



# 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 |
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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<br>GSM1900: 1850.2 MHz ~ 1909.8 MHz<br>WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz<br>WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz<br>WCDMA Band V: 826.4 MHz ~ 846.6 MHz<br>LTE Band 2: 1850.7 MHz ~ 1909.3 MHz<br>LTE Band 4: 1710.7 MHz ~ 1754.3 MHz<br>LTE Band 5: 824.7 MHz ~ 848.3 MHz<br>LTE Band 7: 2502.5 MHz ~ 2567.5 MHz<br>LTE Band 12: 699.7 MHz ~ 715.3 MHz<br>LTE Band 13: 779.5 MHz ~ 784.5 MHz<br>LTE Band 17: 706.5 MHz ~ 713.5 MHz<br>LTE Band 25: 1850.7 MHz ~ 1914.3 MHz<br>LTE Band 26: 814.7 MHz ~ 848.3 MHz<br>LTE Band 38: 2572.5 MHz ~ 2617.5 MHz<br>LTE Band 41: 2498.5 MHz ~ 2687.5 MHz<br>LTE Band 66: 1710.7 MHz ~ 1779.3 MHz<br>LTE Band 71: 665.5 MHz ~ 695.5 MHz<br>WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz<br>WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz<br>NFC : 13.56 MHz<br>60 GHz Low Power Transmitter: 60GHz:58-63.5GHz |
| Mode                                    | GSM/GPRS/EGPRS/DTM<br>RMC/AMR 12.2Kbps<br>HSDPA<br>HSUPA<br>DC-HSDPA<br>LTE: QPSK, 16QAM, 64QAM<br>WLAN: 802.11a/b/g/n/ac HT20 / HT40 / VHT20 / VHT40 / VHT80<br>Bluetooth BR/EDR/LE<br>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 <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. Power Density Calculation**

| Band                    | Frequency (MHz) | Antenna Gain (dBi)       | Maximum Power (dBm) | Average EIRP (mW) | Power Density at 20cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | 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 <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Power Density / Limit |
| 60GHz Transmitter       | 58000           | 11.83                    |                     | 15.24             | 0.003                                       | 1.000                       | 0.003                 |





| WWAN<br>Power Density / Limit | 2.4GHz WLAN<br>Power Density / Limit | 5GHz WLAN<br>Power Density / Limit | 60GHz Low Power<br>Transmitter<br>Power Density / Limit | $\Sigma$ (Power Density / Limit) |
|-------------------------------|--------------------------------------|------------------------------------|---|----------------------------------|
| 0.223                         | 0.071                                | 0.050                              | 0.003   | 0.347                            |
| WWAN<br>Power Density / Limit | 5GHz WLAN<br>Power Density / Limit   | Bluetooth<br>Power Density / Limit | 60GHz Low Power<br>Transmitter<br>Power Density / Limit | $\Sigma$ (Power Density / Limit) |
| 0.223                         | 0.050                                | 0.016                              | 0.003   | 0.292                            |

**Note:**

1. For collocation 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.  $\Sigma$  (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + 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.