



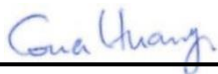
RF EXPOSURE EVALUATION REPORT

FCC ID : A4RG020PQ
Equipment : Phone
Model Name : G020P, G020Q
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Manufacturer : 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 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

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History of this test report

Report No.	Version	Description	Issued Date
FA8N0620-06B	Rev. 01	Initial issue of report	Jul. 11, 2019

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

Product Feature & Specification	
EUT Type	Phone
Model Name	G020P, G020Q
FCC ID	A4RG020PQ
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: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 25: 1850.7 MHz ~ 1914.3 MHz LTE Band 26: 814.7 MHz ~ 848.3 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz LTE Band 66: 1710.7 MHz ~ 1779.3 MHz LTE Band 71: 665.5 MHz ~ 695.5 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 NFC : 13.56 MHz 60 GHz Low Power Transmitter: 60GHz:58-63.5GHz
Mode	GSM/GPRS/EGPRS/DTM RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM WLAN: 802.11a/b/g/n/ac HT20 / HT40 / VHT20 / VHT40 / VHT80 Bluetooth BR/EDR/LE NFC:ASK
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 Tune-up Limit

General Note:

1. For each cellular band, the device has 4 antennas, the antenna selection is based on the connection quality condition, and only one antenna will transmit at a time.
2. The maximum power of the WWAN antenna will be selected to evaluate the power density

<WWAN Maximum Power>

Antenna	WWAN Ant 1	Ant 0b	Ant 0c
Band	Maximum Tune Up Power (dBm)	Maximum Tune Up Power (dBm)	Maximum Tune Up Power (dBm)
GSM850 (GSM/GPRS 1TX)	33.5		33.5
GSM850 (GPRS 2TX)	32		32
GSM850 (GPRS 3TX)	30		30
GSM850 (GPRS4TX)	29		29
GSM850 (EGPRS 1TX)	27.5		27.5
GSM850 (EGPRS 2TX)	27		27
GSM850 (EGPRS 3TX)	25		25
GSM850 (EGPRS 4TX)	23		23
GSM1900 (GSM/GPRS 1TX)	30.5	30.5	
GSM1900 (GPRS 2TX)	29.5	29.5	
GSM1900 (GPRS 3TX)	27.5	27.5	
GSM1900 (GPRS4TX)	26.5	26.5	
GSM1900 (EGPRS 1TX)	26.5	26.5	
GSM1900 (EGPRS 2TX)	26	26	
GSM1900 (EGPRS 3TX)	25	25	
GSM1900 (EGPRS 4TX)	24	24	
WCDMA II	25	25	
WCDMA IV	25	25	25
WCDMA V	25		25
LTE Band 4			25
LTE Band 7	25	25	25
LTE Band 12/17	25		25
LTE Band 13	25		25
LTE Band 25/2	25	25	
LTE Band 26/5	25		25
LTE Band 41/38	25	25	25
LTE Band 41 HPUE	27	27	
LTE Band 66/4	25	25	
LTE Band 71	25		25



<WLAN/BT/60GHz Maximum Power>

Frequency Band	Modulation	Maximum Tune Up Power (dBm) SISO		Maximum Tune Up Power (dBm) MIMO		
		Ant 2	Ant 4	Ant 2	Ant 4	Ant 2+4
WLAN 2.4GHz	802.11b	23	23	23	23	26
	802.11g	22	22	22	22	25
	802.11n HT20	21.5	21.5	21.5	21.5	24.5
	802.11ac VHT20	21.5	21.5	21.5	21.5	24.5

Frequency Band	Modulation	Maximum Tune Up Power (dBm) SISO		Maximum Tune Up Power (dBm) MIMO		
		Ant 4	Ant 5	Ant 4	Ant 5	Ant 4+5
WLAN5GHz UNII1	802.11a	19	19	19	19	22
	802.11n HT20	19	19	19	19	22
	802.11n HT40	20	20	20	20	23
	802.11n VHT20	19	19	19	19	22
	802.11n VHT40	20	20	20	20	23
	802.11n VHT80	14.5	14.5	14.5	14.5	17.5
WLAN5GHz UNII 2A	802.11a	19	19	19	19	22
	802.11n HT20	19	19	19	19	22
	802.11n HT40	21	21	21	21	24
	802.11n VHT20	19	19	19	19	22
	802.11n VHT40	21	21	21	21	24
	802.11n VHT80	17	17	17	17	20
WLAN5GHz UNII 2C	802.11a	19	19	19	19	22
	802.11n HT20	19	19	19	19	22
	802.11n HT40	21	21	21	21	24
	802.11n VHT20	19	19	19	19	22
	802.11n VHT40	21	21	21	21	24
	802.11n VHT80	21	21	21	21	24
WLAN5GHz UNII 3	802.11a	21	21	21	21	24
	802.11n HT20	21	21	21	21	24
	802.11n HT40	21	21	21	21	24
	802.11n VHT20	21	21	21	21	24
	802.11n VHT40	21	21	21	21	24
	802.11n VHT80	21	21	21	21	24

Frequency Band	Modulation		Maximum Tune Up Power Table (dBm)
Bluetooth	BR/EDR	1Mbps	19.5
		2Mbps	19.5
		3Mbps	19.5
	LE	1Mbps	12.5
		2Mbps	12.5

Frequency Band	Maximum EIRP Power Table (dBm)
60GHz Transmitter	11.83



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)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
GSM 850 (1 Tx slot)	824	1.40	33.50	389.05	0.077	0.549	0.141
GPRS 850 (1 Tx slot)	824	1.40	33.50	389.05	0.077	0.549	0.141
GPRS 850 (2 Tx slots)	824	1.40	32.00	546.94	0.109	0.549	0.198
GPRS 850 (3 Tx slots)	824	1.40	30.00	517.61	0.103	0.549	0.188
GPRS 850 (4 Tx slots)	824	1.40	29.00	549.54	0.109	0.549	0.199
EGPRS 850 (1 Tx slot)	824	1.40	27.50	97.72	0.019	0.549	0.035
EGPRS 850 (2 Tx slots)	824	1.40	27.00	172.96	0.034	0.549	0.063
EGPRS 850 (3 Tx slots)	824	1.40	25.00	163.69	0.033	0.549	0.059
EGPRS 850 (4 Tx slots)	824	1.40	23.00	137.71	0.027	0.549	0.050
GSM 1900 (1 Tx slot)	1850	1.50	30.50	199.53	0.040	1.000	0.040
GPRS 1900 (1 Tx slot)	1850	1.50	30.50	199.53	0.040	1.000	0.040
GPRS 1900 (2 Tx slots)	1850	1.50	29.50	314.73	0.063	1.000	0.063
GPRS 1900 (3 Tx slots)	1850	1.50	27.50	297.85	0.059	1.000	0.059
GPRS 1900 (4 Tx slots)	1850	1.50	26.50	316.23	0.063	1.000	0.063
EGPRS 1900 (1 Tx slot)	1850	1.50	26.50	79.43	0.016	1.000	0.016
EGPRS 1900 (2 Tx slots)	1850	1.50	26.00	140.59	0.028	1.000	0.028
EGPRS 1900 (3 Tx slots)	1850	1.50	25.00	167.51	0.033	1.000	0.033
EGPRS 1900 (4 Tx slots)	1850	1.50	24.00	177.41	0.035	1.000	0.035
WCDMA Band 2	1850	1.50	25.00	446.68	0.089	1.000	0.089
WCDMA Band 4	1710	0.80	25.00	380.19	0.076	1.000	0.076
WCDMA Band 5	804	1.40	25.00	436.52	0.087	0.536	0.162
LTE Band 2	1850	1.50	25.00	446.68	0.089	1.000	0.089
LTE Band 4	1710	0.80	25.00	380.19	0.076	1.000	0.076
LTE Band 5	824	1.40	25.00	436.52	0.087	0.549	0.158
LTE Band 7	2500	3.50	25.00	707.95	0.141	1.000	0.141
LTE Band 12	699	0.70	25.00	371.54	0.074	0.466	0.159
LTE Band 13	777	0.70	25.00	371.54	0.074	0.518	0.143
LTE Band 17	704	0.70	25.00	371.54	0.074	0.469	0.158
LTE Band 25	1850	1.50	25.00	446.68	0.089	1.000	0.089
LTE Band 26	814	1.40	25.00	436.52	0.087	0.543	0.160
LTE Band 38	2570	3.50	25.00	707.95	0.141	1.000	0.141
LTE Band 41	2496	3.50	27.00	1122.02	0.223	1.000	0.223
LTE Band 66	1710	0.80	25.00	380.19	0.076	1.000	0.076
LTE Band 71	663	0.70	25.00	371.54	0.074	0.442	0.167
WLAN2.4GHz Band	2412	-0.5	26.00	354.81	0.071	1.000	0.071
WLAN5GHz Band	5180	0.0	24.00	251.19	0.050	1.000	0.050
Bluetooth	2402	-0.5	19.50	79.43	0.016	1.000	0.016
Band	Frequency (MHz)	Maximum EIRP Power (dBm)		Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
60GHz Transmitter	58000	11.83		15.24	0.003	1.000	0.003

WWAN Power Density / Limit	2.4GHz WLAN Power Density / Limit	5GHz WLAN Power Density / Limit	60GHz Low Power Transmitter Power Density / Limit	Σ (Power Density / Limit)
0.223	0.071	0.050	0.003	0.347
WWAN Power Density / Limit	5GHz WLAN Power Density / Limit	Bluetooth Power Density / Limit	60GHz Low Power Transmitter Power Density / Limit	Σ (Power Density / Limit)
0.223	0.050	0.016	0.003	0.292

Note:

1. For colocation analysis, the highest (power density/limit) among all WWAN wireless modes is chosen for summation.
2. The maximum EIRP of 60GHz low power transmitter refer to 15.255 Test report (report no.: RF190315C01)
3. 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 + 60GHz low power transmitter or WWAN + 5GHz WLAN + Bluetooth + 60GHz low power transmitter.
4. Considering the WWAN collocation with the WLAN / Bluetooth / 60GHz low power transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 4 collocated transmitters is compliant

Conclusion:

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