

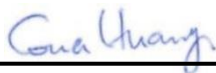
# RF Exposure Evaluation

## (Mobile Condition)

FCC ID : A4RGP4BC  
Equipment : Phone  
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



## **Table of Contents**

<b>1. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) .....</b>	<b>4</b>
<b>2. MAXIMUM TUNE-UP LIMIT (UNIT: DBM).....</b>	<b>5</b>
<b>3. RF EXPOSURE LIMIT INTRODUCTION .....</b>	<b>16</b>
<b>4. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION .....</b>	<b>17</b>
4.1. Power Density Calculation.....	17





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

Product Feature & Specification	
Equipment Name	Phone
FCC ID	A4RGP4BC
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 n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n7 : 2500 MHz ~ 2570 MHz 5G NR n12 : 699 MHz ~ 716 MHz 5G NR n14 : 788 MHz ~ 798 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n30 : 2305 MHz ~ 2315 MHz 5G NR n38 : 2570 MHz ~ 2620 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77: 3450MHz ~ 3550MHz, 3700 MHz ~ 3980 MHz WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2G Band: 5150 MHz ~ 5250 MHz WLAN 5.3G Band: 5250 MHz ~ 5350 MHz WLAN 5.5G Band: 5470 MHz ~ 5725 MHz WLAN 5.8G Band: 5725 MHz ~ 5850 MHz WLAN 5.8G UNII4 Band: 5850 MHz ~ 5895 MHz WLAN6E: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC: 13.56 MHz WPT: 110KHz ~ 148.5KHz UWB: 6489.6 MHz, 7987.2 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE NFC:ASK WPT: ASK UWB: BPM-BPSK
Remark:	1. Enable SP mode for UNII-5 and UNII-7.

Reviewed by: Jason Wang

Report Producer: Paula Chen



**2. Maximum Tune-up Limit (unit: dBm)**

1. The maximum power of the WWAN antenna will be selected to evaluate the power density
2. For MPE calculation is using the highest output among 2Tx switching antennas for each frequency band.
3. The device additional support uplink MIMO on n41, n48 and n77.
4. n41 PC1.5 Main Tx0 Ant2 and Sub Tx0 Ant 1, n48 PC3 Sub Tx0 Ant1 of device only support uplink MIMO.
5. n41 PC1.5 Main Tx1 Ant 0, Sub Tx1 Ant 5, and n48 PC3 Sub Tx1 Ant5 of device only support uplink MIMO.

**<WWAN Maximum Power>**

Maximum Transmit Burst Average Power (dBm)				
Band	Config	Antenna	Duty cycle	Mobile Condition
				Index 1
GSM850 GSM/GPRS 1TX	Main TX0	0	12.50%	33.5
GSM850 GPRS 2TX	Main TX0	0	25.00%	32.5
GSM850 GPRS 3TX	Main TX0	0	37.50%	31.5
GSM850 GPRS 4TX	Main TX0	0	50.00%	30.5
GSM850 EDGE 1TX	Main TX0	0	12.50%	28
GSM850 EDGE 2TX	Main TX0	0	25.00%	27.5
GSM850 EDGE 3TX	Main TX0	0	37.50%	27.5
GSM850 EDGE 4TX	Main TX0	0	50.00%	25.5
GSM1900 GSM/GPRS 1TX	Main TX0	2	12.50%	31
GSM1900 GPRS 2TX	Main TX0	2	25.00%	29.5
GSM1900 GPRS 3TX	Main TX0	2	37.50%	29
GSM1900 GPRS 4TX	Main TX0	2	50.00%	28
GSM1900 EDGE 1TX	Main TX0	2	12.50%	26
GSM1900 EDGE 2TX	Main TX0	2	25.00%	25
GSM1900 EDGE 3TX	Main TX0	2	37.50%	25
GSM1900 EDGE 4TX	Main TX0	2	50.00%	24
WCDMA B2	Main TX0	2	100.00%	25.5
WCDMA B4	Main TX0	2	100.00%	25.5
WCDMA B5	Main TX0	0	100.00%	25.5
LTE B7	Main TX0	2	100.00%	25.5
LTE B12/B17	Main TX0	0	100.00%	25.5
LTE B13	Main TX0	0	100.00%	25.5
LTE B14	Main TX0	0	100.00%	25.5
LTE B25/B2	Main TX0	2	100.00%	25.5
LTE B26/B5	Main TX0	0	100.00%	25.5
LTE B30	Main TX0	2	100.00%	22.9
LTE-B38 PC3	Main TX0	2	63.30%	25.5
LTE-B38 PC2	Main TX0	2	43.30%	26.9
LTE B41 PC3	Main TX0	2	63.30%	25.5
LTE B41 PC2	Main TX0	2	43.30%	27.5
LTE B48 PC3	Main TX0	6	63.30%	24.7
LTE B66/B4	Main TX0	2	100.00%	25.5
LTE B71	Main TX0	0	100.00%	25.5
FR1 n5	Main TX0	0	100.00%	25.5
FR1 n7	Main TX0	2	100.00%	25.5
FR1 n12	Main TX0	0	100.00%	25.5
FR1 n14	Main TX0	0	100.00%	25.5
FR1 n25/n2	Main TX0	2	100.00%	25.5
FR1 n30	Main TX0	2	100.00%	22.9
FR1 n38 PC3	Main TX0	2	100.00%	25.5
FR1 n41 PC3	Main TX0	2	100.00%	25.5



FR1 n41 PC2	Main TX0	2	50.00%	27.5
FR1 n41 PC1.5 MIMO	Main TX0	2	25.00%	26.5
FR1 n48 PC3	Main TX0	6	100.00%	24.7
FR1 n66	Main TX0	2	100.00%	25.5
FR1 n71	Main TX0	0	100.00%	25.5
FR1 n77 PC3	Main TX0	6	100.00%	24.1
FR1 n77 PC2	Main TX0	6	50.00%	27.1
LTE B2 Sub	Sub TX0	1	100.00%	25.5
LTE B66/B4 Sub	Sub TX0	1	100.00%	25.5
FR1 n2 Sub	Sub TX0	1	100.00%	25.5
FR1 n38 PC3 Sub	Sub TX0	1	100.00%	25.5
FR1 n41 PC3 Sub	Sub TX0	1	100.00%	25.5
FR1 n41 PC2 Sub	Sub TX0	1	50.00%	27.5
FR1 n41 PC1.5 Sub MIMO	Sub TX0	1	25.00%	26.5
FR1 n48 PC3 Sub MIMO	Sub TX0	1	100.00%	21.1
FR1 n66 Sub	Sub TX0	1	100.00%	25.5
FR1 n77 PC3 Sub	Sub TX0	1	100.00%	25.5

Maximum Transmit Burst Average Power (dBm)				
Band	Config	Antenna	Duty cycle	Mobile Condition
				Index 1
GSM850 GSM/GPRS 1TX	Main TX1	1	12.50%	33.5
GSM850 GPRS 2TX	Main TX1	1	25.00%	32.5
GSM850 GPRS 3TX	Main TX1	1	37.50%	31.5
GSM850 GPRS 4TX	Main TX1	1	50.00%	30.5
GSM850 EDGE 1TX	Main TX1	1	12.50%	28.0
GSM850 EDGE 2TX	Main TX1	1	25.00%	27.5
GSM850 EDGE 3TX	Main TX1	1	37.50%	27.5
GSM850 EDGE 4TX	Main TX1	1	50.00%	25.5
GSM1900 GSM/GPRS 1TX	Main TX1	0	12.50%	30.8
GSM1900 GPRS 2TX	Main TX1	0	25.00%	29.3
GSM1900 GPRS 3TX	Main TX1	0	37.50%	28.8
GSM1900 GPRS 4TX	Main TX1	0	50.00%	27.8
GSM1900 EDGE 1TX	Main TX1	0	12.50%	25.8
GSM1900 EDGE 2TX	Main TX1	0	25.00%	24.8
GSM1900 EDGE 3TX	Main TX1	0	37.50%	24.8
GSM1900 EDGE 4TX	Main TX1	0	50.00%	23.8
WCDMA B2	Main TX1	0	100.00%	25.3
WCDMA B4	Main TX1	0	100.00%	25.3
WCDMA B5	Main TX1	1	100.00%	25.5
LTE B7	Main TX1	0	100.00%	25.1
LTE B12/B17	Main TX1	1	100.00%	25.5
LTE B13	Main TX1	1	100.00%	25.5
LTE B14	Main TX1	1	100.00%	25.5
LTE B25/B2	Main TX1	0	100.00%	25.3
LTE B26/B5	Main TX1	1	100.00%	25.5
LTE B30	Main TX1	0	100.00%	23.1
LTE-B38 PC3	Main TX1	0	63.30%	25.1
LTE-B38 PC2	Main TX1	0	43.30%	26.5
LTE B41 PC3	Main TX1	0	63.30%	25.1
LTE B41 PC2	Main TX1	0	43.30%	27.1
LTE B48 PC3	Main TX1	7	63.30%	24.2
LTE B66/B4	Main TX1	0	100.00%	24.8



# FCC RF EXPOSURE REPORT

Report No. : FA102919-18

LTE B71	Main TX1	1	100.00%	25.5
FR1 n5	Main TX1	1	100.00%	25.5
FR1 n7	Main TX1	0	100.00%	25.1
FR1 n12	Main TX1	1	100.00%	25.5
FR1 n14	Main TX1	1	100.00%	25.5
FR1 n25/n2	Main TX1	0	100.00%	25.3
FR1 n30	Main TX1	0	100.00%	23.1
FR1 n38 PC3	Main TX1	0	100.00%	24.5
FR1 n41 PC3	Main TX1	0	100.00%	24.5
FR1 n41 PC2	Main TX1	0	50.00%	27.5
FR1 n41 PC1.5 MIMO	Main TX1	0	25.00%	26.5
FR1 n48 PC3	Main TX1	7	100.00%	24.2
FR1 n66	Main TX1	0	100.00%	25.3
FR1 n71	Main TX1	1	100.00%	25.5
FR1 n77 PC3	Main TX1	7	100.00%	24.0
FR1 n77 PC2	Main TX1	7	50.00%	26.5
LTE B2 Sub	Sub TX1	5	100.00%	25.3
LTE B66/B4 Sub	Sub TX1	5	100.00%	25.3
FR1 n2 Sub	Sub TX1	5	100.00%	25.3
FR1 n38 PC3 Sub	Sub TX1	5	100.00%	24.5
FR1 n41 PC3 Sub	Sub TX1	5	100.00%	24.5
FR1 n41 PC2 Sub	Sub TX1	5	50.00%	26.5
FR1 n41 PC1.5 Sub MIMO	Sub TX1	5	25.00%	25.5
FR1 n48 PC3 Sub MIMO	Sub TX1	5	100.00%	20.4
FR1 n66 Sub	Sub TX1	5	100.00%	25.3
FR1 n77 PC3 Sub	Sub TX1	5	100.00%	24.9



<WLAN Maximum Power Table>

<2.4GHz WLAN>

Burst Average Power (dBm)						
Transmit Antenna				MIMO		
2.4GHz WLAN	Mode	Channel	Frequency (MHz)	Ant 4 Tune-Up Limit	Ant 3 Tune-Up Limit	Ant 4+3 Tune-Up Limit
	802.11b 1Mbps	1	2412	23.00	23.00	-
		6	2437	23.00	23.00	-
		11	2462	23.00	23.00	-
		12	2467	23.00	23.00	-
		13	2472	20.50	20.00	-

Burst Average Power (dBm)						
Transmit Antenna				MIMO		
2.4GHz WLAN	Mode	Channel	Frequency (MHz)	Ant 4+3(4) Tune-Up Limit	Ant 4+3(3) Tune-Up Limit	Ant 4+3 Tune-Up Limit
	802.11g 6Mbps	1	2412	23.00	23.00	26.00
		6	2437	23.00	23.00	26.00
		11	2462	19.50	19.50	22.50
		12	2467	15.50	15.50	18.50
		13	2472	13.00	13.00	16.00
	802.11n-HT20 MCS0	1	2412	21.00	21.00	24.00
		6	2437	23.00	23.00	26.00
		11	2462	19.00	19.00	22.00
		13	2472	12.00	12.00	15.00
	802.11ac-VHT20 MCS0	1	2412	21.00	21.00	24.00
		6	2437	23.00	23.00	26.00
		11	2462	19.00	19.00	22.00
		13	2472	12.00	12.00	15.00
	802.11ax-HE20 MCS0	1	2412	21.00	21.00	24.00
		6	2437	23.00	23.00	26.00
		11	2462	19.00	19.00	22.00
		12	2467	15.00	15.00	18.00
		13	2472	12.00	12.00	15.00





<5GHz WLAN>

Burst Average Power (dBm)						
Transmit Antenna				MIMO		
Mode	Channel	Frequency (MHz)	Ant 4+8(4) Tune-Up Limit	Ant 4+8(8) Tune-Up Limit	Ant 4+8 Tune-Up Limit	
5.2GHz WLAN	802.11a 6Mbps	36	5180	21.50	21.50	24.50
		40	5200	21.50	21.50	24.50
		44	5220	21.50	21.50	24.50
		48	5240	21.50	21.50	24.50
	802.11n-HT20 MCS0	36	5180	21.00	21.00	24.00
		40	5200	21.00	21.00	24.00
		44	5220	21.00	21.00	24.00
		48	5240	21.00	21.00	24.00
	802.11n-HT40 MCS0	38	5190	16.00	16.00	19.00
		46	5230	21.50	21.50	24.50
	802.11ac-VHT20 MCS0	36	5180	20.00	20.00	23.00
		40	5200	21.00	21.00	24.00
		44	5220	21.00	21.00	24.00
		48	5240	21.00	21.00	24.00
	802.11ac-VHT40 MCS0	38	5190	16.00	16.00	19.00
		46	5230	21.50	21.50	24.50
	802.11ac-VHT80 MCS0	42	5210	16.00	16.00	19.00
	802.11ax-HE20 MCS0	36	5180	20.00	20.00	23.00
		40	5200	21.50	21.50	24.50
		44	5220	21.50	21.50	24.50
48		5240	21.50	21.50	24.50	
802.11ax-HE40 MCS0	38	5190	16.50	16.50	19.50	
	46	5230	21.50	21.50	24.50	
802.11ax-HE80 MCS0	42	5210	16.00	16.00	19.00	



Burst Average Power (dBm)						
	Transmit Antenna			MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4+8(4) Tune-Up Limit	Ant 4+8(8) Tune-Up Limit	Ant 4+8 Tune-Up Limit
5.3GHz WLAN	802.11a 6Mbps	52	5260	21.50	21.50	24.50
		56	5280	21.50	21.50	24.50
		60	5300	21.50	21.50	24.50
		64	5320	21.50	21.50	24.50
	802.11n-HT20 MCS0	52	5260	21.00	21.00	24.00
		56	5280	21.00	21.00	24.00
		60	5300	21.00	21.00	24.00
		64	5320	20.00	20.00	23.00
	802.11n-HT40 MCS0	54	5270	21.50	21.50	24.50
		62	5310	16.50	16.50	19.50
	802.11ac-VHT20 MCS0	52	5260	21.00	21.00	24.00
		56	5280	21.00	21.00	24.00
		60	5300	21.00	21.00	24.00
		64	5320	21.00	21.00	24.00
	802.11ac-VHT40 MCS0	54	5270	21.00	21.00	24.00
		62	5310	16.50	16.50	19.50
	802.11ac-VHT80 MCS0	58	5290	16.50	16.50	19.50
	802.11ac-VHT160 MCS0	50	5250	16.50	16.50	19.50
	802.11ax-HE20 MCS0	52	5260	21.00	21.00	24.00
		56	5280	21.00	21.00	24.00
60		5300	21.00	21.00	24.00	
64		5320	21.00	21.00	24.00	
802.11ax-HE40 MCS0	54	5270	21.00	21.00	24.00	
	62	5310	16.50	16.50	19.50	
802.11ax-HE80 MCS0	58	5290	16.50	16.50	19.50	
802.11ax-HE160 MCS0	50	5250	16.50	16.50	19.50	



Burst Average Power (dBm)							
5.5GHz WLAN	Transmit Antenna			MIMO			
	Mode	Channel	Frequency (MHz)	Ant 4+8(4) Tune-Up Limit	Ant 4+8(8) Tune-Up Limit	Ant 4+8 Tune-Up Limit	
802.11a 6Mbps	100	100	5500	21.50	21.50	24.50	
		116	5580	18.00	18.00	21.00	
		124	5620	16.50	16.50	19.50	
		132	5660	16.50	16.50	19.50	
		140	5700	16.00	16.00	19.00	
		144	5720	16.00	16.00	19.00	
	802.11n-HT20 MCS0	100	100	5500	20.50	20.50	23.50
			116	5580	17.00	17.00	20.00
			124	5620	16.50	16.50	19.50
			132	5660	16.50	16.50	19.50
			140	5700	16.50	16.50	19.50
	802.11n-HT40 MCS0	102	102	5510	16.50	16.50	19.50
110			5550	21.00	21.00	24.00	
126			5630	19.50	19.50	22.50	
134			5670	18.00	18.00	21.00	
142			5710	18.00	18.00	21.00	
802.11ac-VHT20 MCS0	100	100	5500	20.00	20.00	23.00	
		116	5580	17.00	17.00	20.00	
		124	5620	16.50	16.50	19.50	
		132	5660	16.50	16.50	19.50	
		140	5700	16.50	16.50	19.50	
802.11ac-VHT40 MCS0	102	102	5510	16.50	16.50	19.50	
		110	5550	21.00	21.00	24.00	
		126	5630	19.50	19.50	22.50	
		134	5670	18.00	18.00	21.00	
		142	5710	18.00	18.00	21.00	
802.11ac-VHT80 MCS0	106	106	5530	17.00	17.00	20.00	
		122	5610	20.00	20.00	23.00	
		138	5690	19.00	19.00	22.00	
802.11ac-VHT160 MCS0	114	5570	16.50	16.50	19.50		
802.11ax-HE20 MCS0	100	100	5500	20.50	20.50	23.50	
		116	5580	17.50	17.50	20.50	
		124	5620	16.50	16.50	19.50	
		132	5660	16.50	16.50	19.50	
		140	5700	16.50	16.50	19.50	
		144	5720	16.50	16.50	19.50	
802.11ax-HE40 MCS0	102	102	5510	17.00	17.00	20.00	
		110	5550	21.00	21.00	24.00	
		126	5630	19.50	19.50	22.50	
		134	5670	18.00	18.00	21.00	
		142	5710	18.00	18.00	21.00	
802.11ax-HE80 MCS0	106	106	5530	17.50	17.50	20.50	
		122	5610	20.00	20.00	23.00	
		138	5690	19.00	19.00	22.00	
802.11ax-HE160 MCS0	114	5570	17.00	17.00	20.00		



Burst Average Power (dBm)						
5.8GHz WLAN	Transmit Antenna			MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4+8(4) Tune-Up Limit	Ant 4+8(8) Tune-Up Limit	Ant 4+8 Tune-Up Limit
802.11a 6Mbps		149	5745	15.00	23.00	23.64
		157	5785	15.00	23.00	23.64
		165	5825	15.00	23.00	23.64
802.11n-HT20 MCS0		149	5745	15.00	23.00	23.64
		157	5785	15.00	23.00	23.64
		165	5825	15.00	23.00	23.64
802.11n-HT40 MCS0		151	5755	16.00	21.50	22.58
		159	5795	16.00	21.50	22.58
802.11ac-VHT20 MCS0		149	5745	15.50	23.00	23.71
		157	5785	15.50	23.00	23.71
		165	5825	15.50	23.00	23.71
802.11ac-VHT40 MCS0		151	5755	16.00	21.50	22.58
		159	5795	16.00	21.50	22.58
802.11ac-VHT80 MCS0		155	5775	18.00	22.00	24.21
802.11ax-HE20 MCS0		149	5745	15.00	23.00	23.64
		157	5785	15.00	23.00	23.64
		165	5825	15.00	23.00	23.64
802.11ax-HE40 MCS0		151	5755	16.00	22.00	22.97
		159	5795	16.00	22.00	22.97
802.11ax-HE80 MCS0		155	5775	18.00	22.00	24.21



Burst Average Power (dBm)						
5.9GHz WLAN	Transmit Antenna			MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4+8(4) Tune-Up Limit	Ant 4+8(8) Tune-Up Limit	Ant 4+8 Tune-Up Limit
802.11a 6Mbps		169	5845	21.50	21.50	24.50
		173	5865	21.50	21.50	24.50
		177	5885	21.50	21.50	24.50
802.11n-HT20 MCS0		169	5845	21.50	21.50	24.50
		173	5865	21.50	21.50	24.50
		177	5885	21.50	21.50	24.50
802.11n-HT40 MCS0		167	5835	22.00	22.00	25.00
		175	5875	22.00	22.00	25.00
802.11ac-VHT20 MCS0		169	5845	21.50	21.50	24.50
		173	5865	21.50	21.50	24.50
		177	5885	21.50	21.50	24.50
802.11ac-VHT40 MCS0		167	5835	22.00	22.00	25.00
		175	5875	22.00	22.00	25.00
802.11ac-VHT80 MCS0		171	5855	20.50	20.50	23.50
802.11ac-VHT160 MCS0		163	5815	20.50	20.50	23.50
802.11ax-HE20 MCS0		169	5845	22.00	22.00	25.00
		173	5865	22.00	22.00	25.00
		177	5885	22.00	22.00	25.00
802.11ax-HE40 MCS0		167	5835	22.00	22.00	25.00
		175	5875	22.00	22.00	25.00
802.11ax-HE80 MCS0		171	5855	20.50	20.50	23.50
802.11ax-HE160 MCS0		163	5815	20.50	20.50	23.50



<6GHz WLAN>

Burst Average Power (dBm)						
	Transmit Antenna			MIMO		
	Mode	Channel	Frequency (MHz)	Ant 4+3(4) Tune-Up Limit	Ant 4+3(3) Tune-Up Limit	Ant 4+3 Tune-Up Limit
WiFi 6E	802.11a 6Mbps	1	5955	22	22	25
		49	6195	21.5	21.5	24.5
		93	6415	19	19	22
		117	6535	18.5	18.5	21.5
		149	6695	17.5	17.5	20.5
	802.11ax-HE20 MCS0	181	6855	17.5	17.5	20.5
		1	5955	22	22	25
		49	6195	21.5	21.5	24.5
		93	6415	18.5	18.5	21.5
		117	6535	18.5	18.5	21.5
	802.11ax-HE40 MCS0	149	6695	18	18	21
		181	6855	18	18	21
		3	5965	19.5	19.5	22.5
		51	6205	21	21	24
		91	6405	19.5	19.5	22.5
	802.11ax-HE80 MCS0	123	6565	18.5	18.5	21.5
		147	6685	18.5	18.5	21.5
		179	6845	19	19	22
		7	5985	19.5	19.5	22.5
		55	6225	21	21	24
	802.11ax-HE160 MCS0	87	6385	21	21	24
		135	6625	18	18	21
		151	6705	18.5	18.5	21.5
		167	6785	20	20	23
	802.11ax-HE160 MCS0	15	6025	19	19	22
		47	6185	20.5	20.5	23.5
		79	6345	20.5	20.5	23.5
		143	6665	19.5	19.5	22.5



**<Bluetooth Maximum Power>**

Mode	Burst Average Power (dBm)					
	Ant 4			Ant 4		
	BR / EDR					
	LE			LE		
	1Mbps	2Mbps	3Mbps	1Mbps	2Mbps	
Tune-up Limit	20.5	18.5	18.5	20.5	20.5	

Mode	Burst Average Power (dBm)					
	Ant 3			Ant 3		
	BR / EDR					
	LE			LE		
	1Mbps	2Mbps	3Mbps	1Mbps	2Mbps	
Tune-up Limit	20.5	18.5	18.5	20.5	20.5	

Mode	BR / EDR	Burst Average Power (dBm)								
		1Mbps			2Mbps			3Mbps		
		Ant 4+3(4)	Ant 4+3(3)	Ant 4+3	Ant 4+3(4)	Ant 4+3(3)	Ant 4+3	Ant 4+3(4)	Ant 4+3(3)	Ant 4+3
Tune-up Limit		17.5	17.5	20.5	15.5	15.5	18.5	15.5	15.5	18.5

Mode	LE	Burst Average Power (dBm)					
		1Mbps			2Mbps		
		Ant 4+3(4)	Ant 4+3(3)	Ant 4+3	Ant 4+3(4)	Ant 4+3(3)	Ant 4+3
Tune-up Limit		17.5	17.5	20.5	15.5	15.5	18.5

**<UWB Maximum Power>**

UWB	Maximum Average Power (dBm)			
	Ant 1	Ant 2	Ant 3 (CH05)	Ant 3 (CH09)
	-14	-9.0	-15.6	-13.15
	Antenna Gain (dBi)			
	Ant 1	Ant 2	Ant 3 (CH05)	Ant 3 (CH09)
	0	-5	1.6	-0.85
Maximum EIRP Power (dBm)				
14				



### 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

#### TX0

Band	Antenna	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
GSM850 GSM/GPRS 1TX	0	-2.30	33.50	31.2	1.32	165.96	0.033	0.549	0.060
GSM850 GPRS 2TX	0	-2.30	32.50	30.2	1.05	261.78	0.052	0.549	0.095
GSM850 GPRS 3TX	0	-2.30	31.50	29.2	0.83	311.89	0.062	0.549	0.113
GSM850 GPRS 4TX	0	-2.30	30.50	28.2	0.66	331.13	0.066	0.549	0.120
GSM850 EDGE 1TX	0	-2.30	28.00	25.7	0.37	46.77	0.009	0.549	0.017
GSM850 EDGE 2TX	0	-2.30	27.50	25.2	0.33	82.78	0.016	0.549	0.030
GSM850 EDGE 3TX	0	-2.30	27.50	25.2	0.33	124.17	0.025	0.549	0.045
GSM850 EDGE 4TX	0	-2.30	25.50	23.2	0.21	104.46	0.021	0.549	0.038
GSM1900 GSM/GPRS 1TX	2	1.50	31.00	32.5	1.78	223.87	0.045	1.000	0.045
GSM1900 GPRS 2TX	2	1.50	29.50	31.0	1.26	314.73	0.063	1.000	0.063
GSM1900 GPRS 3TX	2	1.50	29.00	30.5	1.12	420.73	0.084	1.000	0.084
GSM1900 GPRS 4TX	2	1.50	28.00	29.5	0.89	446.68	0.089	1.000	0.089
GSM1900 EDGE 1TX	2	1.50	26.00	27.5	0.56	70.79	0.014	1.000	0.014
GSM1900 EDGE 2TX	2	1.50	25.00	26.5	0.45	111.67	0.022	1.000	0.022
GSM1900 EDGE 3TX	2	1.50	25.00	26.5	0.45	167.51	0.033	1.000	0.033
GSM1900 EDGE 4TX	2	1.50	24.00	25.5	0.35	177.41	0.035	1.000	0.035
WCDMA B2	2	1.50	25.50	27.0	0.50	501.19	0.100	1.000	0.100
WCDMA B4	2	-1.20	25.50	24.3	0.27	269.15	0.054	1.000	0.054
WCDMA B5	0	-2.30	25.50	23.2	0.21	208.93	0.042	0.549	0.076
LTE B7	2	-0.80	25.50	24.7	0.30	295.12	0.059	1.000	0.059
LTE B12/B17	0	-2.80	25.50	22.7	0.19	186.21	0.037	0.466	0.080
LTE B13	0	-2.40	25.50	23.1	0.20	204.17	0.041	0.518	0.078
LTE B14	0	-2.20	25.50	23.3	0.21	213.80	0.043	0.525	0.081
LTE B25/B2	2	1.50	25.50	27.0	0.50	501.19	0.100	1.000	0.100
LTE B26/B5	0	-2.30	25.50	23.2	0.21	208.93	0.042	0.543	0.077
LTE B30	2	1.10	22.90	24.0	0.25	251.19	0.050	1.000	0.050
LTE-B38 PC3	2	-0.80	25.50	24.7	0.30	295.12	0.059	1.000	0.059
LTE-B38 PC2	2	-0.80	26.90	26.1	0.41	407.38	0.081	1.000	0.081
LTE B41 PC3	2	-0.80	25.50	24.7	0.30	295.12	0.059	1.000	0.059
LTE B41 PC2	2	-0.80	27.50	26.7	0.47	467.74	0.093	1.000	0.093
LTE B48 PC3	6	-1.70	24.70	23.0	0.20	199.53	0.040	1.000	0.040
LTE B66/B4	2	-1.20	25.50	24.3	0.27	269.15	0.054	1.000	0.054
LTE B71	0	-5.30	25.50	20.2	0.10	104.71	0.021	0.442	0.047
FR1 n5	0	-2.30	25.50	23.2	0.21	208.93	0.042	0.549	0.076
FR1 n7	2	-0.80	25.50	24.7	0.30	295.12	0.059	1.000	0.059
FR1 n12	0	-2.80	25.50	22.7	0.19	186.21	0.037	0.466	0.080
FR1 n14	0	-2.20	25.50	23.3	0.21	213.80	0.043	0.525	0.081
FR1 n25/n2	2	1.50	25.50	27.0	0.50	501.19	0.100	1.000	0.100
FR1 n30	2	1.10	22.90	24.0	0.25	251.19	0.050	1.000	0.050
FR1 n38 PC3	2	-0.80	25.50	24.7	0.30	295.12	0.059	1.000	0.059
FR1 n41 PC3	2	-0.80	25.50	24.7	0.30	295.12	0.059	1.000	0.059
FR1 n41 PC2	2	-0.80	27.50	26.7	0.47	467.74	0.093	1.000	0.093
FR1 n41 PC1.5 MIMO	2	-0.80	26.50	25.7	0.37	371.54	0.074	1.000	0.074
FR1 n48 PC3	6	-1.70	24.70	23.0	0.20	199.53	0.040	1.000	0.040
FR1 n66	2	-0.50	25.50	25.0	0.32	316.23	0.063	1.000	0.063
FR1 n71	0	-5.30	25.50	20.2	0.10	104.71	0.021	0.442	0.047
FR1 n77 PC3	6	-1.70	24.10	22.4	0.17	173.78	0.035	1.000	0.035



# FCC RF EXPOSURE REPORT

Report No. : FA102919-18

FR1 n77 PC2	6	-1.70	27.10	25.4	0.35	346.74	0.069	1.000	0.069
LTE B2 Sub	1	-8.30	25.50	17.2	0.05	52.48	0.010	1.000	0.010
LTE B66/B4 Sub	1	-4.60	25.50	20.9	0.12	123.03	0.024	1.000	0.024
FR1 n2 Sub	1	-8.30	25.50	17.2	0.05	52.48	0.010	1.000	0.010
FR1 n38 PC3 Sub	1	-1.70	25.50	23.8	0.24	239.88	0.048	1.000	0.048
FR1 n41 PC3 Sub	1	-1.70	25.50	23.8	0.24	239.88	0.048	1.000	0.048
FR1 n41 PC2 Sub	1	-0.17	27.50	27.3	0.54	540.75	0.108	1.000	0.108
FR1 n41 PC1.5 Sub MIMO	1	-1.70	26.50	24.8	0.30	302.00	0.060	1.000	0.060
FR1 n48 PC3 Sub MIMO	1	-4.20	21.10	16.9	0.05	48.98	0.010	1.000	0.010
FR1 n66 Sub	1	-4.60	25.50	20.9	0.12	123.03	0.024	1.000	0.024
FR1 n77 PC3 Sub	1	-5.50	25.50	20.0	0.10	100.00	0.020	1.000	0.020

## TX1

Band	Antenna	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
GSM850 GSM/GPRS 1TX	1	-4.60	33.50	28.9	0.78	97.72	0.019	0.549	0.035
GSM850 GPRS 2TX	1	-4.60	32.50	27.9	0.62	154.15	0.031	0.549	0.056
GSM850 GPRS 3TX	1	-4.60	31.50	26.9	0.49	183.65	0.037	0.549	0.067
GSM850 GPRS 4TX	1	-4.60	30.50	25.9	0.39	194.98	0.039	0.549	0.071
GSM850 EDGE 1TX	1	-4.60	28.00	23.4	0.22	27.54	0.005	0.549	0.010
GSM850 EDGE 2TX	1	-4.60	27.50	22.9	0.19	48.75	0.010	0.549	0.018
GSM850 EDGE 3TX	1	-4.60	27.50	22.9	0.19	73.12	0.015	0.549	0.026
GSM850 EDGE 4TX	1	-4.60	25.50	20.9	0.12	61.51	0.012	0.549	0.022
GSM1900 GSM/GPRS 1TX	0	1.40	30.80	32.2	1.66	208.93	0.042	1.000	0.042
GSM1900 GPRS 2TX	0	1.40	29.30	30.7	1.17	293.72	0.058	1.000	0.058
GSM1900 GPRS 3TX	0	1.40	28.80	30.2	1.05	392.64	0.078	1.000	0.078
GSM1900 GPRS 4TX	0	1.40	27.80	29.2	0.83	416.87	0.083	1.000	0.083
GSM1900 EDGE 1TX	0	1.40	25.80	27.2	0.52	66.07	0.013	1.000	0.013
GSM1900 EDGE 2TX	0	1.40	24.80	26.2	0.42	104.22	0.021	1.000	0.021
GSM1900 EDGE 3TX	0	1.40	24.80	26.2	0.42	156.33	0.031	1.000	0.031
GSM1900 EDGE 4TX	0	1.40	23.80	25.2	0.33	165.57	0.033	1.000	0.033
WCDMA B2	0	1.40	25.30	26.7	0.47	467.74	0.093	1.000	0.093
WCDMA B4	0	2.60	25.30	27.9	0.62	616.60	0.123	1.000	0.123
WCDMA B5	1	-4.60	25.50	20.9	0.12	123.03	0.024	0.549	0.045
LTE B7	0	0.70	25.10	25.8	0.38	380.19	0.076	1.000	0.076
LTE B12/B17	1	-5.80	25.50	19.7	0.09	93.33	0.019	0.466	0.040
LTE B13	1	-5.20	25.50	20.3	0.11	107.15	0.021	0.518	0.041
LTE B14	1	-5.40	25.50	20.1	0.10	102.33	0.020	0.525	0.039
LTE B25/B2	0	1.40	25.30	26.7	0.47	467.74	0.093	1.000	0.093
LTE B26/B5	1	-4.60	25.50	20.9	0.12	123.03	0.024	0.543	0.045
LTE B30	0	0.90	23.10	24.0	0.25	251.19	0.050	1.000	0.050
LTE-B38 PC3	0	0.70	25.10	25.8	0.38	380.19	0.076	1.000	0.076
LTE-B38 PC2	0	0.70	26.50	27.2	0.52	524.81	0.104	1.000	0.104
LTE B41 PC3	0	0.70	25.10	25.8	0.38	380.19	0.076	1.000	0.076
LTE B41 PC2	0	0.70	27.10	27.8	0.60	602.56	0.120	1.000	0.120
LTE B48 PC3	7	-1.20	24.20	23.0	0.20	199.53	0.040	1.000	0.040
LTE B66/B4	0	-2.10	24.80	22.7	0.19	186.21	0.037	1.000	0.037
LTE B71	1	-5.30	25.50	20.2	0.10	104.71	0.021	0.442	0.047
FR1 n5	1	-4.60	25.50	20.9	0.12	123.03	0.024	0.549	0.045
FR1 n7	0	0.70	25.10	25.8	0.38	380.19	0.076	1.000	0.076
FR1 n12	1	-5.80	25.50	19.7	0.09	93.33	0.019	0.466	0.040
FR1 n14	1	-5.40	25.50	20.1	0.10	102.33	0.020	0.525	0.039
FR1 n25/n2	0	1.40	25.30	26.7	0.47	467.74	0.093	1.000	0.093
FR1 n30	0	0.90	23.10	24.0	0.25	251.19	0.050	1.000	0.050



# FCC RF EXPOSURE REPORT

Report No. : FA102919-18

FR1 n38 PC3	0	0.70	24.50	25.2	0.33	331.13	0.066	1.000	0.066
FR1 n41 PC3	0	0.70	24.50	25.2	0.33	331.13	0.066	1.000	0.066
FR1 n41 PC2	0	0.70	27.50	28.2	0.66	660.69	0.132	1.000	0.132
FR1 n41 PC1.5 MIMO	0	0.70	26.50	27.2	0.52	524.81	0.104	1.000	0.104
FR1 n48 PC3	7	-1.20	24.20	23.0	0.20	199.53	0.040	1.000	0.040
FR1 n66	0	-2.10	25.30	23.2	0.21	208.93	0.042	1.000	0.042
FR1 n71	1	-5.30	25.50	20.2	0.10	104.71	0.021	0.442	0.047
FR1 n77 PC3	7	-1.20	24.00	22.8	0.19	190.55	0.038	1.000	0.038
FR1 n77 PC2	7	-1.20	26.50	25.3	0.34	338.84	0.067	1.000	0.067
LTE B2 Sub	5	-3.00	25.30	22.3	0.17	169.82	0.034	1.000	0.034
LTE B66/B4 Sub	5	-3.80	25.30	21.5	0.14	141.25	0.028	1.000	0.028
FR1 n2 Sub	5	-3.00	25.30	22.3	0.17	169.82	0.034	1.000	0.034
FR1 n38 PC3 Sub	5	-3.00	24.50	21.5	0.14	141.25	0.028	1.000	0.028
FR1 n41 PC3 Sub	5	-3.00	24.50	21.5	0.14	141.25	0.028	1.000	0.028
FR1 n41 PC2 Sub	5	-3.00	26.50	23.5	0.22	223.87	0.045	1.000	0.045
FR1 n41 PC1.5 Sub MIMO	5	-3.00	25.50	22.5	0.18	177.83	0.035	1.000	0.035
FR1 n48 PC3 Sub MIMO	5	-4.00	20.40	16.4	0.04	43.65	0.009	1.000	0.009
FR1 n66 Sub	5	-3.80	25.30	21.5	0.14	141.25	0.028	1.000	0.028
FR1 n77 PC3 Sub	5	-2.60	24.90	22.3	0.17	169.82	0.034	1.000	0.034

## WLAN / BT / UWB

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
WLAN2.4GHz Band	-0.4	26.0	25.6	0.36	363.08	0.072	1.000	0.072
WLAN5GHz/6GHz Band	1.2	25.0	26.2	0.42	416.87	0.083	1.000	0.083
Bluetooth	-0.4	20.5	20.1	0.10	102.33	0.020	1.000	0.020
UWB			-14.0	0.00004	0.0398	0.00001	1.000	0.00001



WWAN Power Density / Limit	2.4GHz WLAN Power Density / Limit	5GHz/6GHz WLAN Power Density / Limit	WPT	UWB	Σ (Power Density / Limit)
0.132	0.072	0.083	0.01	0.00001	0.29701
WWAN Power Density / Limit	5GHz/6GHz WLAN Power Density / Limit	Bluetooth Power Density / Limit	WPT	UWB	Σ (Power Density / Limit)
0.132	0.083	0.020	0.01	0.00001	0.24501

**Note:**

- Above power density calculation selected highest output power and antenna from all transmit antenna to be evaluation.
- In simultaneous transmission for this device, 5G NR including uplink MIMO and LTE transmission are managed and controlled by Samsung S.LSI TAS, while the RF exposure from WLAN,WPT, BT and UWB radios are managed using legacy approach, therefore simultaneous transmission compliance can be assessed on LTE+ WLAN+UWB+WPT+BT or NR+WLAN+UWB+WPT+BT, above power density calculation selected highest power density between LTE and 5G NR for simultaneous transmission analysis with other transmitters.
- The uplink MIMO only operate in 5G FR1 n41/48/77.
- WPT ratio is, from Sporton WPT evaluation report (FCC ID: A4RGP4BC, Report No.: FA102919-06B), 0.01 = 0.0159 / 1.63 for calculation.
- For colocation analysis, the highest (power density/limit) among all WWAN wireless modes is chosen for summation.
- Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission) / (corresponding MPE limit)], for all transmission configuration was consider and list above table.
- Considering the all the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of collocated transmitters is compliant.

**Conclusion:**

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