

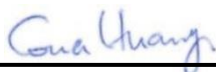


FCC SAR TEST REPORT

FCC ID : A4RGD1YQ
Equipment : Phone
Model Name : GD1YQ
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Standard : FCC 47 CFR Part 2 (2.1093)
ANSI/IEEE C95.1-1992
IEEE 1528-2013

The product was received on Apr. 17, 2020 and testing was started from Nov. 13, 2020 and completed on Nov. 13, 2020. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test 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

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1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Google LLC, Phone, GD1YQ, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary			Highest Simultaneous Transmission 1g SAR (W/kg)
		Head (Separation 0mm)	Body-worn (Separation 10mm)	Hotspot (Separation 10mm)	
Licensed	FR1 n77	0.98	0.70	0.97	1.57
Date of Testing:		2020/11/13			

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

Reviewed by: Jason Wang
Report Producer: Carlie Tsai

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01
- FCC KDB 941225 D07 UMPC Mini Tablet v01r02



3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	Phone
Model Name	GD1YQ
FCC ID	A4RGD1YQ
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 CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 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 n25 : 1850 MHz ~ 1915 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77 : 3700 MHz ~ 3980 MHz 5G NR n260: 37GHz ~ 40GHz 5G NR n261: 27.5GHz ~ 28.35GHz WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz WLAN 5.2GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8GHz Band: 5725 MHz ~ 5825 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC: 13.56 MHz WPT: 110KHz ~ 148.5KHz
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/WPT: ASK
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
Remark: 1. Enable 5G FR1 n77, in this report only evaluation 5G FR1 n77 only, other bands refer to original SAR report, FCC ID: A4RGD1YQ, Sporton SAR report no.: CA011718-01A. 2. Since n77 which Plimit > Pmax, the smart transmit part2 validation test is not needed as no power enforcement will be required in this condition. Detail Plimit and Pmax refer to section 4.0.	



3.2 Maximum Tune-up Limit

General Note:

- 1. For each cellular band, the device has several WWAN antennas, the antenna selection is based on the connection quality condition, and only one antenna will transmit at a time.
2. The device implements the power management and sensor detection for SAR compliance at different exposure conditions (head, body-worn, hotspot, extremity) by DSI and the Qualcomm Smart Transmit will manage to ensure the power level not exceeding the associated power table. Details about the power management decision and sensor detection are provided in the operational description.
3. The DSI 0 was not used for SAR testing, the other DSI may have the same power levels but DSI 0 is covered for all modes under the mobile RF exposure evaluation, please refer to Sporton's test report FA011718-06B

Table with 2 columns: Config*, Support transmit antenna and band. Rows include Config 0 and Config 1 with detailed antenna and band specifications.

*Config 0 and 1 means output ports of power measurement for different antennas and bands.



Config0			Maximum Transmit Power Level (dBm)					
Radio Tech	Band Number	Antenna name	DSI_0	DSI_2	DSI_4	DSI_6	DSI_7	DSI_8
			Default	Head Standalone	Body Standalone	Hotspot Simultaneous Transmit	Head Simultaneous Transmit	Body Simultaneous Transmit
GSM1Tx	850	ANT0	33.7	33.7	33.7	33.7	33.7	33.7
GSM2Tx	850	ANT0	32.0	32.0	32.0	32.0	32.0	32.0
GSM3Tx	850	ANT0	31.0	31.0	31.0	31.0	31.0	31.0
GSM4Tx	850	ANT0	30.0	30.0	30.0	30.0	30.0	30.0
EGPRS1Tx	850	ANT0	28.0	28.0	28.0	28.0	28.0	28.0
EGPRS2Tx	850	ANT0	27.0	27.0	27.0	27.0	27.0	27.0
EGPRS3Tx	850	ANT0	27.0	27.0	27.0	27.0	27.0	27.0
EGPRS4Tx	850	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
GSM1Tx	1900	ANT2	31.0	31.0	31.0	31.0	31.0	31.0
GSM2Tx	1900	ANT2	29.5	29.5	29.5	29.5	29.5	29.5
GSM3Tx	1900	ANT2	29.0	29.0	29.0	29.0	29.0	29.0
GSM4Tx	1900	ANT2	28.0	28.0	28.0	28.0	28.0	28.0
EGPRS1Tx	1900	ANT2	27.0	27.0	27.0	27.0	27.0	27.0
EGPRS2Tx	1900	ANT2	26.0	26.0	26.0	26.0	26.0	26.0
EGPRS3Tx	1900	ANT2	25.0	25.0	25.0	25.0	25.0	25.0
EGPRS4Tx	1900	ANT2	24.0	24.0	24.0	24.0	24.0	24.0
WCDMA AMR/RMC	B2	ANT2	25.0	25.0	25.0	24.2	25.0	24.7
WCDMA HSDPA/HSUPA	B2	ANT2	24.0	24.0	24.0	23.2	24.0	23.7
WCDMA AMR/RMC	B4	ANT2	25.0	25.0	25.0	24.8	25.0	25.0
WCDMA HSDPA/HSUPA	B4	ANT2	24.0	24.0	24.0	23.8	24.0	24.0
WCDMA AMR/RMC	B5	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
WCDMA HSDPA/HSUPA	B5	ANT0	24.0	24.0	24.0	24.0	24.0	24.0
CDMA	BC0	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
CDMA	BC1	ANT2	25.0	25.0	24.7	23.7	25.0	23.9
CDMA	BC10	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B2	ANT2	25.0	25.0	25.0	24.2	25.0	24.2
LTE	B4	ANT2	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B5	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B7	ANT2	25.0	25.0	23.1	18.7	25.0	22.3
LTE	B12	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B13	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B14	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B17	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B25	ANT2	25.0	25.0	25.0	24.2	25.0	24.2
LTE	B26	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B30	ANT2	25.0	25.0	22.9	19.7	25.0	22.1
LTE	B38	ANT2	25.0	25.0	25.0	20.2	25.0	24.2
LTE	B38_HPUE	ANT2	27.5	27.5	26.6	21.8	27.5	25.8
LTE	B41	ANT2	25.0	25.0	25.0	20.2	25.0	24.2
LTE	B41_HPUE	ANT2	27.5	27.5	26.6	21.8	27.5	25.8
LTE	B48	ANT7	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B66	ANT2	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B71	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n2	ANT2	25.0	25.0	24.9	24.1	25.0	24.1
5G FR1	n5	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n7	ANT2	25.0	25.0	22.6	19.2	25.0	21.8
5G FR1	n12	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n25	ANT2	25.0	25.0	25.0	24.1	25.0	25.0
5G FR1	n41	ANT2	25.0	25.0	25.0	25.0	25.0	24.1
5G FR1	n41_HPUE	ANT5	27.5	25.2	27.5	27.5	24.4	27.5
5G FR1	n66	ANT2	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n71	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n77	ANT7	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n77_HPUE	ANT7	27.5	27.5	27.5	27.5	27.5	27.5



Config1			Maximum Transmit Power Level (dBm)					
Radio Tech	Band Number	Antenna name	DSI_0	DSI_2	DSI_4	DSI_6	DSI_7	DSI_8
			Default	Head Standalone	Body Standalone	Hotspot Simultaneous Transmit	Head Simultaneous Transmit	Body Simultaneous Transmit
WCDMA AMR/RMC	B2	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
WCDMA HSDPA/HSUPA	B2	ANT0	24.0	24.0	24.0	24.0	24.0	24.0
WCDMA AMR/RMC	B4	ANT0	25.0	25.0	23.0	21.9	25.0	22.2
WCDMA HSDPA/HSUPA	B4	ANT0	24.0	24.0	22.0	20.9	24.0	21.2
WCDMA AMR/RMC	B5	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
WCDMA HSDPA/HSUPA	B5	ANT1	24.0	24.0	24.0	24.0	24.0	24.0
CDMA	BC0	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
CDMA	BC1	ANT0	25.0	25.0	25.0	24.1	25.0	25.0
CDMA	BC10	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B2	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B4	ANT0	25.0	25.0	23.0	21.7	25.0	22.2
LTE	B5	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B7	ANT0	25.0	25.0	25.0	24.7	25.0	24.7
LTE	B12	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B13	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B14	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B17	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B25	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B26	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B30	ANT0	25.0	25.0	25.0	24.7	25.0	25.0
LTE	B38	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B38_HPUE	ANT0	27.5	27.5	27.5	27.5	27.5	27.5
LTE	B41	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
LTE	B41_HPUE	ANT0	27.5	27.5	27.5	27.5	27.5	27.5
LTE	B48	ANT2	23.5	23.5	23.5	23.5	23.5	23.5
LTE	B66	ANT0	25.0	25.0	23.0	21.7	25.0	22.2
LTE	B71	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n2	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n5	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n7	ANT0	25.0	25.0	25.0	24.8	25.0	24.8
5G FR1	n12	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n25	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n41	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n66	ANT0	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n71	ANT1	25.0	25.0	25.0	25.0	25.0	25.0
5G FR1	n77	ANT2	23.5	23.5	23.5	23.5	23.5	23.5
5G FR1	n77_HPUE	ANT2	26.5	26.5	26.5	26.5	26.5	26.5



<WLAN Maximum Power>

General Note:

1. The device implements the power management for WLAN SAR compliance at different exposure conditions (head, body-worn, hotspot). The control logic about the power management decision is provided in the operational description.
2. The WLAN power table relate to each exposure condition is description below:
 - a. Default Power Table: when operate at mobile condition.
 - b. Power Table 1: when operate at body condition in standalone or transmit simultaneous with Bluetooth when WWAN off.
 - c. Power Table 2: when operate at head exposure condition.
 - d. Power Table 3: when operate at hotspot or body exposure condition when transmit simultaneously with WWAN on.

<Default Power Table>

<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	23	23	23	23	26
		6	2437	23	23	23	23	26
		11	2462	23	23	23	23	26
		12	2467	18.5	18.5	18.5	18.5	21.5
		13	2472	14	14	14	14	17
	802.11g 6Mbps	1	2412	18.5	18.5	18.5	18.5	21.5
		6	2437	22	22	22	22	25
		11	2462	18	18	18	18	21
		12	2467	12.5	12.5	12.5	12.5	15.5
	802.11n-HT20 MCS0	13	2472	2	-2	2	-2	3.5
		1	2412	18	18	18	18	21
		6	2437	22.5	22.5	22.5	22.5	25.5
		11	2462	17.5	17.5	17.5	17.5	20.5
	802.11ac-VHT20 MCS0	12	2467	10.5	10.5	10.5	10.5	13.5
		13	2472	2	-2	2	-2	3.5
		1	2412	18	18	18	18	21
		6	2437	22.5	22.5	22.5	22.5	25.5
		11	2462	17.5	17.5	17.5	17.5	20.5
		12	2467	10.5	10.5	10.5	10.5	13.5
		13	2472	2	-2	2	-2	3.5

<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	18.5	18.5	18.5	18.5	21.5
		40	5200	18.5	18.5	18.5	18.5	21.5
		44	5220	18.5	18.5	18.5	18.5	21.5
		48	5240	17.5	17.5	17.5	17.5	20.5
	802.11n-HT20 MCS0	36	5180	18.5	18.5	18.5	18.5	21.5
		40	5200	18.5	18.5	18.5	18.5	21.5
		44	5220	18.5	18.5	18.5	18.5	21.5
		48	5240	18.5	18.5	18.5	18.5	21.5
	802.11n-HT40 MCS0	38	5190	13	13	13	13	16
		46	5230	21	21	21	21	24
	802.11ac-VHT20 MCS0	36	5180	18.5	18.5	18.5	18.5	21.5
		40	5200	18.5	18.5	18.5	18.5	21.5
		44	5220	18.5	18.5	18.5	18.5	21.5
		48	5240	18.5	18.5	18.5	18.5	21.5
	802.11ac-VHT40 MCS0	38	5190	13	13	13	13	16
		46	5230	21	21	21	21	24
	802.11ac-VHT80 MCS0	42	5210	12.5	12.5	12.5	12.5	15.5



	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	17.5	17.5	17.5	17.5	20.5
		56	5280	17.5	17.5	17.5	17.5	20.5
		60	5300	17.5	17.5	17.5	17.5	20.5
		64	5320	17.5	17.5	17.5	17.5	20.5
	802.11n-HT20 MCS0	52	5260	18	18	18	18	21
		56	5280	18	18	18	18	21
		60	5300	18	18	18	18	21
		64	5320	18	18	18	18	21
	802.11n-HT40 MCS0	54	5270	21	21	21	21	24
		62	5310	13.5	13.5	13.5	13.5	16.5
	802.11ac-VHT20 MCS0	52	5260	18	18	18	18	21
		56	5280	18	18	18	18	21
		60	5300	18	18	18	18	21
		64	5320	18	18	18	18	21
	802.11ac-VHT40 MCS0	54	5270	21	21	21	21	24
		62	5310	13.5	13.5	13.5	13.5	16.5
802.11ac-VHT80 MCS0	58	5290	12	12	12	12	15	

	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	18	18	18	18	21
		116	5580	18	18	18	18	21
		124	5620	18	18	18	18	21
		132	5660	18	18	18	18	21
		140	5700	18	18	18	18	21
		144	5720	18	18	18	18	21
	802.11n-HT20 MCS0	100	5500	18	18	18	18	21
		116	5580	18	18	18	18	21
		124	5620	18	18	18	18	21
		132	5660	18	18	18	18	21
		140	5700	18	18	18	18	21
		144	5720	18	18	18	18	21
	802.11n-HT40 MCS0	102	5510	16	16	16	16	19
		110	5550	21	21	21	21	24
		126	5630	21	21	21	21	24
		134	5670	21	21	21	21	24
		142	5710	21	21	21	21	24
	802.11ac-VHT20 MCS0	100	5500	18	18	18	18	21
		116	5580	18	18	18	18	21
		124	5620	18	18	18	18	21
		132	5660	18	18	18	18	21
		140	5700	18	18	18	18	21
		144	5720	18	18	18	18	21
	802.11ac-VHT40 MCS0	102	5510	16	16	16	16	19
		110	5550	21	21	21	21	24
		126	5630	21	21	21	21	24
		134	5670	21	21	21	21	24
		142	5710	21	21	21	21	24
802.11ac-VHT80 MCS0	106	5530	13	13	13	13	16	
	122	5610	21	21	21	21	24	
	138	5690	21	21	21	21	24	



Transmit Antenna				SISO	SISO	MIMO		
5.8GHz WLAN	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	21	21	21	21	24
		157	5785	21	21	21	21	24
		165	5825	21	21	21	21	24
	802.11n-HT20 MCS0	149	5745	21	21	21	21	24
		157	5785	21	21	21	21	24
		165	5825	21	21	21	21	24
	802.11n-HT40 MCS0	151	5755	21	21	21	21	24
		159	5795	21	21	21	21	24
	802.11ac-VHT20 MCS0	149	5745	21	21	21	21	24
157		5785	21	21	21	21	24	
802.11ac-VHT40 MCS0	151	5755	21	21	21	21	24	
	159	5795	21	21	21	21	24	
802.11ac-VHT80 MCS0	155	5775	21	21	21	21	24	

<Power Table 1>

<2.4GHz WLAN>

Transmit Antenna				SISO	SISO	MIMO		
2.4GHz WLAN	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
	802.11b 1Mbps	1	2412	23	23	23	23	26
		6	2437	23	23	23	23	26
		11	2462	23	23	23	23	26
		12	2467	18.5	18.5	18.5	18.5	21.5
		13	2472	14	14	14	14	17
	802.11g 6Mbps	1	2412	18.5	18.5	18.5	18.5	21.5
		6	2437	22	22	22	22	25
		11	2462	18	18	18	18	21
		12	2467	12.5	12.5	12.5	12.5	15.5
		13	2472	2	-2	2	-2	3.5
	802.11n-HT20 MCS0	1	2412	18	18	18	18	21
		6	2437	22.5	22.5	22.5	22.5	25.5
		11	2462	17.5	17.5	17.5	17.5	20.5
		12	2467	10.5	10.5	10.5	10.5	13.5
		13	2472	2	-2	2	-2	3.5
	802.11ac-VHT20 MCS0	1	2412	18	18	18	18	21
6		2437	22.5	22.5	22.5	22.5	25.5	
11		2462	17.5	17.5	17.5	17.5	20.5	
12		2467	10.5	10.5	10.5	10.5	13.5	
13		2472	2	-2	2	-2	3.5	



<5GHz WLAN>

Transmit Antenna				SISO	SISO	MIMO		
5.2GHz WLAN	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	36	5180	18.5	18.5	18.5	18.5	21.5
		40	5200	18.5	18.5	18.5	18.5	21.5
		44	5220	18.5	18.5	18.5	18.5	21.5
		48	5240	17.5	17.5	17.5	17.5	20.5
	802.11n-HT20 MCS0	36	5180	18.5	18.5	18.5	18.5	21.5
		40	5200	18.5	18.5	18.5	18.5	21.5
		44	5220	18.5	18.5	18.5	18.5	21.5
	802.11n-HT40 MCS0	38	5190	13	13	13	13	16
		46	5230	21	21	21	21	24
802.11ac-VHT20 MCS0	36	5180	18.5	18.5	18.5	18.5	21.5	
	40	5200	18.5	18.5	18.5	18.5	21.5	
	44	5220	18.5	18.5	18.5	18.5	21.5	
802.11ac-VHT40 MCS0	48	5240	18.5	18.5	18.5	18.5	21.5	
	38	5190	13	13	13	13	16	
802.11ac-VHT80 MCS0	46	5230	21	21	21	21	24	
	42	5210	12.5	12.5	12.5	12.5	15.5	

Transmit Antenna				SISO	SISO	MIMO			
5.3GHz WLAN	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	52	5260	17.5	17.5	17.5	17.5	17.5	20.5
		56	5280	17.5	17.5	17.5	17.5	17.5	20.5
		60	5300	17.5	17.5	17.5	17.5	17.5	20.5
		64	5320	17.5	17.5	17.5	17.5	17.5	20.5
	802.11n-HT20 MCS0	52	5260	18	18	18	18	18	21
		56	5280	18	18	18	18	18	21
		60	5300	18	18	18	18	18	21
	802.11n-HT40 MCS0	64	5320	18	18	18	18	18	21
		54	5270	21	21	21	21	24	
802.11ac-VHT20 MCS0	62	5310	13.5	13.5	13.5	13.5	16.5		
	52	5260	18	18	18	18	18	21	
802.11ac-VHT40 MCS0	56	5280	18	18	18	18	18	21	
	60	5300	18	18	18	18	18	21	
	64	5320	18	18	18	18	18	21	
802.11ac-VHT80 MCS0	54	5270	21	21	21	21	24		
	62	5310	13.5	13.5	13.5	13.5	16.5		
802.1118.00ac-VHT80 MCS0	58	5290	12	12	12	12	15		



	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	18	18	18	18	21
		116	5580	18	18	18	18	21
		124	5620	18	18	18	18	21
		132	5660	18	18	18	18	21
		140	5700	18	18	18	18	21
		144	5720	18	18	18	18	21
	802.11n-HT20 MCS0	100	5500	18	18	18	18	21
		116	5580	18	18	18	18	21
		124	5620	18	18	18	18	21
		132	5660	18	18	18	18	21
		140	5700	18	18	18	18	21
	802.11n-HT40 MCS0	102	5510	16	16	16	16	19
		110	5550	21	21	21	21	24
		126	5630	21	21	21	21	24
		134	5670	21	21	21	21	24
	802.11ac-VHT20 MCS0	142	5710	20.5	20.5	20.5	20.5	23.5
		100	5500	18	18	18	18	21
		116	5580	18	18	18	18	21
		124	5620	18	18	18	18	21
		132	5660	18	18	18	18	21
	802.11ac-VHT40 MCS0	140	5700	18	18	18	18	21
		144	5720	18	18	18	18	21
		102	5510	16	16	16	16	19
		110	5550	21	21	21	21	24
		126	5630	21	21	21	21	24
	802.11ac-VHT80 MCS0	134	5670	20.5	20.5	20.5	20.5	23.5
		142	5710	20.5	20.5	20.5	20.5	23.5
		106	5530	13	13	13	13	16
		122	5610	21	21	21	21	24
		138	5690	20.5	20.5	20.5	20.5	23.5

	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
5.8GHz WLAN	802.11a 6Mbps	149	5745	21	21	21	21	24
		157	5785	21	21	21	21	24
		165	5825	21	21	21	21	24
	802.11n-HT20 MCS0	149	5745	21	21	21	21	24
		157	5785	20.5	20.5	20.5	20.5	23.5
		165	5825	20.5	20.5	20.5	20.5	23.5
	802.11n-HT40 MCS0	151	5755	21	21	21	21	24
		159	5795	21	21	21	21	24
	802.11ac-VHT20 MCS0	149	5745	21	21	21	21	24
		157	5785	20.5	20.5	20.5	20.5	23.5
		165	5825	20.5	20.5	20.5	20.5	23.5
	802.11ac-VHT40 MCS0	151	5755	21	21	21	21	24
		159	5795	21	21	21	21	24
	802.11ac-VHT80 MCS0	155	5775	21	21	21	21	24



<Power Table 2>

<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	16.00	17.50	16.00	17.50	19.80
		6	2437	16.00	17.50	16.00	17.50	19.80
		11	2462	16.00	17.50	16.00	17.50	19.80
		12	2467	16.00	17.50	16.00	17.50	19.80
		13	2472	16.00	17.50	16.00	17.50	19.80
	802.11g 6Mbps	1	2412	16.00	17.50	16.00	17.50	19.80
		6	2437	16.00	17.50	16.00	17.50	19.80
		11	2462	16.00	17.50	16.00	17.50	19.80
		12	2467	12.50	12.50	12.50	12.50	15.50
	802.11n-HT20 MCS0	13	2472	2.00	0.00	2.00	0.00	4.10
		1	2412	16.00	17.50	16.00	17.50	19.80
		6	2437	16.00	17.50	16.00	17.50	19.80
		11	2462	16.00	17.50	16.00	17.50	19.80
	802.11ac-VHT20 MCS0	12	2467	11.00	10.50	11.00	10.50	13.80
		13	2472	2.00	0.00	2.00	0.00	4.10
		1	2412	16.00	17.50	16.00	17.50	19.80
		6	2437	16.00	17.50	16.00	17.50	19.80
	802.11ac-VHT20 MCS0	11	2462	16.00	17.50	16.00	17.50	19.80
		12	2467	11.00	11.00	11.00	11.00	14.00
		13	2472	2.00	0.00	2.00	0.00	4.10

<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	9.50	11.50	9.50	11.50	13.60
		40	5200	9.50	11.50	9.50	11.50	13.60
		44	5220	9.50	11.50	9.50	11.50	13.60
		48	5240	9.50	11.50	9.50	11.50	13.60
	802.11n-HT20 MCS0	36	5180	9.50	11.50	9.50	11.50	13.60
		40	5200	9.50	11.50	9.50	11.50	13.60
		44	5220	9.50	11.50	9.50	11.50	13.60
		48	5240	9.50	11.50	9.50	11.50	13.60
	802.11n-HT40 MCS0	38	5190	9.50	11.50	9.50	11.50	13.60
		46	5230	9.50	11.50	9.50	11.50	13.60
	802.11ac-VHT20 MCS0	36	5180	9.50	11.50	9.50	11.50	13.60
		40	5200	9.50	11.50	9.50	11.50	13.60
		44	5220	9.50	11.50	9.50	11.50	13.60
		48	5240	9.50	11.50	9.50	11.50	13.60
	802.11ac-VHT40 MCS0	38	5190	9.50	11.50	9.50	11.50	13.60
		46	5230	9.50	11.50	9.50	11.50	13.60
	802.11ac-VHT80 MCS0	42	5210	9.50	11.50	9.50	11.50	13.60



5.3GHz 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		52	5260	9.50	11.50	9.50	11.50	13.60
		56	5280	9.50	11.50	9.50	11.50	13.60
		60	5300	9.50	11.50	9.50	11.50	13.60
		64	5320	9.50	11.50	9.50	11.50	13.60
802.11n-HT20 MCS0		52	5260	9.50	11.50	9.50	11.50	13.60
		56	5280	9.50	11.50	9.50	11.50	13.60
		60	5300	9.50	11.50	9.50	11.50	13.60
		64	5320	9.50	11.50	9.50	11.50	13.60
802.11n-HT40 MCS0		54	5270	9.50	11.50	9.50	11.50	13.60
		62	5310	9.50	11.50	9.50	11.50	13.60
802.11ac-VHT20 MCS0		52	5260	9.50	11.50	9.50	11.50	13.60
		56	5280	9.50	11.50	9.50	11.50	13.60
		60	5300	9.50	11.50	9.50	11.50	13.60
		64	5320	9.50	11.50	9.50	11.50	13.60
802.11ac-VHT40 MCS0		54	5270	9.50	11.50	9.50	11.50	13.60
		62	5310	9.50	11.50	9.50	11.50	13.60
802.11ac-VHT80 MCS0		58	5290	9.50	11.50	9.50	11.50	13.60

5.5GHz 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
802.11a 6Mbps		100	5500	9.00	12.00	9.00	12.00	13.80
		116	5580	9.00	12.00	9.00	12.00	13.80
		124	5620	9.00	12.00	9.00	12.00	13.80
		132	5660	9.00	12.00	9.00	12.00	13.80
		140	5700	9.00	12.00	9.00	12.00	13.80
		144	5720	9.00	12.00	9.00	12.00	13.80
802.11n-HT20 MCS0		100	5500	9.00	12.00	9.00	12.00	13.80
		116	5580	9.00	12.00	9.00	12.00	13.80
		124	5620	9.00	12.00	9.00	12.00	13.80
		132	5660	9.00	12.00	9.00	12.00	13.80
		140	5700	9.00	12.00	9.00	12.00	13.80
		144	5720	9.00	12.00	9.00	12.00	13.80
802.11n-HT40 MCS0		102	5510	9.00	12.00	9.00	12.00	13.80
		110	5550	9.00	12.00	9.00	12.00	13.80
		126	5630	9.00	12.00	9.00	12.00	13.80
		134	5670	9.00	12.00	9.00	12.00	13.80
		142	5710	9.00	12.00	9.00	12.00	13.80
802.11ac-VHT20 MCS0		100	5500	9.00	12.00	9.00	12.00	13.80
		116	5580	9.00	12.00	9.00	12.00	13.80
		124	5620	9.00	12.00	9.00	12.00	13.80
		132	5660	9.00	12.00	9.00	12.00	13.80
		140	5700	9.00	12.00	9.00	12.00	13.80
		144	5720	9.00	12.00	9.00	12.00	13.80
802.11ac-VHT40 MCS0		102	5510	9.00	12.00	9.00	12.00	13.80
		110	5550	9.00	12.00	9.00	12.00	13.80
		126	5630	9.00	12.00	9.00	12.00	13.80
		134	5670	9.00	12.00	9.00	12.00	13.80
		142	5710	9.00	12.00	9.00	12.00	13.80
802.11ac-VHT80 MCS0		106	5530	9.00	12.00	9.00	12.00	13.80
		122	5610	9.00	12.00	9.00	12.00	13.80
		138	5690	9.00	12.00	9.00	12.00	13.80



Transmit Antenna				SISO	SISO	MIMO		
5.8GHz WLAN	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	9.00	12.50	9.00	12.50	14.10
		157	5785	9.00	12.50	9.00	12.50	14.10
		165	5825	9.00	12.50	9.00	12.50	14.10
	802.11n-HT20 MCS0	149	5745	9.00	12.50	9.00	12.50	14.10
		157	5785	9.00	12.50	9.00	12.50	14.10
		165	5825	9.00	12.50	9.00	12.50	14.10
	802.11n-HT40 MCS0	151	5755	9.00	12.50	9.00	12.50	14.10
		159	5795	9.00	12.50	9.00	12.50	14.10
	802.11ac-VHT20 MCS0	149	5745	9.00	12.50	9.00	12.50	14.10
157		5785	9.00	12.50	9.00	12.50	14.10	
165		5825	9.00	12.50	9.00	12.50	14.10	
802.11ac-VHT40 MCS0	151	5755	9.00	12.50	9.00	12.50	14.10	
	159	5795	9.00	12.50	9.00	12.50	14.10	
802.11ac-VHT80 MCS0	155	5775	9.00	12.50	9.00	12.50	14.10	

<Power Table 3>

<2.4GHz WLAN>

Transmit Antenna				SISO	SISO	MIMO		
2.4GHz WLAN	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
	802.11b 1Mbps	1	2412	23.00	23.00	23.00	23.00	26.00
		6	2437	23.00	23.00	23.00	23.00	26.00
		11	2462	23.00	23.00	23.00	23.00	26.00
		12	2467	18.50	18.50	18.50	18.50	21.50
		13	2472	14.00	14.00	14.00	14.00	17.00
	802.11g 6Mbps	1	2412	18.50	18.50	18.50	18.50	21.50
		6	2437	22.00	22.00	22.00	22.00	25.00
		11	2462	18.00	18.00	18.00	18.00	21.00
		12	2467	12.50	12.50	12.50	12.50	15.50
		13	2472	2.00	-2.00	2.00	-2.00	3.50
	802.11n-HT20 MCS0	1	2412	18.00	18.00	18.00	18.00	21.00
		6	2437	22.50	22.50	22.50	22.50	25.50
		11	2462	17.50	17.50	17.50	17.50	20.50
		12	2467	10.50	10.50	10.50	10.50	13.50
		13	2472	2.00	-2.00	2.00	-2.00	3.50
	802.11ac-VHT20 MCS0	1	2412	18.00	18.00	18.00	18.00	21.00
		6	2437	22.50	22.50	22.50	22.50	25.50
		11	2462	17.50	17.50	17.50	17.50	20.50
		12	2467	10.50	10.50	10.50	10.50	13.50
13		2472	2.00	-2.00	2.00	-2.00	3.50	



<5GHz WLAN>

Transmit Antenna				SISO	SISO	MIMO		
5.2GHz WLAN	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		36	5180	18.50	18.50	18.50	18.50
40			5200	18.50	18.50	18.50	18.00	21.30
44			5220	18.50	18.50	18.50	17.50	21.00
48			5240	17.50	17.50	17.50	17.00	20.30
802.11n-HT20 MCS0		36	5180	18.50	18.50	18.50	18.50	21.50
		40	5200	18.50	18.50	18.50	18.50	21.50
		44	5220	18.50	18.50	18.50	18.50	21.50
802.11n-HT40 MCS0		38	5190	13.00	13.00	13.00	13.00	16.00
		46	5230	21.00	20.50	21.00	20.50	23.80
		36	5180	18.50	18.50	18.50	18.50	21.50
802.11ac-VHT20 MCS0		40	5200	18.50	18.50	18.50	18.50	21.50
		44	5220	18.50	18.50	18.50	18.50	21.50
		48	5240	18.50	18.50	18.50	18.50	21.50
802.11ac-VHT40 MCS0		38	5190	13.00	13.00	13.00	13.00	16.00
		46	5230	21.00	20.50	21.00	20.50	23.80
802.11ac-VHT80 MCS0		42	5210	12.50	12.50	12.50	12.50	15.50

Transmit Antenna				SISO	SISO	MIMO		
5.3GHz WLAN	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		52	5260	17.50	17.50	17.50	17.50
56			5280	17.50	17.50	17.50	17.50	20.50
60			5300	17.50	17.50	17.50	17.50	20.50
64			5320	17.50	17.50	17.50	17.50	20.50
802.11n-HT20 MCS0		52	5260	18.00	18.00	18.00	18.00	21.00
		56	5280	18.00	18.00	18.00	18.00	21.00
		60	5300	18.00	18.00	18.00	18.00	21.00
802.11n-HT40 MCS0		54	5270	21.00	21.00	21.00	21.00	24.00
		62	5310	13.50	13.50	13.50	13.50	16.50
		52	5260	18.00	18.00	18.00	18.00	21.00
802.11ac-VHT20 MCS0		56	5280	18.00	18.00	18.00	18.00	21.00
		60	5300	18.00	18.00	18.00	18.00	21.00
		64	5320	18.00	18.00	18.00	18.00	21.00
802.11ac-VHT40 MCS0		54	5270	21.00	21.00	21.00	21.00	24.00
		62	5310	13.50	13.50	13.50	13.50	16.50
802.11ac-VHT80 MCS0		58	5290	12.00	12.00	12.00	12.00	15.00



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	18.00	18.00	18.00	18.00	21.00
		116	5580	18.00	18.00	18.00	18.00	21.00
		124	5620	18.00	18.00	18.00	18.00	21.00
		132	5660	18.00	18.00	18.00	18.00	21.00
		140	5700	18.00	18.00	18.00	18.00	21.00
		144	5720	18.00	18.00	18.00	18.00	21.00
	802.11n-HT20 MCS0	100	5500	18.00	18.00	18.00	18.00	21.00
		116	5580	18.00	18.00	18.00	18.00	21.00
		124	5620	18.00	18.00	18.00	18.00	21.00
		132	5660	18.00	18.00	18.00	18.00	21.00
		144	5720	18.00	18.00	18.00	18.00	21.00
	802.11n-HT40 MCS0	102	5510	16.00	16.00	16.00	16.00	19.00
		110	5550	20.00	21.00	20.00	21.00	23.50
		126	5630	20.00	21.00	20.00	21.00	23.50
		134	5670	20.00	21.00	20.00	21.00	23.50
		142	5710	20.00	20.50	20.00	20.50	23.30
	802.11ac-VHT20 MCS0	100	5500	18.00	18.00	18.00	18.00	21.00
		116	5580	18.00	18.00	18.00	18.00	21.00
		124	5620	18.00	18.00	18.00	18.00	21.00
		132	5660	18.00	18.00	18.00	18.00	21.00
		144	5720	18.00	18.00	18.00	18.00	21.00
	802.11ac-VHT40 MCS0	102	5510	16.00	16.00	16.00	16.00	19.00
		110	5550	20.00	21.00	20.00	21.00	23.50
		126	5630	20.00	21.00	20.00	21.00	23.50
		134	5670	20.00	20.50	20.00	20.50	23.30
		142	5710	20.00	20.50	20.00	20.50	23.30
	802.11ac-VHT80 MCS0	106	5530	13.00	13.00	13.00	13.00	16.00
		122	5610	20.00	21.00	20.00	21.00	23.50
138		5690	20.00	20.50	20.00	20.50	23.30	

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
5.8GHz WLAN	802.11a 6Mbps	149	5745	21.00	21.00	21.00	21.00	24.00
		157	5785	21.00	21.00	21.00	21.00	24.00
		165	5825	21.00	21.00	21.00	21.00	24.00
	802.11n-HT20 MCS0	149	5745	21.00	21.00	21.00	21.00	24.00
		157	5785	20.50	20.50	20.50	20.50	23.50
		165	5825	20.50	20.50	20.50	20.50	23.50
	802.11n-HT40 MCS0	151	5755	21.00	21.00	21.00	21.00	24.00
		159	5795	21.00	21.00	21.00	21.00	24.00
	802.11ac-VHT20 MCS0	149	5745	21.00	21.00	21.00	21.00	24.00
		157	5785	20.50	20.50	20.50	20.50	23.50
		165	5825	20.50	20.50	20.50	20.50	23.50
	802.11ac-VHT40 MCS0	151	5755	21.00	21.00	21.00	21.00	24.00
		159	5795	21.00	21.00	21.00	21.00	24.00
	802.11ac-VHT80 MCS0	155	5775	21.00	21.00	21.00	21.00	24.00



<Bluetooth Maximum Power>

General Note:

- 1. The device implements the power management for Bluetooth SAR compliance at different exposure conditions (head, body-worn, hotspot). The control logic about the power management decision is provided in the operational description.
- 2. The Bluetooth power table relate to each exposure condition is description below:
 - a. Default Power Table: when operate at mobile condition.
 - b. Power Table 1: when operate at body condition in standalone or transmit simultaneous with WLAN when WWAN off or transmit simultaneous with WWAN when WLAN off.
 - c. Power Table 2: when operate at head exposure condition.
 - d. Power Table 3: when operate at hotspot or body exposure condition and transmit simultaneously with WWAN/WLAN on.

<Default Power Table>

Mode	Average power (dBm)				
	BR / EDR			LE	
	1Mbps	2Mbps	3Mbps	1Mbps	2Mbps
Tune-up Limit	19.50	19.50	19.50	19.50	19.50

<Power Table1>

Mode	Average power (dBm)				
	BR / EDR			LE	
	1Mbps	2Mbps	3Mbps	1Mbps	2Mbps
Tune-up Limit	19.50	19.50	19.50	19.00	19.00

<Power Table 2>

Mode	Average power (dBm)				
	BR / EDR			LE	
	1Mbps	2Mbps	3Mbps	1Mbps	2Mbps
Tune-up Limit	12.00	12.00	12.00	12.00	12.00

<Power Table 3>

Mode	Average power (dBm)				
	BR / EDR			LE	
	1Mbps	2Mbps	3Mbps	1Mbps	2Mbps
Tune-up Limit	19.50	19.50	19.50	19.00	19.00



3.3 General 5G NR and LTE SAR Test and Reporting Considerations

LTE Information																																																															
FCC ID	A4RGD1YQ																																																														
Equipment Name	Phone																																																														
Operating Frequency Range of each LTE transmission band	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																																																														
Channel Bandwidth	LTE Band 02: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 04: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 05: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 07: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 14: 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 25: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 26: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz LTE Band 30: 5MHz, 10MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 48: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 66: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 71: 5MHz, 10MHz, 15MHz, 20MHz																																																														
UE Rel and Cat.	Rel15, UL cat. 13, DL cat. 18																																																														
uplink modulations used	QPSK / 16QAM / 64QAM																																																														
LTE Voice / Data requirements	Voice and Data																																																														
LTE MPR permanently built-in by design	<p>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table>	Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3	256 QAM	≥ 1						≤ 5
Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})						MPR (dB)																																																								
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																																									
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																																								
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																																								
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																																								
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2																																																								
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3																																																								
256 QAM	≥ 1						≤ 5																																																								
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)																																																														
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																																														
Power reduction applied to satisfy SAR compliance	The device has several different power modes for head / hotspot conditions SAR compliance; power selection is determined by the device's positioning and usage scenarios.																																																														
LTE Carrier Aggregation Combinations	Inter-Band and Intra-Band possible combinations and the detail power measurement please referred to section13																																																														
LTE Carrier Aggregation Additional Information	1. This device supports LTE Carrier Aggregation (CA) in the uplink for LTE B5/B7/B41/B48/B66 with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per FCC Guidance. 2. This device supports maximum of 4 carriers in the downlink and 2 carriers in the uplink. Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.																																																														



Transmission (H, M, L) channel numbers and frequencies in each LTE band																
LTE Band 2																
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860				
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880				
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900				
LTE Band 4																
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720				
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5				
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745				
LTE Band 5																
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	20407	824.7	20415	825.5	20425	826.5	20425	826.5	20450	829	20450	829				
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5	20525	836.5	20525	836.5				
H	20643	848.3	20635	847.5	20625	846.5	20625	846.5	20600	844	20600	844				
LTE Band 7																
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510	20875	2512.5	20900	2515				
M	21100	2535	21100	2535	21100	2535	21100	2535	21100	2535	21100	2535				
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560	21325	2557.5	21300	2555				
LTE Band 12																
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	23017	699.7	23025	700.5	23035	701.5	23060	704	23085	707	23110	710				
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5	23095	707.5	23095	707.5				
H	23173	715.3	23165	714.5	23155	713.5	23130	711	23105	708	23080	706				
LTE Band 13																
	Bandwidth 5 MHz				Bandwidth 10 MHz				Bandwidth 15 MHz				Bandwidth 20 MHz			
	Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #		Freq.(MHz)	
L	23205		779.5		23230		782		23255		785		23280		788	
M	23230		782		23230		782		23230		782		23230		782	
H	23255		784.5		23230		782		23255		785		23280		788	
LTE Band 14																
	Bandwidth 5 MHz				Bandwidth 10 MHz				Bandwidth 15 MHz				Bandwidth 20 MHz			
	Channel #		Channel #		Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #		Freq.(MHz)	
L	23305		790.5		23330		793		23355		796		23380		799	
M	23330		793		23330		793		23330		793		23330		793	
H	23355		795.5		23330		793		23355		796		23380		799	
LTE Band 17																
	Bandwidth 5 MHz				Bandwidth 10 MHz				Bandwidth 15 MHz				Bandwidth 20 MHz			
	Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #		Freq.(MHz)	
L	23755		706.5		23780		709		23805		712		23830		715	
M	23790		710		23790		710		23790		710		23790		710	
H	23825		713.5		23800		711		23825		714		23850		717	
LTE Band 25																
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	26047	1850.7	26055	1851.5	26065	1852.5	26090	1855	26115	1857.5	26140	1860				
M	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880				
H	26683	1914.3	26675	1913.5	26665	1912.5	26640	1910	26615	1907.5	26590	1905				



LTE Band 26												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz			
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5		
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5		
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5		
LTE Band 30												
	Bandwidth 5 MHz				Bandwidth 10 MHz							
	Channel #		Freq.(MHz)		Channel #		Freq.(MHz)					
L	27685		2307.5		27710		2310					
M	27710		2310									
H	27735		2312.5									
LTE Band 38												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580				
M	38000	2595	38000	2595	38000	2595	38000	2595				
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610				
LTE Band 41												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506				
L	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5				
M	40620	2593	40620	2593	40620	2593	40620	2593				
H	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5				
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680				
LTE Band 66												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770
LTE Band 71												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	133147	665.5	133172	668	133197	670.5	133222	673				
M	133297	680.5	133297	680.5	133297	680.5	133297	680.5				
H	133447	695.5	133422	693	133397	690.5	133372	688				
LTE Band 48												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	55265	3552.5	55290	3555	55315	3557.5	55340	3560				
L	55810	3607	55815	3607.5	55820	3608	55830	3609				
M	56170	3643	56165	3642.5	56160	3642	56150	3641				
H	56715	3697.5	56690	3695	56665	3692.5	56640	3690				



5G NR Information								
FCC ID	A4RGD1YQ							
Equipment Name	Phone							
Operating Frequency Range of each 5G NR transmission band	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 n25 : 1850 MHz ~ 1915 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77 : 3700 MHz ~ 3980 MHz							
Channel Bandwidth	5G NR n2: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n5: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n7: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n12: 5MHz, 10MHz, 15MHz 5G NR n25: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n41: 20MHz, 40MHz, 50MHz, 60MHz, 80MHz, 90MHz, 100MHz 5G NR n66: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n71: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n77: 10MHz, 15MHz, 20MHz, 40MHz, 50MHz, 60MHz, 80MHz, 90MHz, 100MHz							
SCS	FDD: SCS15KHz, TDD: SCS30KHz							
uplink modulations used	DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM CP-OFDM QPSK / 16QAM / 64QAM / 256QAM							
A-MPR (Additional MPR) disabled for SAR Testing?	Yes							
LTE Anchor Bands for n2	LTE B5/12/13/14							
LTE Anchor Bands for n5	LTE B2/7/30/48/66							
LTE Anchor Bands for n7	LTE B5/12							
LTE Anchor Bands for n12	LTE B2/66							
LTE Anchor Bands for n25	LTE B12							
LTE Anchor Bands for n41	LTE B2/4/25/26/41/66							
LTE Anchor Bands for n66	LTE B5/12/13/14/48/71							
LTE Anchor Bands for n71	LTE B2/7/66							
LTE Anchor Bands for n77	LTE B41							
Transmission (H, M, L) channel numbers and frequencies in each 5G NR band								
NR Band 2								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	370500	1852.5	371000	1855	371500	1857.5	372000	1860
M	376000	1880	376000	1880	376000	1880	376000	1880
H	381500	1907.5	381000	1905	380500	1902.5	380000	1900
NR Band 5								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	165300	826.5	165800	829	166300	831.5	166800	834
M	167300	836.5	167300	836.5	167300	836.5	167300	836.5
H	169300	846.5	168800	844	168300	841.5	167800	839
NR Band 7								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	500500	2502.5	501000	2505	501500	2507.5	502000	2510
M	507000	2535	507000	2535	507000	2535	507000	2535
H	513500	2567.5	513000	2565	512500	2562.5	512000	2560
NR Band 12								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	140300	701.5	140800	704	141300	706.5	141800	709
M	141500	707.5	141500	707.5	141500	707.5	141500	707.5
H	142700	713.5	142200	711	141700	708.5	141200	706



NR Band 25													
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz						
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)					
L	370500	1852.5	371000	1855	371500	1857.5	372000	1860					
M	376000	1880	376000	1880	376000	1880	376000	1880					
H	382500	1912.5	382000	1910	381500	1907.5	381000	1905					

NR Band 41														
	Bandwidth 20MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	501204	2506.02	503202	2516.01	504204	2521.02	505200	2526	507204	2536.02	508200	2541	509202	2546.01
M	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99
H	535998	2679.99	534000	2670	532998	2664.99	531996	2659.98	529998	2649.99	528996	2644.98	528000	2640

NR Band 66								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	342500	1712.5	343000	1715	343500	1717.5	344000	1720
M	349000	1745	349000	1745	349000	1745	349000	1745
H	355500	1777.5	355000	1775	354500	1772.5	354000	1770

NR Band 71								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	133100	665.5	133600	668	13410	670.5	134600	673
M	136100	680.5	136100	680.5	136100	680.5	136100	680.5
H	139100	695.5	138600	693	13810	690.5	137600	688

NR Band 77														
	Bandwidth 20MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	647334	3710.01	648000	3720	648334	3725.01	648668	3730.02	649334	3740.01	649668	3745.02	650000	3750
M	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840
H	664668	3970.02	664000	3960	663668	3955.02	663334	3950.01	662668	3940.02	662334	3935.01	662000	3930

4. Smart Transmit feature for RF Exposure compliance

The FCC RF exposure limit is defined based on time-averaged RF exposure. The product implements Qualcomm Smart Transmit feature which controls the instantaneous transmitting power for WWAN transmitter to ensure the product in compliance with FCC RF exposure limit over a defined time window, for SAR (transmit frequency ≤ 6GHz). To control and manage transmitting power in real time and to ensure at all times the time-averaged RF exposure is compliant to the regulation requirement.

This report describes the procedures for the SAR char generation, and the parameters obtained from SAR characterization (referred to as SAR char, respectively) will be used as input for Smart Transmit. SAR char will be entered via the Embedded File System (EFS) to enable the Smart Transmit Feature.

<Terminologies in this report>

P _{limit}	The time-averaged RF power which corresponds to SAR _{design_target} .
P _{max}	Maximum target power level
SAR _{design_target} :	The design target for SAR compliance. It should be less than regulatory power density limit to account for all device design related uncertainties.
SAR char	P _{limit} for all the technologies/bands for all applicable DSI

<SAR Characterization>

SAR char must be generated to cover all radio configurations and usage scenarios that the wireless device supports for operating at 6 GHz or below. It will then be used as input for Smart Transmit to control and manage RF exposure for f < 6 GHz.

<SAR design target and uncertainty>

The detail SAR design target relate to each exposure conditions pls refer to operation description

	Uncertainty dB (k=2)
Total uncertainty	1.0

To account for total uncertainty, SAR_{design_target} should be determined as:

$$SAR_{design_target} < SAR_{regulatory_limit} \times 10^{\frac{-total\ uncertainty}{10}}$$

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of SAR_design_target, below the predefined time-averaged power limit, for each characterized technology and band.

Smart Transmit allows the device to transmit at higher power instantaneously, as high as Pmax, when needed, but enforces power limiting to maintain time-averaged transmit power to Plimit. Below table shows Plimit EFS settings and maximum tune up output power Pmax configured for this EUT for various transmit conditions (Device State Index DSI).

<P_{limit} for supported technologies and bands (P_{limit} in EFS file)>

Config 0							
Band	Antenna	Head Standalone (DSI:2)	Body Worn Standalone (DSI:4)	Hotspot (DSI:6)	Head Simultaneous (DSI:7)	Body Worn Simultaneous (DSI:8)	Pmax*
GSM850(GPRS 4 Tx slots)**	0	29.8	29.9	29.1	29.0	29.1	26.0
GSM1900(GPRS 4 Tx slots)**	2	29.8	25.2	25.1	29.0	24.4	24.0
WCDMA B2	2	27.7	24.5	23.2	26.9	23.7	24.0
WCDMA B4	2	27.5	24.8	23.8	26.7	24.0	24.0
WCDMA B5	0	30.0	29.6	28.8	29.2	28.8	24.0
CDMA BC0	0	29.9	30.0	29.2	29.1	29.2	24.0
CDMA BC1	2	27.5	23.7	22.7	26.7	22.9	24.0
CDMA BC10	0	30.8	30.4	29.6	30.0	29.6	24.0
LTE B7	2	28.5	22.1	17.7	27.7	21.3	24.0
LTE B12/17	0	31.8	29.9	29.1	31.0	29.1	24.0
LTE B13	0	30.8	29.4	28.6	30.0	28.6	24.0
LTE B14	0	30.8	29.5	28.7	30.0	28.7	24.0
LTE B25/2	2	27.8	24	23.2	27.0	24.0	24.0
LTE B26/5	0	30.0	29.7	28.9	29.2	28.9	24.0
LTE B30	2	27.6	21.9	18.7	26.8	21.1	24.0
LTE B41/38**	2	27.0	22.0	17.2	26.2	21.2	22.0
LTE B41/38 HPUE**	2	27.0	22.0	17.2	26.2	21.2	22.9
LTE B48**	7	25.1	24.2	22.2	24.3	23.4	22.0
LTE B66/4	2	28.4	25.0	24.2	27.6	24.2	24.0
LTE B71	0	32.6	31.2	30.4	31.8	30.4	24.0
FR1 n25/2	2	27.8	23.9	23.1	27.0	23.1	24.0
FR1 n5	0	33.2	41.9	41.1	32.4	41.1	24.0
FR1 n7	2	27.9	21.6	18.2	27.1	20.8	24.0
FR1 n12	0	33.3	31.9	31.1	32.5	31.1	24.0
FR1 n41	2	26.8	20.8	19.3	26.0	20.0	19.2
FR1 n41 HPUE**	5	19.4	24.5	24.8	18.6	23.7	21.7
FR1 n66	2	29.0	25.4	24.6	28.2	24.6	24.0
FR1 n71	0	33.5	35.2	34.4	32.7	34.4	24.0
FR1 n77**	7	23.8	25.3	22.6	23.0	25.3	19.2
FR1 n77 HPUE**	7	23.8	25.3	22.6	23.0	25.3	21.7

Config 1							
Band	Antenna	Head Standalone (DSI:2)	Body Worn Standalone (DSI:4)	Hotspot (DSI:6)	Head Simultaneous (DSI:7)	Body Worn Simultaneous (DSI:8)	Pmax*
WCDMA B2	0	27.7	27.6	24.3	26.9	26.8	24.0
WCDMA B4	0	29.8	22.0	20.9	29.0	21.2	24.0
WCDMA B5	1	27.1	30.9	30.1	26.3	30.1	24.0
CDMA BC0	1	29.0	30.2	29.4	28.2	29.4	24.0
CDMA BC1	0	27.7	24.8	23.1	26.9	24.0	24.0
CDMA BC10	1	27.9	30.6	29.8	27.1	29.8	24.0
LTE B7	0	25.0	24.5	23.7	24.2	23.7	24.0
LTE B12/17	1	29.0	31.4	30.6	28.2	30.6	24.0
LTE B13	1	28.4	31.5	30.7	27.6	30.7	24.0
LTE B14	1	27.9	30.8	30.0	27.1	30.0	24.0
LTE B25/2	0	27.3	27.3	25.0	26.5	26.5	24.0
LTE B26/5	1	27.6	31.1	30.3	26.8	30.3	24.0
LTE B30	0	25.6	26.6	23.7	24.8	25.8	24.0
LTE B41/38**	0	26.6	24.7	23.9	25.8	23.9	22.0
LTE B41/38_HPUE**	0	26.6	24.7	23.9	25.8	23.9	22.9
LTE B48**	2	25.7	24.6	22.3	24.9	23.8	20.5
LTE B66/4	0	28.0	22.0	20.7	27.2	21.2	24.0
LTE B71	1	28.9	32.4	31.6	28.1	31.6	24.0
FR1 n25/2	0	37.3	30.5	32.5	36.5	29.7	24.0
FR1 n5	1	26.4	43.0	42.2	25.6	42.2	24.0
FR1 n7	0	25.9	24.6	23.8	25.1	23.8	24.0
FR1 n12	1	28.4	30.9	28.6	27.6	30.1	24.0
FR1 n41**	0	25.1	25.4	24.6	24.3	24.6	19.2
FR1 n66	0	35.4	32.9	27.8	34.6	32.1	24.0
FR1 n71	1	27.3	31.8	31.0	26.5	31.0	24.0
FR1 n77	2	27.7	28.6	25.5	27.7	25.5	17.7
FR1 n77 HPUE**	2	27.7	28.6	25.5	27.7	25.5	20.7

*P_{max} is used for RF tune up procedure. The maximum allowed output power is equal to P_{max} + 1dB uncertainty.

**All P_{limit} power levels entered in the Table correspond to average power levels after accounting for duty cycle in the case TDD modulation schemes (for e.g., GSM & LTE TDD & NR TDD).

The max allowed output power is the P_{limit} + 1dB device uncertainty, and if P_{limit} is higher than P_{max}, the device output power will be P_{max} instead.



5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$SAR = \frac{d}{dt} \left(\frac{dW}{dm} \right) = \frac{d}{dt} \left(\frac{dW}{\rho dv} \right)$$

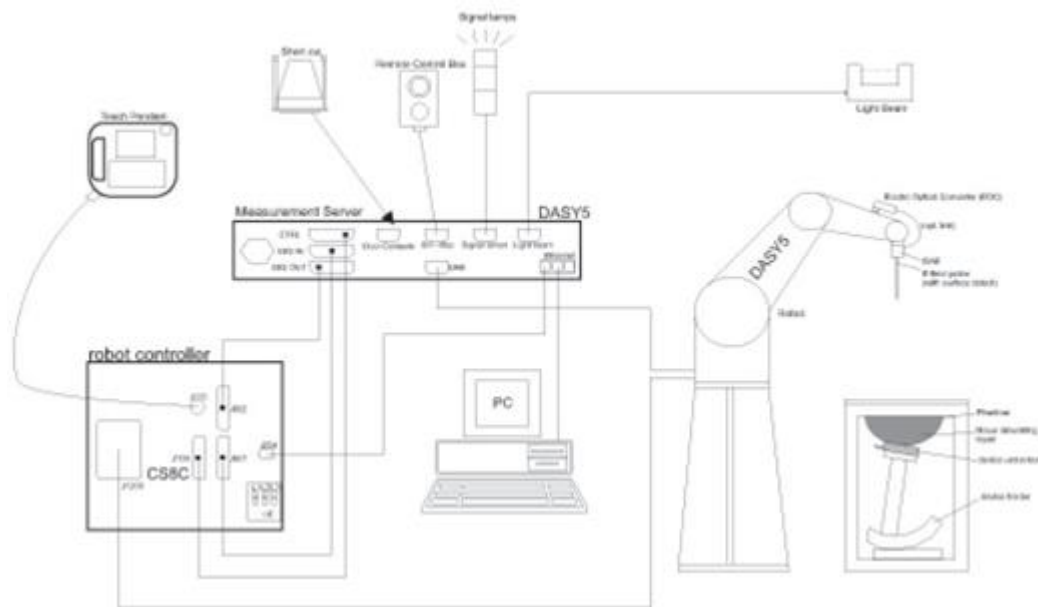
SAR is expressed in units of Watts per kilogram (W/kg)

$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 Test Side Location


Sporton Lab and below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 0007) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

Test Side	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory			
Test Site Location	TW1190 No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, CHINESE TAIPEI		TW0007 No. 58, Aly. 75, Ln. 564, Wehnuia 3rd, Rd., Guishan Dist., Taoyuan City, CHINESE TAIPEI	
	SAR01-HY	SAR03-HY	SAR08-HY	SAR09-HY
Test Site No.	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY
	SAR06-HY	SAR10-HY		


7.2 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ± 0.2 dB (30 MHz – 4 GHz)	
Directivity	± 0.2 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 μ W/g – >100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ± 0.2 dB (30 MHz – 6 GHz)	
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 μ W/g – >100 mW/g Linearity: ± 0.2 dB (noise: typically <1 μ W/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

7.3 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

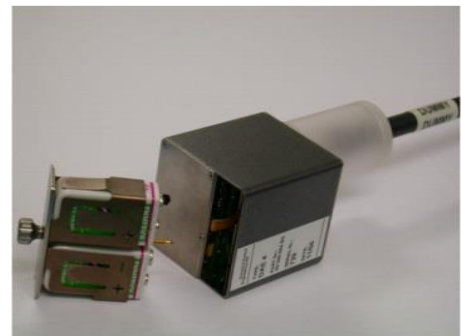



Fig 5.1 Photo of DAE

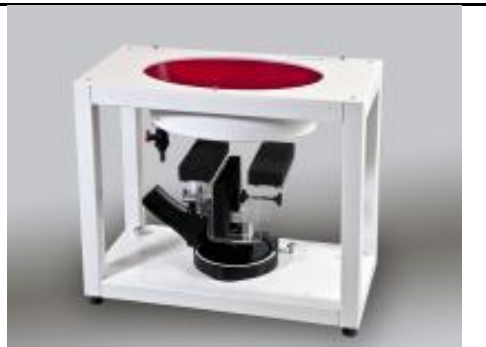
7.4 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.



Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

- (a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
- (d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix D demonstrates.
- (c) Set scan area, grid size and other setting on the DASY software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{Area}, \Delta y_{Area}$	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

		≤ 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASy measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.



9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	3300MHz System Validation Kit ⁽²⁾	D3300V2	1005	Apr. 11, 2019	Apr. 09, 2021
SPEAG	3700MHz System Validation Kit ⁽²⁾	D3700V2	1006	Mar. 05, 2019	Mar. 03, 2021
SPEAG	3900MHz System Validation Kit ⁽²⁾	D3900V2	1017	Apr. 29, 2019	Apr. 27, 2021
SPEAG	Data Acquisition Electronics	DAE4	778	Jun. 04, 2020	Jun. 03, 2021
SPEAG	Dosimetric E-Field Probe	EX3DV4	3753	Jun. 25, 2020	Jun. 24, 2021
RCPTWN	Thermometer	HTC-1	TM685-1	Nov. 10, 2020	Nov. 09, 2021
SPEAG	Device Holder	N/A	N/A	N/A	N/A
R&S	Signal Generator	SMA100A	101091	Jul. 20, 2020	Jul. 19, 2021
Keysight	ENA Network Analyzer	E5071C	MY46101588	Jun. 10, 2020	Jun. 09, 2021
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 16, 2020	Sep. 15, 2021
LINE SEIKI	Digital Thermometer	DTM3000-spezial	3252	Jun. 23, 2020	Jun. 22, 2021
Anritsu	Power Meter	ML2495A	1419002	Aug. 19, 2020	Aug. 18, 2021
Anritsu	Power Sensor	MA2411B	1911176	Aug. 18, 2020	Aug. 17, 2021
Anritsu	Power Meter	ML2495A	1804003	Oct. 21, 2020	Oct. 20, 2021
Anritsu	Power Sensor	MA2411B	1726150	Oct. 21, 2020	Oct. 20, 2021
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jun. 30, 2020	Jun. 29, 2021
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Mar. 12, 2020	Mar. 11, 2021
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 21, 2020	Oct. 20, 2021
Mini-Circuits	Power Amplifier	ZVE-8G+	479102029	Aug. 26, 2020	Aug. 25, 2021
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASYS, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

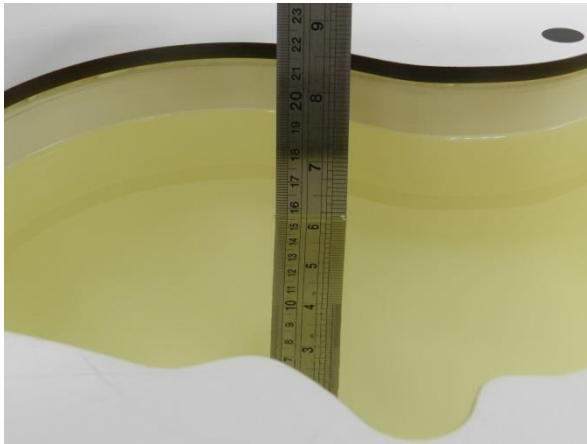


Fig 10.1 Photo of Liquid Height for Head SAR

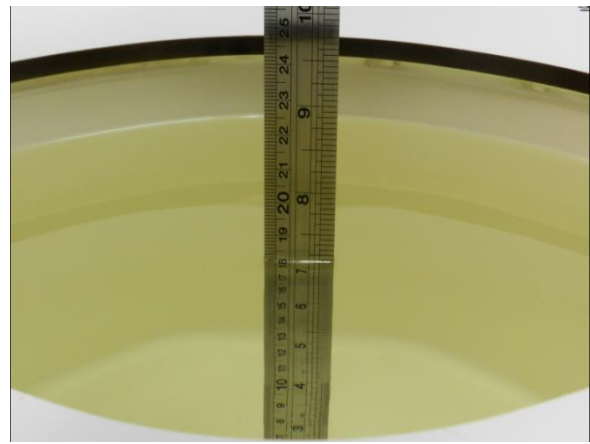


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
3300	22.6	2.716	38.081	2.70	38.13	0.59	-0.13	±5	2020/11/13
3700	22.6	3.126	37.625	3.12	37.70	0.19	-0.20	±5	2020/11/13
4100	22.6	3.537	37.171	3.53	37.28	0.20	-0.29	±5	2020/11/13

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2020/11/13	3300	50	D3300V2-1005	EX3DV4 - SN3753	DAE4 Sn778	3.27	65.50	65.4	-0.15
2020/11/13	3700	50	D3700V2-1006	EX3DV4 - SN3753	DAE4 Sn778	3.27	67.30	65.4	-2.82
2020/11/13	4100	50	D3900V2-1017-4100	EX3DV4 - SN3753	DAE4 Sn778	3.22	66.30	64.4	-2.87

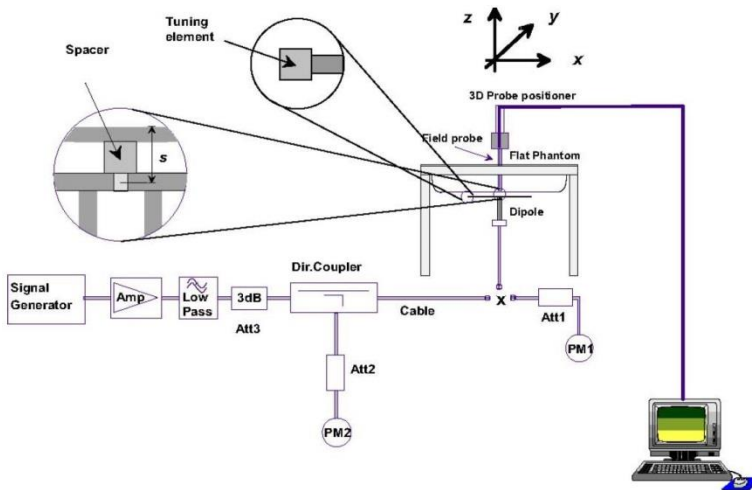


Fig 8.3.1 System Performance Check Setup



Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 9.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M,” the left ear reference point (ERP) is marked “LE,” and the right ERP is marked “RE.” Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 9.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 9.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 9.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

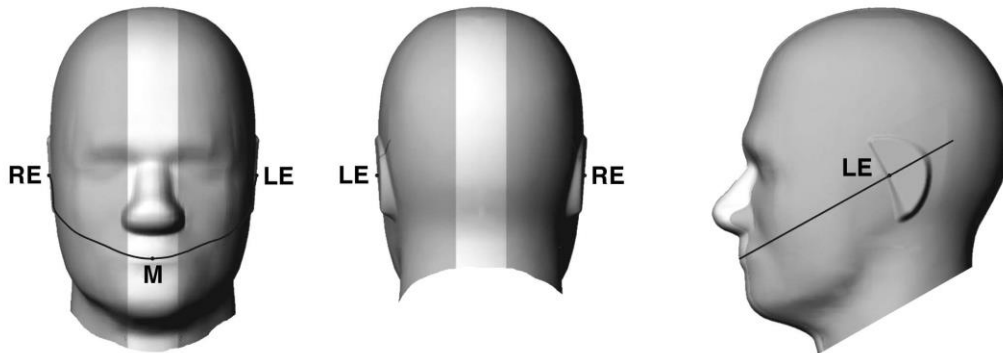


Fig 9.1.1 Front, back, and side views of SAM twin phantom

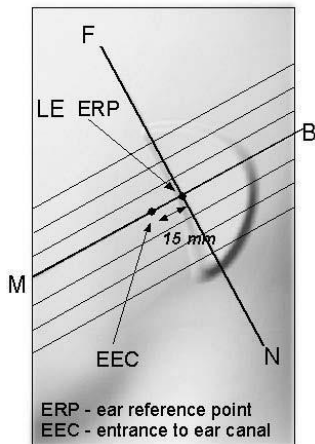


Fig 9.1.2 Close-up side view of phantom showing the ear region.

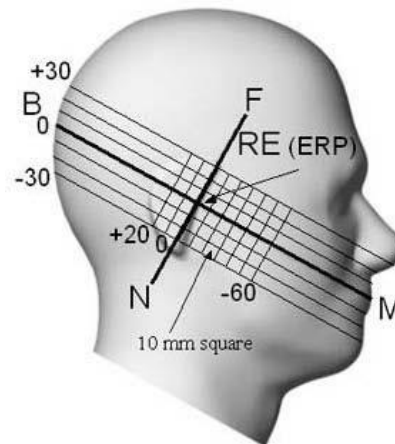


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width w_t of the handset at the level of the acoustic output (point A in Figure 9.2.1 and Figure 9.2.2), and the midpoint of the width w_b of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 9.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 9.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 9.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 9.2.3. The actual rotation angles should be documented in the test report.

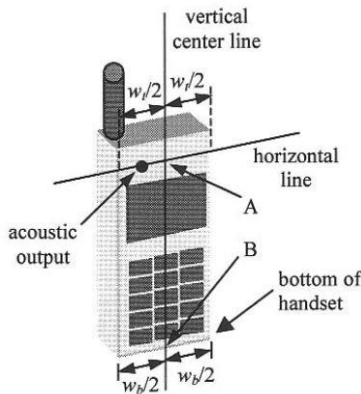


Fig 9.2.1 Handset vertical and horizontal reference lines—“fixed case”

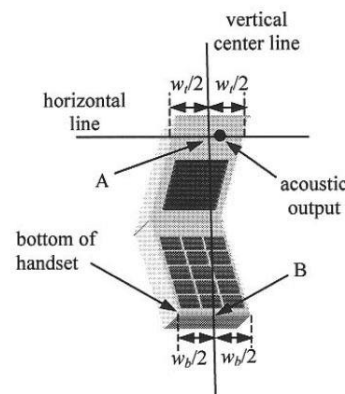


Fig 9.2.2 Handset vertical and horizontal reference lines—“clam-shell case”

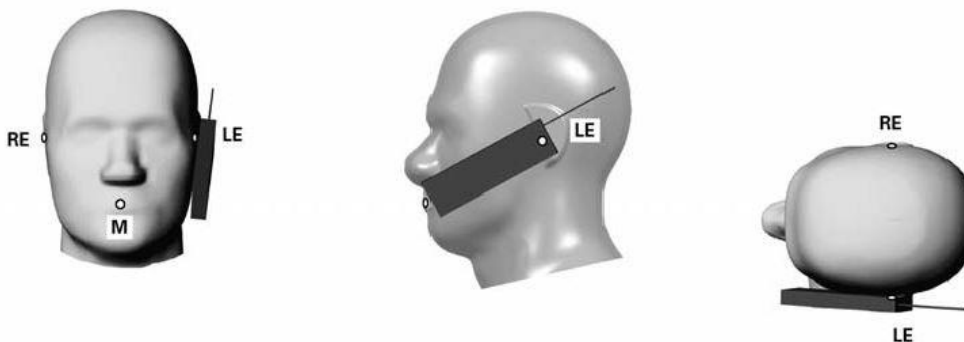


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 9.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

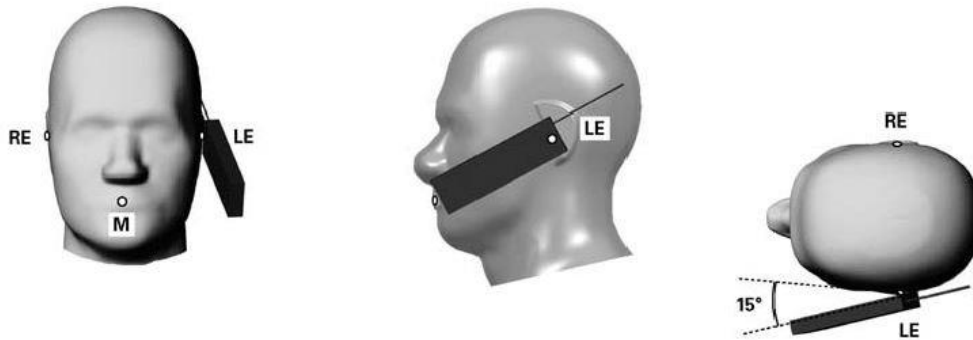


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 9.4). Per KDB648474 D04v01r03, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset attached to the handset.

Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

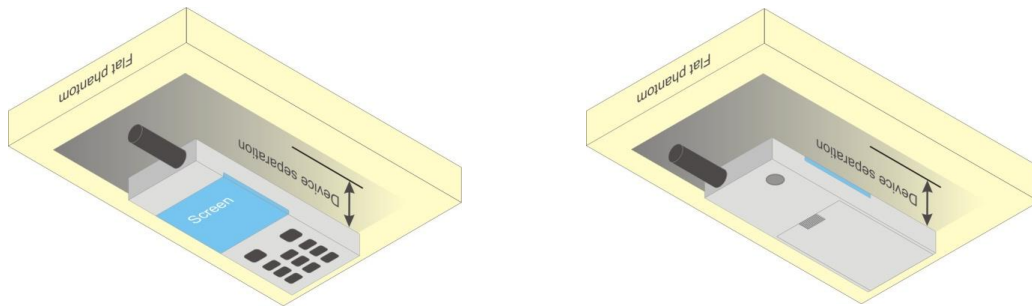


Fig 9.4 Body Worn Position

11.5 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

12. 5G NR Output Power (Unit: dBm)

General Note:

1. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
 - a. For DFT-s-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 2 and 3, the CP-OFDM mode will not higher than DFT-s-OFDM mode, therefore, similar FCC KDB 941225 D05 procedure for other modulation output power for each RB allocation configuration is > not ½ dB higher than the same configuration in DFT-s-Pi/2 BPSK and the reported SAR for the DFT-s-Pi/2 BPSK configuration is ≤ 1.45 W/kg; CP-OFDM measurement is unnecessary.
 - b. For DFT-s-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 3, full measurement on Pi/2 BPSK/QPSK with larger bandwidth, for 16QAM/64QAM/256QAM spot check 1RB 1offset configuration to ensure the output power will not ½ dB higher than Pi/2 BPSK and QPSK, for smaller bandwidth output power also spot check 1RB 1offset configuration at Pi/2 BPSK to ensure output power will not ½ dB higher than largest supported bandwidth.
 - c. SAR testing start with the largest channel bandwidth and measure SAR for Pi/2 BPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
 - d. 50% RB allocation for Pi/2 BPSK SAR testing follows 1RB Pi/2 BPSK allocation procedure
 - e. Pi/2 BPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
 - f. QPSK/16QAM/64QAM/256QAM output powers are not ½ dB higher than the same configuration in Pi/2 BPSK, also reported SAR for the Pi/2 BPSK configuration is less than 1.45 W/kg, QPSK/16QAM/64QAM/256QAM SAR testing are not required.
 - g. Smaller bandwidth output power for each RB allocation configuration for this device will not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device

<3GPP 38.101 MPR for EN-DC>

Table 6.2.2-1 Maximum power reduction (MPR) for power class 3

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5 ¹ ≤ 0.5 ²	≤ 1.2 ¹ ≤ 0.5 ²	≤ 0.2 ¹ 0 ²
	QPSK	≤ 1		0
	16 QAM	≤ 2		≤ 1
	64 QAM			≤ 2.5
	256 QAM			≤ 4.5
CP-OFDM	QPSK	≤ 3		≤ 1.5
	16 QAM	≤ 3		≤ 2
	64 QAM		≤ 3.5	
	256 QAM		≤ 6.5	

NOTE 1: Applicable for UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and if the IE *powerBoostPi2BPSK* is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. The reference power of 0 dB MPR is 26 dBm.
NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79 with Pi/2 BPSK modulation and if the IE *powerBoostPi2BPSK* is set to 0 and if more than 40 % of slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79.

Table 6.2.2-2 Maximum power reduction (MPR) for power class 2

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5	≤ 0.5	0
	QPSK	≤ 3.5	≤ 1	0
	16 QAM	≤ 3.5	≤ 2	≤ 1
	64 QAM	≤ 3.5		≤ 2.5
	256 QAM		≤ 4.5	
CP-OFDM	QPSK	≤ 3.5	≤ 3	≤ 1.5
	16 QAM	≤ 3.5	≤ 3	≤ 2
	64 QAM		≤ 3.5	
	256 QAM		≤ 6.5	



<n77_Config 0_Ant 7_DSI 2/4/6/7/8>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				650000	656000	662000	25.0	0.0
Frequency (MHz)				3750	3840	3930		
100	PI/2 BPSK	1	1	24.50	24.62	24.56		
100	PI/2 BPSK	1	137	24.41	24.55	24.46	25.0	0.0
100	PI/2 BPSK	1	271	24.46	24.54	24.51		
100	PI/2 BPSK	135	0	24.45	24.49	24.45		
100	PI/2 BPSK	135	69	24.41	24.46	24.43	25.0	0.0
100	PI/2 BPSK	135	138	24.45	24.50	24.46		
100	PI/2 BPSK	270	0	24.26	24.41	24.30		
100	QPSK	1	1	24.39	24.49	24.29	25.0	0.0
100	QPSK	1	137	24.39	24.47	24.37		
100	QPSK	1	271	24.36	24.56	24.43		
100	QPSK	135	0	24.39	24.36	24.48	25.0	0.0
100	QPSK	135	69	24.50	24.43	24.43		
100	QPSK	135	138	24.33	24.42	24.29		
100	QPSK	270	0	23.81	23.95	23.84	24.0	1.0
100	16QAM	1	1	23.75	23.76	23.68	24.0	1.0
100	64QAM	1	1	22.27	22.15	22.41	22.5	2.5
100	256QAM	1	1	20.17	20.39	20.07	20.5	4.5
Channel				649668	656000	662334	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3745.02	3840	3935.01		
90	PI/2 BPSK	1	1	24.46	24.48	24.48	25.0	0.0
Channel				649334	656000	662668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3740.01	3840	3940.02		
80	PI/2 BPSK	1	1	24.47	24.54	24.47	25.0	0.0
Channel				648668	656000	663334	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3730.02	3840	3950.01		
60	PI/2 BPSK	1	1	24.42	24.52	24.55	25.0	0.0
Channel				648334	656000	663668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3725.01	3840	3955.02		
50	PI/2 BPSK	1	1	24.44	24.47	24.50	25.0	0.0
Channel				648000	656000	664000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3720	3840	3960		
40	PI/2 BPSK	1	1	24.41	24.51	24.54	25.0	0.0
Channel				647334	656000	664668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3710.01	3840	3970.02		
20	PI/2 BPSK	1	1	24.48	24.46	24.48	25.0	0.0



<n77_HPUE_Config 0_Ant 7_DSI 2/4/6/7/8>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				650000	656000	662000	27.5	0.0
Frequency (MHz)				3750	3840	3930		
100	PI/2 BPSK	1	1	26.17	26.25	26.20		
100	PI/2 BPSK	1	137	26.00	26.13	26.01	27.5	0.0
100	PI/2 BPSK	1	271	26.03	26.13	26.04		
100	PI/2 BPSK	135	0	26.13	26.15	26.10		
100	PI/2 BPSK	135	69	26.07	26.07	26.08	27.5	0.0
100	PI/2 BPSK	135	138	26.02	26.07	26.06		
100	PI/2 BPSK	270	0	26.04	26.13	26.05		
100	QPSK	1	1	26.03	26.09	26.10	27.5	0.0
100	QPSK	1	137	26.00	26.10	26.09		
100	QPSK	1	271	26.05	26.14	26.03		
100	QPSK	135	0	26.03	26.17	26.03	27.5	0.0
100	QPSK	135	69	26.02	26.12	25.99		
100	QPSK	135	138	26.07	26.07	26.13		
100	QPSK	270	0	26.08	26.05	26.08	26.5	1.0
100	16QAM	1	1	25.92	26.11	25.96	26.5	1.0
100	64QAM	1	1	24.31	24.42	24.45	25.0	2.5
100	256QAM	1	1	22.37	22.42	22.32	23.0	4.5
Channel				649668	656000	662334	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3745.02	3840	3935.01		
90	PI/2 BPSK	1	1	26.02	26.24	26.10	27.5	0.0
Channel				649334	656000	662668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3740.01	3840	3940.02		
80	PI/2 BPSK	1	1	26.06	26.23	26.12	27.5	0.0
Channel				648668	656000	663334	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3730.02	3840	3950.01		
60	PI/2 BPSK	1	1	26.00	26.21	26.14	27.5	0.0
Channel				648334	656000	663668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3725.01	3840	3955.02		
50	PI/2 BPSK	1	1	26.03	26.19	26.14	27.5	0.0
Channel				648000	656000	664000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3720	3840	3960		
40	PI/2 BPSK	1	1	26.06	26.22	26.10	27.5	0.0
Channel				647334	656000	664668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3710.01	3840	3970.02		
20	PI/2 BPSK	1	1	26.00	26.18	26.13	27.5	0.0



<n77_Config 1_Ant 2_DSI 2/4/6/7/8>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				650000	656000	662000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3750	3840	3930		
100	PI/2 BPSK	1	1	22.49	22.52	22.42		
100	PI/2 BPSK	1	137	22.39	22.49	22.37		
100	PI/2 BPSK	1	271	22.34	22.38	22.29		
100	PI/2 BPSK	135	0	22.32	22.49	22.36	23.5	0.0
100	PI/2 BPSK	135	69	22.23	22.47	22.30		
100	PI/2 BPSK	135	138	22.29	22.39	22.28		
100	PI/2 BPSK	270	0	22.29	22.42	22.35	23.0	0.5
100	QPSK	1	1	22.12	22.24	22.38	23.5	0.0
100	QPSK	1	137	22.28	22.42	22.31		
100	QPSK	1	271	22.25	22.38	22.27		
100	QPSK	135	0	22.30	22.42	22.27	23.5	0.0
100	QPSK	135	69	22.26	22.42	22.34		
100	QPSK	135	138	22.25	22.40	22.32		
100	QPSK	270	0	22.35	22.40	22.17	22.5	1.0
100	16QAM	1	1	22.28	22.33	22.12	22.5	1.0
100	64QAM	1	1	20.77	20.74	20.57	21.0	2.5
100	256QAM	1	1	18.72	18.80	18.68	19.0	4.5
Channel				649668	656000	662334	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3745.02	3840	3935.01		
90	PI/2 BPSK	1	1	22.48	22.43	22.38	23.5	0.0
Channel				649334	656000	662668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3740.01	3840	3940.02		
80	PI/2 BPSK	1	1	22.48	22.50	22.32	23.5	0.0
Channel				648668	656000	663334	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3730.02	3840	3950.01		
60	PI/2 BPSK	1	1	22.46	22.49	22.33	23.5	0.0
Channel				648334	656000	663668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3725.01	3840	3955.02		
50	PI/2 BPSK	1	1	22.43	22.46	22.42	23.5	0.0
Channel				648000	656000	664000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3720	3840	3960		
40	PI/2 BPSK	1	1	22.45	22.42	22.33	23.5	0.0
Channel				647334	656000	664668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3710.01	3840	3970.02		
20	PI/2 BPSK	1	1	22.41	22.51	22.33	23.5	0.0



<n77_HPUE_Config 1_Ant 2_DSI 2/4/6/7/8>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				650000	656000	662000	26.5	0.0
Frequency (MHz)				3750	3840	3930		
100	PI/2 BPSK	1	1	25.08	25.14	25.13		
100	PI/2 BPSK	1	137	25.02	25.07	25.01	26.5	0.0
100	PI/2 BPSK	1	271	25.00	25.08	25.01		
100	PI/2 BPSK	135	0	25.06	25.13	25.01		
100	PI/2 BPSK	135	69	24.93	25.13	24.94	26.5	0.0
100	PI/2 BPSK	135	138	24.96	25.05	24.95		
100	PI/2 BPSK	270	0	24.97	25.00	24.97		
100	QPSK	1	1	24.96	25.02	25.02	26.5	0.0
100	QPSK	1	137	24.95	25.09	25.02		
100	QPSK	1	271	25.04	25.11	25.04		
100	QPSK	135	0	25.06	25.14	24.93	26.5	0.0
100	QPSK	135	69	25.01	25.03	25.03		
100	QPSK	135	138	25.10	25.07	24.99		
100	QPSK	270	0	24.38	24.49	24.32	25.5	1.0
100	16QAM	1	1	24.41	24.28	24.32	25.5	1.0
100	64QAM	1	1	22.34	22.41	22.35	24.0	2.5
100	256QAM	1	1	20.23	20.41	20.29	22.0	4.5
Channel				649668	656000	662334	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3745.02	3840	3935.01		
90	PI/2 BPSK	1	1	25.01	25.05	25.04	26.5	0.0
Channel				649334	656000	662668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3740.01	3840	3940.02		
80	PI/2 BPSK	1	1	25.02	25.06	25.06	26.5	0.0
Channel				648668	656000	663334	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3730.02	3840	3950.01		
60	PI/2 BPSK	1	1	25.08	25.11	25.04	26.5	0.0
Channel				648334	656000	663668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3725.01	3840	3955.02		
50	PI/2 BPSK	1	1	25.01	25.08	25.08	26.5	0.0
Channel				648000	656000	664000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3720	3840	3960		
40	PI/2 BPSK	1	1	25.03	25.07	25.05	26.5	0.0
Channel				647334	656000	664668	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3710.01	3840	3970.02		
20	PI/2 BPSK	1	1	25.06	25.12	25.07	26.5	0.0

13. RF Exposure position consideration

Distance of the Antenna to the EUT surface/edge						
Antennas	Front	Back	Top Side	Bottom Side	Right Side	Left Side
WWAN Ant 0	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	≤ 25mm
WWAN Ant 1	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm
WWAN Ant 2	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	≤ 25mm
WWAN Ant 5	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm
WWAN Ant 7	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	≤ 25mm
2.4GHz WLAN Ant 3	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm
2.4GHz WLAN/BT Ant 4	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm
5GHz WLAN Ant 3	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm
5GHz WLAN Ant 4	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm

Positions for SAR tests; Hotspot mode						
Antennas	Front	Back	Top Side	Bottom Side	Right Side	Left Side
WWAN Ant 0	Yes	Yes	No	Yes	Yes	Yes
WWAN Ant 1	Yes	Yes	Yes	No	Yes	Yes
WWAN Ant 2	Yes	Yes	No	Yes	Yes	Yes
WWAN Ant 5	Yes	Yes	Yes	No	Yes	Yes
WWAN Ant 7	Yes	Yes	No	Yes	Yes	Yes
2.4GHz WLAN Ant 3	Yes	Yes	Yes	No	Yes	Yes
2.4GHz WLAN/BT Ant 4	Yes	Yes	Yes	No	Yes	Yes
5GHz WLAN Ant 3	Yes	Yes	Yes	No	Yes	Yes
5GHz WLAN Ant 4	Yes	Yes	Yes	No	Yes	Yes

General Note:

- Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge
- The detail antenna location refers to operation description.



14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For NR TDD SAR = Measured SAR(W/kg)*Tune-up Scaling Factor*transmission cycle factor
2. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.
3. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
4. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g product specific SAR is required only for the surfaces and edges with hotspot mode 1 –g reported SAR > 1.2 W/kg

5G NR Note:

1. Due to test setup limitations, SAR testing for NR was performed using Factory Test Mode software to establish the connection, according to manufacturer definition for TDD actual transmission cycle is 33%, but factory test mode software is set and perform SAR with 25%, therefore, the SAR test result will be scaled up to 33%
2. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
 - a. SAR testing start with the largest channel bandwidth and measure SAR for PI/2 BPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
 - b. 50% RB allocation for PI/2 BPSK SAR testing follows 1RB PI/2 BPSK allocation procedure
 - c. PI/2 BPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
 - d. QPSK/16QAM/64QAM/256QAM output powers are not $\frac{1}{2}$ dB higher than the same configuration in PI/2 BPSK, also reported SAR for the PI/2 BPSK configuration is less than 1.45 W/kg, QPSK/16QAM/64QAM/256QAM SAR testing are not required.
 - e. Smaller bandwidth output power for each RB allocation configuration for this device will not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device



14.1 Head SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Output power state	Ch.	Freq. (MHz)	configure	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Right Cheek	0mm	DSI 2/7	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.06	0.192	0.341
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Right Cheek	0mm	DSI 2/7	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	-0.01	0.175	0.318
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Right Tilted	0mm	DSI 2/7	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.02	0.233	0.414
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Right Tilted	0mm	DSI 2/7	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	0.14	0.209	0.380
01	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Left Cheek	0mm	DSI 2/7	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.05	0.550	0.977
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Left Cheek	0mm	DSI 2/7	650000	3750	Config 0	26.17	27.50	1.358	25	1.332	0.05	0.512	0.926
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Left Cheek	0mm	DSI 2/7	662000	3930	Config 0	26.20	27.50	1.349	25	1.332	0.05	0.433	0.778
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Left Cheek	0mm	DSI 2/7	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	-0.02	0.536	0.974
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Left Cheek	0mm	DSI 2/7	650000	3750	Config 0	26.13	27.50	1.371	25	1.332	-0.04	0.520	0.950
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Left Cheek	0mm	DSI 2/7	662000	3930	Config 0	26.10	27.50	1.380	25	1.332	-0.09	0.429	0.789
	FR1 n77_Ant 7_HPUE	100M	BPSK	270	0	Left Cheek	0mm	DSI 2/7	656000	3840	Config 0	26.13	27.00	1.222	25	1.332	0.14	0.525	0.854
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Left Tilted	0mm	DSI 2/7	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.13	0.201	0.357
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Left Tilted	0mm	DSI 2/7	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	-0.02	0.188	0.342
	FR1 n77_Ant 7	100M	BPSK	1	1	Left Cheek	0mm	DSI 2/7	656000	3840	Config 0	24.62	25.00	1.091	25	1.332	0.07	0.425	0.618
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Right Cheek	0mm	DSI 2/7	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	-0.11	0.162	0.295
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Right Cheek	0mm	DSI 2/7	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	0.06	0.133	0.243
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Right Tilted	0mm	DSI 2/7	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	-0.06	0.052	0.095
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Right Tilted	0mm	DSI 2/7	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	0.14	0.041	0.075
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Left Cheek	0mm	DSI 2/7	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	0.19	0.063	0.115
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Left Cheek	0mm	DSI 2/7	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	-0.02	0.052	0.095
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Left Tilted	0mm	DSI 2/7	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	0.03	0.074	0.135
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Left Tilted	0mm	DSI 2/7	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	0.04	0.068	0.124
	FR1 n77_Ant 2	100M	BPSK	1	1	Right Cheek	0mm	DSI 2/7	656000	3840	Config 1	22.52	23.50	1.253	25	1.332	-0.11	0.083	0.139



14.2 Hotspot SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Output power state	Ch.	Freq. (MHz)	configure	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Front	10mm	DSI 6	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.02	0.260	0.462
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Front	10mm	DSI 6	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	-0.04	0.235	0.427
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Back	10mm	DSI 6	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.01	0.391	0.695
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Back	10mm	DSI 6	662000	3930	Config 0	26.17	27.50	1.358	25	1.332	0.15	0.378	0.684
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Back	10mm	DSI 6	656000	3840	Config 0	26.20	27.50	1.349	25	1.332	-0.02	0.342	0.615
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Back	10mm	DSI 6	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	0.03	0.372	0.676
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Back	10mm	DSI 6	662000	3930	Config 0	26.13	27.50	1.371	25	1.332	0.14	0.373	0.681
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Back	10mm	DSI 6	656000	3840	Config 0	26.10	27.50	1.380	25	1.332	0.19	0.339	0.623
	FR1 n77_Ant 7_HPUE	100M	BPSK	270	0	Back	10mm	DSI 6	656000	3840	Config 0	26.13	27.00	1.222	25	1.332	-0.04	0.382	0.622
02	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Left Side	10mm	DSI 6	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	-0.11	0.546	0.970
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	0	Left Side	10mm	DSI 6	662000	3930	Config 0	26.17	27.50	1.358	25	1.332	-0.05	0.503	0.910
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	0	Left Side	10mm	DSI 6	656000	3840	Config 0	26.20	27.50	1.349	25	1.332	0.01	0.514	0.924
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Left Side	10mm	DSI 6	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	0.19	0.521	0.947
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Left Side	10mm	DSI 6	662000	3930	Config 0	26.13	27.50	1.371	25	1.332	-0.02	0.501	0.915
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Left Side	10mm	DSI 6	656000	3840	Config 0	26.10	27.50	1.380	25	1.332	-0.07	0.496	0.912
	FR1 n77_Ant 7_HPUE	100M	BPSK	270	0	Left Side	10mm	DSI 6	656000	3840	Config 0	26.13	27.00	1.222	25	1.332	0.13	0.514	0.837
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Right Side	10mm	DSI 6	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.17	0.015	0.027
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Right Side	10mm	DSI 6	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	-0.07	0.011	0.020
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Bottom Side	10mm	DSI 6	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.16	0.082	0.146
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Bottom Side	10mm	DSI 6	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	-0.05	0.067	0.122
	FR1 n77_Ant 7	100M	BPSK	1	1	Left Side	10mm	DSI 6	656000	3840	Config 0	24.62	25.00	1.091	25	1.332	-0.18	0.372	0.541
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Front	10mm	DSI 6	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	0	0.092	0.168
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Front	10mm	DSI 6	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	0.14	0.070	0.128
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Back	10mm	DSI 6	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	-0.03	0.141	0.257
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Back	10mm	DSI 6	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	-0.02	0.120	0.219
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Left Side	10mm	DSI 6	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	-0.19	0.005	0.009
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Left Side	10mm	DSI 6	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	0.13	0.001	0.002
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Right Side	10mm	DSI 6	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	-0.12	0.238	0.434
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Right Side	10mm	DSI 6	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	0.05	0.133	0.243
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Bottom Side	10mm	DSI 6	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	-0.14	0.135	0.246
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Bottom Side	10mm	DSI 6	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	0.18	0.105	0.192
	FR1 n77_Ant 2	100M	BPSK	1	1	Right Side	10mm	DSI 6	656000	3840	Config 1	22.52	23.50	1.253	25	1.332	-0.02	0.113	0.189



14.3 Body Worn Accessory SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Output power state	Ch.	Freq. (MHz)	configure	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Front	10mm	DSI 4/8	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.02	0.260	0.462
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Front	10mm	DSI 4/8	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	-0.04	0.235	0.427
03	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Back	10mm	DSI 4/8	656000	3840	Config 0	26.25	27.50	1.334	25	1.332	0.01	0.391	0.695
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Back	10mm	DSI 4/8	662000	3930	Config 0	26.17	27.50	1.358	25	1.332	0.15	0.378	0.684
	FR1 n77_Ant 7_HPUE	100M	BPSK	1	1	Back	10mm	DSI 4/8	656000	3840	Config 0	26.20	27.50	1.349	25	1.332	-0.02	0.342	0.615
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Back	10mm	DSI 4/8	656000	3840	Config 0	26.15	27.50	1.365	25	1.332	0.03	0.372	0.676
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Back	10mm	DSI 4/8	662000	3930	Config 0	26.13	27.50	1.371	25	1.332	0.14	0.373	0.681
	FR1 n77_Ant 7_HPUE	100M	BPSK	135	0	Back	10mm	DSI 4/8	656000	3840	Config 0	26.10	27.50	1.380	25	1.332	0.19	0.339	0.623
	FR1 n77_Ant 7_HPUE	100M	BPSK	270	0	Back	10mm	DSI 4/8	656000	3840	Config 0	26.13	27.00	1.222	25	1.332	-0.04	0.382	0.622
	FR1 n77_Ant 7	100M	BPSK	1	1	Back	10mm	DSI 4/8	656000	3840	Config 0	24.62	25.00	1.091	25	1.332	0.04	0.267	0.388
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Front	10mm	DSI 4/8	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	0	0.092	0.168
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Front	10mm	DSI 4/8	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	0.14	0.070	0.128
	FR1 n77_Ant 2_HPUE	100M	BPSK	1	1	Back	10mm	DSI 4/8	656000	3840	Config 1	25.14	26.50	1.368	25	1.332	-0.03	0.141	0.257
	FR1 n77_Ant 2_HPUE	100M	BPSK	135	0	Back	10mm	DSI 4/8	656000	3840	Config 1	25.13	26.50	1.371	25	1.332	-0.02	0.120	0.219
	FR1 n77_Ant 2	100M	BPSK	1	1	Back	10mm	DSI 4/8	656000	3840	Config 1	22.52	23.50	1.253	25	1.332	0.06	0.054	0.090

15. Simultaneous Transmission Analysis

Config	Mode	Capable TX Configurations	Support
1	WWAN OFF (Cellular off)	WiFi 5G SISO (Ant3) + Bluetooth (Ant4)	Y
2		WiFi 5G SISO (Ant4) + Bluetooth (Ant4)	Y
3		WiFi 5G MIMO (Ant3+Ant4) + Bluetooth (Ant4)	Y
4		WiFi 5G MIMO (Ant3+4)	Y
5		WiFi 2.4G SISO (Ant3) + Bluetooth (Ant4)	N
6		WiFi 2.4G MIMO/CDD (Ant4+3)	Y
7		WiFi 2.4G SISO (Ant4) + WiFi 5G SISO (Ant3)	Y
8	WWAN ON (Cellular on)	WiFi 5G SISO (Ant3) + Bluetooth (Ant4)	Y
9		WiFi 5G SISO (Ant4) + Bluetooth (Ant4)	Y
10		WiFi 5G MIMO (Ant3+4) + Bluetooth (Ant4)	Y
11		WiFi 5G SISO (Ant3)	Y
12		WiFi 5G SISO (Ant4)	Y
13		WiFi 5G MIMO (Ant3+4)	Y
14		WiFi 2.4G SISO (Ant4)	Y
15		WiFi 2.4G SISO (Ant3)	Y
16		WiFi 2.4G SISO (Ant3) + Bluetooth (Ant4)	N
17		WiFi 2.4G MIMO/CDD (Ant4+3)	Y
18		Bluetooth (Ant4)	Y
19	WiFi 2.4G SISO (Ant4) + WiFi 5G SISO (Ant3)	Y	
20	LTE + FR1/FR2 (EN-DC)	WiFi 5G SISO (Ant3) + Bluetooth (Ant4)	Y
21		WiFi 5G SISO (Ant4) + Bluetooth (Ant4)	Y
22		WiFi 5G MIMO (Ant3+4) + Bluetooth (Ant4)	Y
23		WiFi 5G SISO (Ant3)	Y
24		WiFi 5G SISO (Ant4)	Y
25		WiFi 5G MIMO (Ant3+4)	Y
26		WiFi 2.4G SISO (Ant4)	Y
27		WiFi 2.4G SISO (Ant3)	Y
28		WiFi 2.4G SISO (Ant3) + Bluetooth (Ant4)	N
29		WiFi 2.4G MIMO/CDD (Ant4+3)	Y
30		Bluetooth (Ant4)	Y
31	WiFi 2.4G SISO (Ant4) + WiFi 5G SISO (Ant3)	Y	

General Note:

1. Simultaneous operation at maximum power levels when the device is neither against the body nor the head (i.e. in a mobile RF exposure condition) is addressed in Sporton test report FA011718-06B
2. For WLAN/Bluetooth SAR results are referring to original Sporton SAR report no.: FA011718-01A and use for Sim-Tx analysis.
3. This device WLAN 2.4GHz / 5.2GHz / 5.8GHz supports Hotspot operation and Bluetooth support tethering applications.
4. The worst case WLAN reported SAR for each configuration was used for SAR summation, regardless of whether the WLAN channel has WiFi Direct and Hotspot capability. Therefore, the following summations represent the absolute worst cases for simultaneous transmission with WLAN.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - i) Scalar SAR summation < 1.6W/kg.
 - ii) $SPLSR = (SAR1 + SAR2)^{1.5} / (\text{min. separation distance, mm})$, and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
 - iii) If $SPLSR \leq 0.04$ for 1g SAR, if $SPLSR < 0.1$ for 10g SAR, simultaneously transmission SAR measurement is not necessary.
 - iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.



15.1 5G NR + LTE + WLAN + BT Sim-Tx analysis

In 5G NR + LTE + WLAN + BT simultaneous transmission, 5G NR and LTE transmission are managed and controlled by Qualcomm® Smart Transmit, while the RF exposure from WLAN and BT radios is managed using legacy approach, i.e., through a fixed power back-off if needed.

Since WLAN and BT do not employ time-averaging, 1gSAR and 10gSAR measurement for WLAN and BT need to be conducted at their corresponding rated power following current FCC test procedures to determine reported SAR values.

Smart Transmit current implementation assumes hotspots from 5G NR and LTE are collocated. Therefore, for a total of 100% exposure margin, if LTE uses x%, then the exposure margin left for 5G NR is capped to (100-x)%. Thus, the compliance equation for LTE + 5G NR is

$$x\% * A + (100-x)\% * B \leq 1.0,$$

Where, A is normalized reported time-averaged SAR exposure ratio from LTE, and $A \leq 1.0$; B is normalized reported time-averaged exposure ratio from 5G NR (i.e., PD exposure for 5G FR2 or SAR exposure for 5G FR1), and $B \leq 1.0$.

Let C = normalized reported SAR exposure ratio from WLAN+BT, then for compliance,

$$x\% * A + (100-x)\% * B + C \leq 1.0 \quad (1)$$

$$x\% * A + (100-x)\% * B \leq x\% * \max(A, B) + (100-x)\% * \max(A, B) \leq \max(A, B)$$

$$x\% * A + (100-x)\% * B + C \leq \max(A, B) + C \leq 1.0 \quad (2)$$

if $A + C \leq 1.0$ and $B + C \leq 1.0$ can be proven, then “ $x\% * A + (100-x)\% * B + C \leq 1.0$ ”. Therefore simultaneous transmission analysis for 5G NR + LTE + WLAN + BT can be performed in two steps

- Step 1: Prove total exposure ratio (TER) of LTE + WLAN + BT < 1
- Step 2: Prove total exposure ratio (TER) of 5G NR + WLAN + BT < 1

15.2 Head Exposure Conditions

WWAN Band	Exposure Position	1	2	3	4	5	7	1+2+3 Summed 1g SAR (W/kg)	1+2+5 Summed 1g SAR (W/kg)	1+4+7 Summed 1g SAR (W/kg)	1+5+7 Summed 1g SAR (W/kg)	1+4+5+7 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN Ant 4	2.4GHz WLAN Ant 3	5GHz WLAN Ant 4	5GHz WLAN Ant 3	Bluetooth Ant 4					
FR1 n77_Ant 7	Right Cheek	0.341	0.071	0.298	0.082	0.251	0.064	0.710	0.663	0.487	0.656	0.738
	Right Tilted	0.414	0.101	0.104	0.102	0.113	0.073	0.619	0.628	0.589	0.600	0.702
	Left Cheek	0.977	0.094	0.274	0.210	0.115	0.071	1.345	1.186	1.258	1.163	1.373
	Left Tilted	0.357	0.252	0.059	0.231	0.054	0.113	0.668	0.663	0.701	0.524	0.755
FR1 n77_Ant 2	Right Cheek	0.295	0.071	0.298	0.082	0.251	0.064	0.664	0.617	0.441	0.610	0.692
	Right Tilted	0.095	0.101	0.104	0.102	0.113	0.073	0.300	0.309	0.270	0.281	0.383
	Left Cheek	0.115	0.094	0.274	0.210	0.115	0.071	0.483	0.324	0.396	0.301	0.511
	Left Tilted	0.135	0.252	0.059	0.231	0.054	0.113	0.446	0.441	0.479	0.302	0.533

15.3 Hotspot Exposure Conditions

<Simultaneous Transmission is active WWAN ON>

WWAN Band	Exposure Position	1	2	3	4	5	6	7	1+2+3 Summed 1g SAR (W/kg)	1+2+5 Summed 1g SAR (W/kg)	1+4+7 Summed 1g SAR (W/kg)	1+5+7 Summed 1g SAR (W/kg)	1+6+7 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN Ant 4	2.4GHz WLAN Ant 3	5GHz WLAN Ant 4	5GHz WLAN Ant 3	5GHz WLAN Ant 4+3	Bluetooth Ant 4					
FR1 n77_Ant 7	Front	0.462	0.194	0.147	0.559	0.114	0.563	0.016	0.803	0.770	1.037	0.592	1.041
	Back	0.695	0.229	0.165	0.330	0.135	0.188	0.023	1.089	1.059	1.048	0.853	0.906
	Left side	0.970	0.044	0.256	0.065	0.551	0.116	0.001	1.270	1.565	1.036	1.522	1.087
	Right side	0.027	0.094	0.024	0.375	0.055	0.388	0.001	0.145	0.176	0.403	0.083	0.416
	Top side		0.277	0.019	0.266	0.118	0.235	0.073	0.296	0.395	0.339	0.191	0.308
	Bottom side	0.146							0.146	0.146	0.146	0.146	0.146
FR1 n77_Ant 2	Front	0.168	0.194	0.147	0.559	0.114	0.563	0.016	0.509	0.476	0.743	0.298	0.747
	Back	0.257	0.229	0.165	0.330	0.135	0.188	0.023	0.651	0.621	0.610	0.415	0.468
	Left side	0.009	0.044	0.256	0.065	0.551	0.116	0.001	0.309	0.604	0.075	0.561	0.126
	Right side	0.434	0.094	0.024	0.375	0.055	0.388	0.001	0.552	0.583	0.810	0.490	0.823
	Top side		0.277	0.019	0.266	0.118	0.235	0.073	0.296	0.395	0.339	0.191	0.308
	Bottom side	0.246							0.246	0.246	0.246	0.246	0.246

<Simultaneous Transmission is active WLAN OFF>

WWAN Band	Exposure Position	1	2	1+2
		WWAN	Bluetooth Ant 4	Summed
FR1 n77_Ant 7_HPUE	Front	0.462	0.016	0.478
	Back	0.695	0.023	0.718
	Left side	0.970	0.001	0.971
	Right side	0.027	0.001	0.028
	Top side		0.073	0.073
	Bottom side	0.146		0.146
FR1 n77_Ant 2_HPUE	Front	0.168	0.016	0.184
	Back	0.257	0.023	0.280
	Left side	0.009	0.001	0.010
	Right side	0.434	0.001	0.435
	Top side		0.073	0.073
	Bottom side	0.246		0.246

15.4 Body-Worn Accessory Exposure Conditions

<Simultaneous Transmission is active WWAN ON>

WWAN Band	Exposure Position	1	2	3	4	5	6	7	1+2+3 Summed 1g SAR (W/kg)	1+2+5 Summed 1g SAR (W/kg)	1+4+7 Summed 1g SAR (W/kg)	1+5+7 Summed 1g SAR (W/kg)	1+6+7 Summed 1g SAR (W/kg)
		WWAN 1g SAR (W/kg)	2.4GHz WLAN Ant 4 1g SAR (W/kg)	2.4GHz WLAN Ant 3 1g SAR (W/kg)	5GHz WLAN Ant 4 1g SAR (W/kg)	5GHz WLAN Ant 3 1g SAR (W/kg)	5GHz WLAN Ant 4+3 1g SAR (W/kg)	Bluetooth Ant 4 1g SAR (W/kg)					
FR1 n77_Ant 7	Front	0.462	0.194	0.147	0.579	0.232	0.579	0.016	0.803	0.888	1.057	0.710	1.057
	Back	0.695	0.229	0.165	0.377	0.292	0.428	0.023	1.089	1.216	1.095	1.010	1.146
FR1 n77_Ant 2	Front	0.168	0.194	0.147	0.579	0.232	0.579	0.016	0.509	0.594	0.763	0.416	0.763
	Back	0.257	0.229	0.165	0.377	0.292	0.428	0.023	0.651	0.778	0.657	0.572	0.708

<Simultaneous Transmission is active WLAN OFF>

WWAN Band	Exposure Position	1	2	1+2 Summed 1g SAR (W/kg)
		WWAN 1g SAR (W/kg)	Bluetooth Ant 4 1g SAR (W/kg)	
FR1 n77_Ant 7	Front	0.462	0.016	0.478
	Back	0.695	0.023	0.718
FR1 n77_Ant 2	Front	0.168	0.016	0.184
	Back	0.257	0.023	0.280



16. Supplemental Antenna tuner tests results

General Note:

1. This device implements antenna tuning techniques in the several frequency band and list as below. SAR test proposal was measured according to the normally required SAR configurations with the tuner active and worst tune state (auto tune) was used for SAR testing and this design will provide the highest power at different user scenarios and would not influence to the antenna characteristics other than impedance matching.
2. The following test procedure was followed to demonstrate that the SAR results in this report represent the appropriate SAR test conditions. For bands with dynamic tuning implemented, SAR will be measured according to the required FCC SAR test procedures with the dynamic tuner active to allow the device to automatically tune to the antenna state for the respective RF exposure test configurations. Additional single point SAR time-sweep measurements will be evaluated for other tuner states to determine that the other tuner configurations would result in equivalent or lower SAR values.
3. To evaluate all of the tuner states, the 144 tuner states are divided evenly among band, mode and exposure combinations so that at least one single point SAR measurement is measured in each configuration. Single point time-sweep measurements will be performed at the peak SAR location determined by the zoom scan of the configuration with the highest reported SAR for each combination. The tuner state will be established remotely so that the device is not moved for the entire series of single point SAR for the tuner states in each combination. The SAR probe will remain stationary at the same position throughout the entire series of single point measurements for each combination.
4. The tuner state was established remotely through Wi-Fi so that the device is not moved for the entire series of single point SAR for the tuner states in each combination (band, mode, exposure conditions).
5. The tuner test result only evaluation n77 only, other bands refer to original report FCC ID: A4RGD1YQ, Report no.: 011718-01A

Antenna Tuner support list	
Config*	Support transmit antenna and band
Config 0	ANT 0: GSM850, UMTS B5, CDMA BC0/BC10, LTE B5/B12/B13/B14/B17/B26/B71, NR n5/n12/n71 ANT 2: GSM1900, UMTS B2/B4, CDMA BC1, LTE B2/B4/B7/B25/B30/B66/B38/B41, NR n2/n7/n25/n41/n66
Config 1	ANT 0: UMTS B2/B4, CDMA BC1, LTE B2/B4/B7/B25/B30/B66/B38/B41, NR n2/n7/n25/n41/n66 ANT 2: NR n77

*Config 0 and 1 means output ports of power measurement for different antennas and bands.



Head																					
Mode	Service/Modulation	Frequency (MHz)	Channel	RB Size	RB Offset	Test Position	Spacing	Measured 1g SAR (W/kg)	Average Value of Time Sweep (W/kg)												
									Auto-Tune (State 22)	0	2	4	6	8	10	12	14	16	18	20	22
FR1 n77_Ant 2	BPSK	3840	656000	1	1	Right Cheek	0 mm	0.162	0.287	0.095	0.18	0.228	0.123	0.085	0.037	0.133	0.152	0.266	0.209	0.218	0.254
									24	26	28	30	32	34	36	38	40	42	44	46	48
									0.037	0.104	0.237	0.152	0.018	0.171	0.047	0.066	0.256	0.142	0.133	0.028	0.171
									50	52	54	56	58	60	62	64	66	68	70	72	74
									0.285	0.152	0.18	0.037	0.199	0.285	0.237	0.218	0.114	0.275	0.161	0.066	0.18
									76	78	80	82	84	86	88	90	92	94	96	98	100
									0.247	0.114	0.028	0.142	0.161	0.028	0.056	0.085	0.285	0.171	0.256	0.237	0.028
									102	104	106	108	110	112	114	116	118	120	122	124	126
									0.028	0.123	0.237	0.056	0.285	0.199	0.256	0.066	0.161	0.152	0.152	0.047	0.133
									128	130	132	134	136	138	140	142					
0.056	0.275	0.247	0.114	0.171	0.19	0.275	0.066														
Body																					
Mode	Service/Modulation	Frequency (MHz)	Channel	RB Size	RB Offset	Test Position	Spacing	Measured 1g SAR (W/kg)	Average Value of Time Sweep (W/kg)												
									Auto-Tune (State 22)	1	3	5	7	9	11	13	15	17	19	21	23
FR1 n77_Ant 2	BPSK	3840	656000	1	1	Right Side	10 mm	0.238	0.469	0.134	0.096	0.105	0.41	0.029	0.362	0.048	0.162	0.124	0.4	0.438	0.029
									25	27	29	31	33	35	37	39	41	43	45	47	49
									0.067	0.229	0.324	0.248	0.372	0.467	0.162	0.143	0.2	0.286	0.419	0.334	0.077
									51	53	55	57	59	61	63	65	67	69	71	73	75
									0.067	0.467	0.334	0.296	0.419	0.096	0.448	0.229	0.105	0.305	0.077	0.343	0.096
									77	79	81	83	85	87	89	91	93	95	97	99	101
									0.315	0.057	0.248	0.362	0.438	0.115	0.296	0.41	0.238	0.467	0.257	0.257	0.077
									103	105	107	109	111	113	115	117	119	121	123	125	127
									0.077	0.267	0.124	0.315	0.362	0.343	0.343	0.41	0.2	0.419	0.038	0.134	0.429
									129	131	133	135	137	139	141	143					
0.229	0.153	0.267	0.305	0.296	0.334	0.124	0.334														

Test Engineer : Mood Huang



17. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

18. References

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992
- [3] IEEE Std. 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 248227 D01 v02r02, "SAR Guidance for IEEE 802.11 (WiFi) Transmitters", Oct 2015.
- [6] FCC KDB 447498 D01 v06, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Oct 2015
- [7] FCC KDB 648474 D04 v01r03, "SAR Evaluation Considerations for Wireless Handsets", Oct 2015.
- [8] FCC KDB 941225 D01 v03r01, "3G SAR MEAUREMENT PROCEDURES", Oct 2015
- [9] FCC KDB 941225 D05 v02r05, "SAR Evaluation Considerations for LTE Devices", Dec 2015
- [10] FCC KDB 941225 D05A v01r02, "Rel. 10 LTE SAR Test Guidance and KDB Inquiries", Oct 2015
- [11] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.
- [12] FCC KDB 941225 D07 v01r02, " SAR Evaluation Procedures for UMPC Mini-Tablet Devices", Oct 2015.
- [13] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [14] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.