAN transmitter or WWAN + 5GHz WLAN + Bluetooth transmitter.
3. Considering the WWAN collocation with the WLAN / Bluetooth low power 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.