RF EXPOSURE EVALUATION REPORT

FCC ID	**:**	**A4RG025J**
Equipment	**:**	**Phone**
Model Name	**:**	**G025J, G025N, G025M**
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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

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History of this test report

Report No.	Version	Description	Issued Date
FA9D0616-05B	Rev. 01	Initial issue of report	Mar. 24, 2020

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Phone
Model Name	G025J, G025N, G025M
FCC ID	A4RG025J
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 CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz CDMA 2000 BC10: 817.9 MHz ~ 823.1 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 14: 790.5 MHz ~ 795.5 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 30: 2307.5 MHz ~ 2312.5 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 ~ 2462 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
Mode	GSM/GPRS/EGPRS AMR / RMC 12.2Kbps HSDPA HSUPA DC-HSDPA CDMA2000 : 1xRTT/1xEv-Do(Rel.0)/1xEv-Do(Rev.A) 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>

Config0			Primary Transmitter Maximum Transmit Power Level (dBm)
Radio Tech	Band Number	Antenna name	DSI_0
			Full
LTE	B2	ANT2	25.7
LTE	B4	ANT2	25.7
LTE	B5	ANT0	25.7
LTE	B7	ANT2	25.0
LTE	B12	ANT0	25.7
LTE	B13	ANT0	25.5
LTE	B14	ANT0	25.7
LTE	B17	ANT0	25.7
LTE	B25	ANT2	25.7
LTE	B26	ANT0	25.7
LTE	B30	ANT2	22.5
LTE	B38	ANT2	25.0
LTE	B38HPUE	ANT2	26.5
LTE	B41	ANT2	25.0
LTE	B41 HPUE	ANT2	26.5
LTE	B66	ANT2	25.7
LTE	B71	ANT0	25.7
CDMA	BC0	ANT0	25.7
CDMA	BC1	ANT2	25.7
CDMA	BC10	ANT0	25.7
WCDMA	B2	ANT2	25.7
WCDMA	B4	ANT2	25.7
WCDMA	B5	ANT0	25.7
GSM/GPRS 1Tx	850	ANT0	33.5
GSM2Tx	850	ANT0	32.0
GSM3Tx	850	ANT0	31.0
GSM4Tx	850	ANT0	30.0
EDGE1Tx	850	ANT0	28.0
EDGE2Tx	850	ANT0	27.0
EDGE3Tx	850	ANT0	27.0
EDGE4Tx	850	ANT0	25.0
GSM/GPRS 1Tx	1900	ANT2	31.0
GSM2Tx	1900	ANT2	29.5
GSM3Tx	1900	ANT2	29.0
GSM4Tx	1900	ANT2	28.0
EDGE1Tx	1900	ANT2	27.0
EDGE2Tx	1900	ANT2	26.0
EDGE3Tx	1900	ANT2	25.0
EDGE4Tx	1900	ANT2	24.0

Config1			Secondary Transmitter Maximum Transmit Power Level (dBm)
Radio Tech	Band Number	Antenna name	DSI_0
			Full
LTE	B5	ANT1	25.7
LTE	B12	ANT1	25.7
LTE	B17	ANT1	25.7
LTE	B26	ANT1	25.7
LTE	B71	ANT1	25.7
CDMA	BC0	ANT1	25.7
CDMA	BC10	ANT1	25.7
WCDMA	B5	ANT1	25.7
GSM/GPRS 1Tx	850	ANT1	33.5
GSM2Tx	850	ANT1	32.0
GSM3Tx	850	ANT1	31.0
GSM4Tx	850	ANT1	30.0
EDGE1Tx	850	ANT1	28.0
EDGE2Tx	850	ANT1	27.0
EDGE3Tx	850	ANT1	27.0
EDGE4Tx	850	ANT1	25.0

Config1			Secondary Transmitter Maximum Transmit Power Level (dBm)
Radio Tech	Band Number	Antenna name	DSI_0
			Full
LTE	B2	ANT0	25.7
LTE	B4	ANT0	25.7
LTE	B7	ANT0	25.0
LTE	B25	ANT0	25.7
LTE	B30	ANT0	22.5
LTE	B38	ANT0	25.0
LTE	B38 HPUE	ANT0	26.5
LTE	B41	ANT0	25.0
LTE	B41 HPUE	ANT0	26.5
LTE	B66	ANT0	25.7
CDMA	BC1	ANT0	25.7
WCDMA	B2	ANT0	25.7
WCDMA	B4	ANT0	25.7
GSM/GPRS 1Tx	1900	ANT0	31.0
GSM2Tx	1900	ANT0	29.5
GSM3Tx	1900	ANT0	29.0
GSM4Tx	1900	ANT0	28.0
EDGE1Tx	1900	ANT0	27.0
EDGE2Tx	1900	ANT0	26.0
EDGE3Tx	1900	ANT0	25.0
EDGE4Tx	1900	ANT0	24.0

Power Selection		Maximum Tune Up Power Table (dBm)				
Transmit Antenna		SISO		MIMO		
	Mode	Ant 4	Ant 3	Ant 4	Ant 3	Ant 4+3
2.4GHz WLAN	802.11b 1Mbps	20		20	20	23
	802.11g 6Mbps	20		20	20	23
	802.11n-HT20 MCS0	19.5		19.5	19.5	22.5
	802.11ac-VHT20 MCS0	19.5		19.5	19.5	22.5

Power Selection		Maximum Tune Up Power Table (dBm)				
Transmit Antenna		SISO		MIMO		
	Mode	Ant 4	Ant 3	Ant 4	Ant 3	Ant 4+3
5GHz WLAN	802.11a 6Mbps		18.5	18.5	18.5	21.5
	802.11n-HT20 MCS0		18	18	18	21
	802.11n-HT40 MCS0		16	16	16	19
	802.11ac-VHT20 MCS0		18	18	18	21
	802.11ac-VHT40 MCS0		16	16	16	19
	802.11ac-VHT80 MCS0		17	17	17	20

Frequency Band	Modulation	Maximum Tune Up Power Table (dBm)
Bluetooth	BR/EDR	18
	LE	9.5

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/f2)	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/f2)	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	-2.20	33.50	169.82	0.034	0.549	0.062
GPRS 850 (1 Tx slot)	824	-2.20	33.50	169.82	0.034	0.549	0.062
GPRS 850 (2 Tx slots)	824	-2.20	32.00	238.75	0.048	0.549	0.087
GPRS 850 (3 Tx slots)	824	-2.20	31.00	284.45	0.057	0.549	0.103
GPRS 850 (4 Tx slots)	824	-2.20	30.00	302.00	0.060	0.549	0.109
EGPRS 850 (1 Tx slot)	824	-2.20	28.00	47.86	0.010	0.549	0.017
EGPRS 850 (2 Tx slots)	824	-2.20	27.00	75.50	0.015	0.549	0.027
EGPRS 850 (3 Tx slots)	824	-2.20	27.00	113.25	0.023	0.549	0.041
EGPRS 850 (4 Tx slots)	824	-2.20	25.00	95.27	0.019	0.549	0.035
GSM 1900 (1 Tx slot)	1850	1.90	31.00	245.47	0.049	1.000	0.049
GPRS 1900 (1 Tx slot)	1850	1.90	31.00	245.47	0.049	1.000	0.049
GPRS 1900 (2 Tx slots)	1850	1.90	29.50	345.10	0.069	1.000	0.069
GPRS 1900 (3 Tx slots)	1850	1.90	29.00	461.32	0.092	1.000	0.092
GPRS 1900 (4 Tx slots)	1850	1.90	28.00	489.78	0.097	1.000	0.097
EGPRS 1900 (1 Tx slot)	1850	1.90	27.00	97.72	0.019	1.000	0.019
EGPRS 1900 (2 Tx slots)	1850	1.90	26.00	154.15	0.031	1.000	0.031
EGPRS 1900 (3 Tx slots)	1850	1.90	25.00	183.67	0.037	1.000	0.037
EGPRS 1900 (4 Tx slots)	1850	1.90	24.00	194.52	0.039	1.000	0.039
CDMA2000 BC0	824	-2.20	25.70	223.87	0.045	0.549	0.081
CDMA2000 BC1	1850	1.90	25.70	575.44	0.115	1.000	0.115
CDMA2000 BC10	817	-2.20	25.70	223.87	0.045	0.545	0.082
WCDMA Band 2	1850	1.90	25.70	575.44	0.115	1.000	0.115
WCDMA Band 4	1710	1.10	25.70	478.63	0.095	1.000	0.095
WCDMA Band 5	804	-2.20	25.70	223.87	0.045	0.536	0.083
LTE Band 2	1850	1.90	25.70	575.44	0.115	1.000	0.115
LTE Band 4	1710	1.10	25.70	478.63	0.095	1.000	0.095
LTE Band 5	824	1.70	25.70	549.54	0.109	0.549	0.199
LTE Band 7	2500	2.50	25.00	562.34	0.112	1.000	0.112
LTE Band 12	699	-6.00	25.70	93.33	0.019	0.466	0.040
LTE Band 13	777	-0.38	25.50	325.09	0.065	0.518	0.125
LTE Band 14	788	-4.00	25.70	147.91	0.029	0.525	0.056
LTE Band 17	704	-6.00	25.70	93.33	0.019	0.469	0.040
LTE Band 25	1850	1.90	25.70	575.44	0.115	1.000	0.115
LTE Band 26	814	-2.20	25.70	223.87	0.045	0.543	0.082
LTE Band 30	2305	-1.70	22.50	120.23	0.024	1.000	0.024
LTE Band 38	2570	1.70	25.00	467.74	0.093	1.000	0.093
LTE Band 41	2496	1.70	26.50	660.69	0.132	1.000	0.132
LTE Band 66	1710	1.10	25.70	478.63	0.095	1.000	0.095
LTE Band 71	663	-7.50	25.70	66.07	0.013	0.442	0.030
WLAN2.4GHz Band	2412	0.5	23.00	223.87	0.045	1.000	0.045
WLAN5GHz Band	5180	0.2	21.50	147.91	0.029	1.000	0.029
Bluetooth	2402	0.5	18.00	70.79	0.014	1.000	0.014

WWAN Power Density / Limit	2.4GHz WLAN Power Density / Limit	5GHz WLAN Power Density / Limit	Σ(Power Density / Limit)
0.199	0.045	0.029	0.273
WWAN Power Density / Limit	**5GHz WLAN Power Density / Limit**	**Bluetooth Power Density / Limit**	**Σ(Power Density / Limit)**
0.199	0.029	0.014	0.242

Note:

1. For colocation 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 low power transmitter or WWAN + 5GHz WLAN + Bluetooth low power 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.