FCC SAR Test Report

APPLICANT	**: Motorola Mobility LLC**
EQUIPMENT	**: Mobile Cellular Phone**
BRAND NAME	**: Motorola**
MODEL NAME	**: XT2301-1**
FCC ID	**: IHDT56AH1**
STANDARD	**: FCC 47 CFR Part 2 (2.1093)**

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB 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. (Shenzhen), the test report shall not be reproduced except in full.

Si Zhang

ilac-MRA A2LA ACCREDITED Cert #5145.01

Approved by: Si Zhang

Sporton International Inc. (Shenzhen)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China

Table of Contents

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA292622	Rev. 01	Initial issue of report.	Dec. 12, 2022

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Motorola Mobility LLC, Mobile Cellular Phone, XT2301-1,** are as follows.

Highest 1g SAR Summary						
Equipment Class	Frequency Band		Head (Separation 0mm)	Hotspot (Separation 5mm)	Body-worn (Separation 5mm)	Highest Simultaneous Transmission 1g SAR (W/kg)
			1g SAR (W/kg)			
Licensed	GSM	GSM850	0.90	0.81	0.81	1.59
		GSM1900	0.89	0.95	0.87	
	WCDMA	WCDMA II	0.89	1.10	0.93	
		WCDMA IV	0.87	1.24	0.86	
		WCDMA V	0.89	0.95	0.95	
	LTE	LTE Band 2/25	0.86	1.14	0.99	
		LTE Band 4/66	0.89	1.16	0.97	
		LTE Band 5/26	0.81	0.92	0.92	
		LTE Band 7	0.84	1.24	1.24	
		LTE Band 12/17	0.90	0.68	0.68	
		LTE Band 13	0.90	0.63	0.63	
		LTE Band 14	0.89	0.83	0.83	
		LTE Band 30	0.90	0.95	0.95	
		LTE Band 71	0.79	0.44	0.43	
		LTE Band 38/41	0.88	**1.25**	1.25	
		LTE Band 48	0.87	0.99	0.98	
	5G NR	FR1 n2/25	0.87	1.24	0.92	
		FR1 n5/26	0.70	0.79	0.79	
		FR1 n7	0.86	1.00	0.61	
		FR1 n12	0.13	0.52	0.52	
		FR1 n14	0.15	0.62	0.62	
		FR1 n30	0.81	0.93	0.90	
		FR1 n66	0.90	1.24	0.99	
		FR1 n70	0.88	1.15	0.89	
		FR1 n71	0.47	0.64	0.64	
		FR1 n38/41	0.89	1.24	1.24	
		FR1 n48	0.94	0.98	0.98	
		FR1 n77/78	0.87	0.96	0.96	
DTS	WLAN	2.4GHz WLAN	**1.30**	0.37	**1.29**	1.59
NII		5GHz WLAN	1.12	0.19	1.15	1.59
DSS	Bluetooth	2.4GHz Bluetooth	0.56	0.22	0.41	1.59

<table>
<tr><th colspan="5">Highest 10g SAR Summary</th></tr>
<tr><th>Equipment Class</th><th colspan="2">Frequency Band</th><th>Product Specific 10g SAR (W/kg) (Separation 0mm)</th><th>Highest Simultaneous Transmission 10g SAR (W/kg)</th></tr>
<tr><td rowspan="18">Licensed</td><td>GSM</td><td>GSM1900</td><td>1.99</td><td rowspan="18">3.67</td></tr>
<tr><td rowspan="2">WCDMA</td><td>WCDMA II</td><td>1.98</td></tr>
<tr><td>WCDMA IV</td><td>1.93</td></tr>
<tr><td rowspan="6">LTE</td><td>LTE Band 2/25</td><td>1.99</td></tr>
<tr><td>LTE Band 4/66</td><td>1.98</td></tr>
<tr><td>LTE Band 7</td><td>1.99</td></tr>
<tr><td>LTE Band 30</td><td>1.95</td></tr>
<tr><td>LTE Band 38/41</td><td>2.00</td></tr>
<tr><td>LTE Band 48</td><td>1.99</td></tr>
<tr><td rowspan="8">5G NR</td><td>FR1 n2/25</td><td>1.99</td></tr>
<tr><td>FR1 n7</td><td>1.99</td></tr>
<tr><td>FR1 n30</td><td>1.94</td></tr>
<tr><td>FR1 n66</td><td>2.00</td></tr>
<tr><td>FR1 n70</td><td>1.99</td></tr>
<tr><td>FR1 n38/41</td><td>2.54</td></tr>
<tr><td>FR1 n48</td><td>1.89</td></tr>
<tr><td>FR1 n77/78</td><td>1.96</td></tr>
<tr><td>DTS</td><td rowspan="2">WLAN</td><td>2.4GHz WLAN</td><td>2.75</td><td>3.67</td></tr>
<tr><td>NII</td><td>5GHz WLAN</td><td>2.99</td><td>3.67</td></tr>
<tr><td colspan="3">Date of Testing:</td><td colspan="2">2022/10/22 ~ 2022/11/30</td></tr>
</table>

Remark:

1. This device supports LTE B2 / B4 / B5 / B17 / B38 and B25 / B66 / B26 / B12 / B41. Since the supported frequency span for LTE B2 / B4 / B5 / B17 / B38 falls completely within the supports frequency span for LTE B25 / B66 / B26 / B12 / B41, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B25 / B66 / B26 / B12 / B41.
2. This device supports 5GNR n78/n38/n5/n2 and n77/n41/n26/n25. Since the supported frequency span for 5GNR n78/n38/n5/n2 falls completely within the supports frequency span for n77/n41/n26/n25, both 5GNR bands have the same target power, and both 5GNR bands share the same transmission path; therefore, SAR was only assessed for n77/n41/n26/n25.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Product Specific 10g SAR) 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.

2. Administration Data

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Testing Laboratory			
Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR03-SZ	CN1256	421272

Applicant	
Company Name	Motorola Mobility LLC
Address	222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

Manufacturer	
Company Name	Motorola Mobility LLC
Address	222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

3. 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 616217 D04 SAR for laptop and tablets v01r02
- 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

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2301-1
FCC ID	IHDT56AH1
IMEI Code	IMEI 1 : 350007550013792 IMEI 2 : 350007550013800
Wireless Technology and Frequency Range	GSM850: 824 MHz ~ 849 MHz GSM1900: 1850 MHz ~ 1910 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n7: 2500 MHz ~ 2570 MHz 5G NR n12 : 699 MHz ~ 716 MHz 5G NR n14 : 788 MHz ~ 798 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n26 : 814 MHz ~ 849 MHz 5G NR n30 : 2305 MHz ~ 2315 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n70 : 1695 MHz ~ 1710 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n38 : 2570 MHz ~ 2620 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n77: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3980 MHz 5G NR n78: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3800 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz WLAN 6E U-NII-5: 5925 MHz ~ 6425 MHz WLAN 6E U-NII-6: 6425 MHz ~ 6525 MHz WLAN 6E U-NII-7: 6525 MHz ~ 6875 MHz WLAN 6E U-NII-8: 6875 MHz ~ 7125 MHz Bluetooth: 2402 MHz ~ 2480 MHz WPT: 111 kHz ~ 148 kHz NFC: 13.56 MHz
Mode	GSM/GPRS/EGPRS

	RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+(16QAM uplink is not supported) LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR : CP-OFDM / DFT-s-OFDM, PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ax HE20/HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac/ax VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 WLAN 6GHz 802.11a WLAN 6GHz 802.11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE WPT: ASK NFC: ASK
HW Version	DVT2
SW Version	TTR33.124
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.
EUT Stage	Identical Prototype

Remark:

1. This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
2. This device 2.4GHz WLAN support hotspot operation and Bluetooth support tethering applications.
3. This device 5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WiFi Direct (GC/GO), and 5.3GHz / 5.5GHz supports WiFi Direct (GC only). WIFI 6E has no hotspot function.
4. The 2.4GHz/5GHz/6GHz WLAN can transmit in MIMO antenna mode only and it has no SISO antenna mode.
5. This device does not support DTM operation and supports GPRS/EGPRS mode up to multi-slot class 12.
6. This device has NFC operations, the NFC antenna is integrated into the device for this model, therefore, all SAR test were performed with the device which already incorporates the NFC antenna. A diagram showing the location of the antenna can be found in the operational description. According to FCC KDB publication 447498 D01v06, transmitters are consider to be operating simultaneously when there is overlapping transmission, with the exception of transmission during network hand-offs with maximum hand-off duration less than 30 seconds.
7. For dual SIM card mobile has single SIM slots + eSIM (electronic SIM) and supports dual SIM dual standby. The WWAN radio transmission will be enabled by either one SIM at a time (single active).
8. The device implements the power management and proximity sensor /receiver detection/hotspot mode for SAR compliance at different exposure conditions (head, body-worn, hotspot, extremity) 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. And the device will invoke corresponding work scenarios power level base on frequency bands/antennas, which can refer to power table at appendix E.
9. For WLAN/BT when transmit simultaneous with WWAN, power reduction will be activated to head. For WLAN/BT when transmit simultaneous with WWAN and Proximity sensors trigger, power reduction will be activated to body-worn and Handheld.
10. This device implements antenna tuning techniques for several WWAN (cellular) operating modes and frequencies for the purpose of improving antenna efficiency over a broad range of frequencies. Specifically, these techniques are employed in the LTE and 5GNR modes. In this report SAR was measured according to the normally required SAR configurations with the tuner active and worst tune state (auto tune) was used for SAR testing. The detail descriptions of the antenna tuner and supplemental data for additional information can be referred to section 18 and appendix F.
11. This device supports HPUE for LTE Band 41 and 5GNR n41/n77 with class 2 level, HPUE power has been measured separately. For HPUE power is higher than power class 3 but with lower duty cycle, the maximum average power for class 2 and class 3 is almost the same, so we chose power class 3 full SAR testing and power class 2 verify the worst case of power class 3 SAR.
12. For 5GNR n41/n77 HPUE, 5GNR n41/n77 PC2 Maximum Duty Cycle is 50%, using FTM (Factory Test Mode) with 50% duty cycle is considered during SAR testing. For 5G NR other bands test, using FTM (Factory Test Mode) with default 100% duty cycle transmission to perform SAR testing.
13. NSA and SA mode should perform SAR separately. For the maximum power of NSA mode is the same as SA total power level, so SA SAR can represent NSA mode SAR.
14. 5GNR NSA mode, the power level is the same as 5GNR SA mode, so 5GNR NSA mode and SA mode power table only show one time.
15. 5G NR supports CP-OFDM and DFT-s-OFDM modulation, for DFT-s-OFDM power is higher than CP-OFDM, so only

show DFT-s-OFDM power table and chose DFT-s-OFDM to perform SAR testing.

16. For DFT-s-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for the CP-OFDM mode will not higher than DFT-s-OFDM mode, therefore, CP-OFDM measurement is unnecessary.
17. 5G NR n41 supports UL MIMO at Antenna 1 and Antenna 2, and 5G NR n48/n77 supports UL MIMO at Antenna 3 and Antenna 8.
18. The device supports HPUE (power class 2) under SISO mode and HPUE (power class 1.5) under UL MIMO mode for 5G NR n41/n77.
19. The device support DBS (Dual Band Simultaneous) function, when the device 2.4GHz and 5GHz or 6GHz transmit at the same time the module will limit different output power for simultaneous transmission compliance.
20. SAR and Power density test report for WIFI 6E U-NII-5/6/7/8 will be separately submitted. About co-located SAR with WWAN/Bluetooth always chose higher SAR of WLAN5G U-NII-1/2A/2C/3 and U-NII-5/6/7/8.
21. RF exposure report for WPC (Wireless power charging) will be separately submitted.
22. This device supports 5GNR FR1 bands as following table, including NSA mode and SA mode. NSA and SA mode performed SAR separately.

<5G NR>

Mode	Band	Duplex	SCS(KHz)	Bandwidths(BW)
NSA	n2	FDD	15	5, 10, 15, 20
	n5	FDD	15	5, 10, 15, 20
	n7	FDD	15	5, 10, 15, 20, 25, 30, 40
	n12	FDD	15	5, 10, 15
	n25	FDD	15	5, 10, 15, 20
	n30	FDD	15	5, 10
	n66	FDD	15	5, 10, 15, 20, 25, 30, 40
	n71	FDD	15	5, 10, 15, 20
	n41	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100
	n77	TDD	30	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100
	n78	TDD	30	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100
SA	n2	FDD	15	5, 10, 15, 20
	n5	FDD	15	5, 10, 15, 20
	n7	FDD	15	5, 10, 15, 20, 25, 30, 40
	n12	FDD	15	5, 10, 15
	n14	FDD	15	5, 10
	n25	FDD	15	5, 10, 15, 20
	n26	FDD	15	5, 10, 15, 20
	n30	FDD	15	5, 10
	n66	FDD	15	5, 10, 15, 20, 25, 30, 40
	n70	FDD	15	5, 10, 15
	n71	FDD	15	5, 10, 15, 20
	n38	TDD	30	10, 15, 20, 25, 30, 40
	n41	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100
	n48	TDD	30	10, 15, 20, 30, 40
	n77	TDD	30	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100
	n78	TDD	30	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100

4.2 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>IHDT56AH1</td></tr>
<tr><td>Equipment Name</td><td>Mobile Cellular Phone</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>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</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 7: 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</td></tr>
<tr><td>uplink modulations used</td><td>QPSK / 16QAM / 64QAM / 256QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Voice and Data</td></tr>
<tr><td>LTE Release Version</td><td>R16, Cat20</td></tr>
<tr><td>CA Support</td><td>Supported, Uplink and Downlink</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3
<table>
<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>
<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>
</table></td></tr>
<tr><td>LTE A-MPR</td><td>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)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>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.</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>Yes, when operating in Proximity sensors/receiver/hotspot detect mechanism, head/body -worn /hotspot/extremity will trigger reduced power for some bands applied to satisfy SAR compliance, the detail please referred to section 14.</td></tr>
<tr><td>LTE Carrier Aggregation Combinations</td><td>Inter-Band and Intra-Band possible combinations and the detail power verification please referred to section 14.</td></tr>
<tr><td>LTE Carrier Aggregation Additional Information</td><td>1. This device supports LTE Carrier Aggregation (CA) in the uplink for intra-band and inter-band with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per FCC Guidance.
2. This device supports maximum of 7 carriers in the downlink and 2 carriers in the uplink.</td></tr>
</table>

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	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7

	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	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 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
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 13

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5		
M	23230	782	23230	782
H	23255	784.5		

LTE Band 14

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Channel #	Channel #	Freq.(MHz)
L	23305	790.5		
M	23330	793	23330	793
H	23355	795.5		

LTE Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

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		
M	27710	2310	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
LM	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
HM	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	133247	675.5	133272	678	133297	680.5	133322	683
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
LM	55810	3607	55815	3607.5	55820	3608	55830	3609
MH	56170	3643	56165	3642.5	56160	3642	56150	3641
H	56715	3697.5	56690	3695	56665	3692.5	56640	3690

<For LTE Overlap Bands Description>

1) LTE Bands BW

Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
LTE Band 2	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 25	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 4	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 66	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 12	Yes	Yes	Yes	Yes		
LTE Band 17			Yes	Yes		
LTE Band 5	Yes	Yes	Yes	Yes		
LTE Band 26	Yes	Yes	Yes	Yes	Yes	
LTE Band 38			Yes	Yes	Yes	Yes
LTE Band 41			Yes	Yes	Yes	Yes

2) LTE Bands tune up:

Band	Antenna	Head DSI 2 Receiver on Tune-up Limit	Body Worn DSI 3 Sensor on& Hotspot Tune-up Limit	Extremely DSI 6 Handheld Tune-up Limit	Sensor Off DSI4 Tune-up Limit	Default Tune-up Limit
LTE Band 2	1	16.6	18.7	21.1	23	23
LTE Band 25	1	16.6	18.7	21.1	23	23
LTE Band 4	1	17.6	18.4	20.2	23	23
LTE Band 66	1	17.6	18.4	20.2	23	23
LTE Band 12	1	23.4	24	24	24	24
LTE Band 17	1	23.4	24	24	24	24
LTE Band 5	1	23.1	24	24	24	24
LTE Band 26	1	23.1	24	24	24	24
LTE Band 38	1	18.5	17.8	22.2	23	23
LTE Band 41	1	18.5	17.8	22.2	23	23

Band	Antenna	Head DSI 2 Receiver on Tune-up Limit	Body Worn DSI 3 Sensor on& Hotspot Tune-up Limit	Extremely DSI 6 Handheld Tune-up Limit	Sensor Off DSI4 Tune-up Limit	Default Tune-up Limit
LTE Band 2	2	24	21.9	23.4	24	24
LTE Band 25	2	24	21.9	23.4	24	24
LTE Band 4	2	24	21.9	23.2	24	24
LTE Band 66	2	24	21.9	23.2	24	24
LTE Band 12	0	24	24	24	24	24
LTE Band 17	0	24	24	24	24	24
LTE Band 5	0	24	24	24	24	24
LTE Band 26	0	24	24	24	24	24
LTE Band 38	2	24	24	24	24	24
LTE Band 41	2	24	24	24	24	24

4.3 General 5G NR SAR Test and Reporting Considerations

5G NR Information	
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 n14 : 788 MHz ~ 798 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n26 : 814 MHz ~ 849 MHz 5G NR n30 : 2305 MHz ~ 2315 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n70 : 1695 MHz ~ 1710 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n38 : 2570 MHz ~ 2620 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n77: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3980 MHz 5G NR n78: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3800 MHz
Channel Bandwidth	The detail please refers to section 4.1 5GNR FR1 bands table.
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 B5/12/13/14/30/66
LTE Anchor Bands for n5	LTE B2/30/48/66
LTE Anchor Bands for n7	LTE B66
LTE Anchor Bands for n12	LTE B2/66
LTE Anchor Bands for n25	LTE B12/66
LTE Anchor Bands for n30	LTE B2/5/12/14/66
LTE Anchor Bands for n41	LTE B2/66
LTE Anchor Bands for n66	LTE B2/5/7/12/13/14/30/48
LTE Anchor Bands for n71	LTE B2/48/66
LTE Anchor Bands for n77	LTE B2/5/7/12/13/14/30/66
LTE Anchor Bands for n78	LTE B5/7/66

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		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	500500	2502.5	501000	2505	501500	2507.5	502000	2510	502500	2512.5	503000	2515	504000	2520
M	507000	2535	507000	2535	507000	2535	507000	2535	507000	2535	507000	2535	507000	2535
H	513500	2567.5	513000	2565	512500	2562.5	512000	2560	511500	2557.5	511000	2555	510000	2550

NR Band 12

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	140300	701.5	140800	704	141300	706.5
M	141500	707.5	141500	707.5	141500	707.5
H	142700	713.5	142200	711	141700	708.5

NR Band 14				
	Bandwidth 5MHz		Bandwidth 10MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	158100	790.5		
M	158600	793	158600	793
H	159100	795.5		

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	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5
H	382500	1912.5	382000	1910	381500	1907.5	381000	1905

NR Band 26								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	163300	816.5	163800	819	164300	821.5	164800	824
M	166300	831.5	166300	831.5	166300	831.5	166300	831.5
H	169300	846.5	168800	844	168300	841.5	167800	839

NR Band 30				
	Bandwidth 5MHz		Bandwidth 10MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	461500	2307.5		
M	462000	2310	462000	2310
H	462500	2312.5		

NR Band 66														
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	342500	1712.5	343000	1715	343500	1717.5	344000	1720	344500	1722.5	345000	1725	346000	1730
M	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745
H	355500	1777.5	355000	1775	354500	1772.5	354000	1770	353500	1767.5	353000	1765	352000	1760

NR Band 70						
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	339500	1697.5	340000	1700		
M	340500	1702.5	340500	1702.5	340500	1702.5
H	341500	1707.5	341000	1705		

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	134100	670.5	134600	673
M	136100	680.5	136100	680.5	136100	680.5	136100	680.5
H	139100	695.5	138600	693	138100	690.5	137600	688

NR Band 38												
	Bandwidth10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	515004	2575.02	515502	2577.51	516000	2580	516504	2582.52	517002	2585.01	518004	2590.02
M	519000	2595	519000	2595	519000	2595	519000	2595	519000	2595	519000	2595
H	522996	2614.98	522498	2612.49	522000	2610	521496	2607.48	520998	2604.99	519996	2599.98

NR Band 41																						
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	500202	2501.01	500700	2503.5	501204	2506.02	502200	2511	503202	2516.01	504204	2521.02	505200	2526	500202	2501.01	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	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99
H	537000	2685	536496	2682.48	535998	2679.99	534996	2674.98	534000	2670	532998	2664.99	531996	2659.98	537000	2685	529998	2649.99	528996	2644.98	528000	2640

NR Band 48										
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	637000	3555	637168	3557.52	637334	3560.01	637668	3565.02	638000	3570
M	641666	3624.99	641666	3624.99	641666	3624.99	641666	3624.99	641666	3624.99
H	646332	3694.98	646166	3692.49	646000	3690	645666	3684.99	645332	3679.98

NR Band 77																								
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	647000	3705	647168	3707.52	647334	3710.01	647500	3712.5	647668	3715.02	648000	3720	648334	3725.01	648668	3730.02	649000	3735	649334	3740.01	649668	3745.02	650000	3750
M	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840
H	665000	3975	664834	3972.51	664666	3970.02	664500	3967.5	664332	3965.01	664000	3960	663668	3955.02	663332	3950.01	663000	3945	662666	3940.02	662332	3935.01	662000	3930

NR Band 78																								
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	647000	3705	647168	3707.52	647334	3710.01	647500	3712.5	647668	3715.02	648000	3720	648334	3725.01	648668	3730.02	649000	3735	649334	3740.01	649668	3745.02		
M	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750
H	653000	3795	652834	3792.51	652668	3790.02	652500	3787.5	652334	3785.01	652000	3780	651668	3775.02	651334	3770.01	651000	3765	650668	3760.02	650334	3755.01		

For <3450 MHz ~ 3550 MHz >

NR Band 77																								
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	630334	3455.01	630500	3457.5	630668	3460.02	630834	3462.51	631000	3465	631334	3470.01	631668	3475.02	632000	3480	632334	3485.01	632668	3490.02	633000	3495		
M	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98
H	636332	3544.98	636166	3542.49	636000	3540	635832	3537.48	635666	3534.99	635332	3529.98	635000	3525	634666	3519.99	634332	3514.98	634000	3510	633666	3504.99		

NR Band 78																								
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	630334	3455.01	630500	3457.5	630668	3460.02	630834	3462.51	631000	3465	631334	3470.01	631668	3475.02	632000	3480	632334	3485.01	632668	3490.02	633000	3495		
M	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98
H	636332	3544.98	636166	3542.49	636000	3540	635832	3537.48	635666	3534.99	635332	3529.98	635000	3525	634668	3520.02	634334	3515.01	634000	3510	633668	3505.02		

<For NR Overlap Bands Description>

1) NR Bands BW

Mode	Band	Duplex	SCS(KHz)	Bandwidths(BW)
NR	n2	FDD	15	5, 10, 15, 20
	n25	FDD	15	5, 10, 15, 20,
	n5	FDD	15	5, 10, 15, 20
	n26	FDD	15	5, 10, 15, 20
	n38	TDD	30	10, 15, 20, 25, 30, 40
	n41	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100
	n77	TDD	30	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100
	n78	TDD	30	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100

2) NR Bands Tune up:

Band	Antenna	Head DSI 2 Receiver on Tune-up Limit	Body Worn DSI 3 Sensor on& Hotspot Tune-up Limit	Extremely DSI 6 Handheld Tune-up Limit	Sensor Off DSI4 Tune-up Limit	Default Tune-up Limit
n2	2	24	22	24	24	24
n25	2	24	22	24	24	24
n5	0	24	24	24	24	24
n26	0	24	24	24	24	24

Band	Antenna	Head DSI 2 Receiver on Tune-up Limit	Body Worn DSI 3 Sensor on& Hotspot Tune-up Limit	Extremely DSI 6 Handheld Tune-up Limit	Sensor Off DSI4 Tune-up Limit	Default Tune-up Limit
n2	1	16.5	17.5	20	24	24
n25	1	16.5	17.5	20	24	24
n5	1	24	24	24	24	24
n26	1	24	24	24	24	24
n38	1	16	15.5	19.5	24	24
n41	1	16	15.5	19.5	24	24

Band	Antenna	Head DSI 2 Receiver on Tune-up Limit	Body Worn DSI 3 Sensor on& Hotspot Tune-up Limit	Extremely DSI 6 Handheld Tune-up Limit	Sensor Off DSI4 Tune-up Limit	Default Tune-up Limit
n77	3	18	16	17	18.5	24
n78	3	18	16	17	18.5	24
n77	7	19	15.5	18.5	24	24
n78	7	19	15.5	18.5	24	24
n77	8	24	13	17	24	24
n78	8	24	13	17	24	24
n77	9	19.5	15	17.5	17.5	24
n78	9	19.5	15	17.5	17.5	24

5. Smart Transmit feature for RF Exposure compliance

The 2nd generation of Smart Transmit (GEN2) operates based on pre-defined sub6 antenna groups (AG). This Device is enabled with the Qualcomm® Smart Transmit Gen2 feature. The 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 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.

Note that WLAN/BT operations are not enabled with Smart Transmit.

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 GEN2 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 SAR limit to account for all device design related uncertainty.
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.

Antenna Group:

Antenna Group 0 (AG0)	ANT1 & ANT3 & ANT4 & ANT7 & ANT8
Antenna Group 1 (AG1)	ANT0 & ANT2 & ANT9

<SAR design target and uncertainty>

Item	Uncertainty dB (k=2)
Total uncertainty	1.5

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)>

Band	Antenna	Head	Body-worn Hotspot	Extremity	Sensor off	Pmax*
		(DSI2)	(DSI3)	(DSI6)	(DSI4)	
GSM850	0	32.5	24.2	23.7	23.7	23.7
GSM850	1	20.3	24.6	23.7	23.7	23.7
GSM1900	1	15.7	17.2	20.0	21.2	21.2
GSM1900	2	33.8	22.4	21.2	21.2	21.2
WCDMA II	1	15.3	17.4	18.7	24.0	24.0
WCDMA II	2	32.1	20.2	21.9	24.0	24.0
WCDMA IV	1	16.1	17.6	19.7	24.0	24.0
WCDMA IV	2	31.7	20.5	21.8	24.0	24.0
WCDMA V	0	33.0	24.9	24.0	24.0	24.0
WCDMA V	1	22.5	24.1	24.0	24.0	24.0
LTE B2/25	1	15.6	17.7	20.1	22.0	22.0
LTE B2/25	2	32.1	20.9	22.4	23.0	23.0
LTE B4/66	1	16.6	17.4	19.2	22.0	22.0
LTE B4/66	2	31.7	20.9	22.2	23.0	23.0
LTE B5/26	0	32.3	23.7	23.0	23.0	23.0
LTE B5/26	1	22.1	23.3	23.0	23.0	23.0
LTE B7	1	15.1	16.0	19.0	22.0	22.0
LTE B7	2	27.7	21.8	21.6	23.0	23.0
LTE B12/B17	0	33.4	25.1	23.0	23.0	23.0
LTE B12/B17	1	22.4	24.6	23.0	23.0	23.0
LTE B13	0	32.2	24.6	23.0	23.0	23.0
LTE B13	1	22.0	25.0	23.0	23.0	23.0
LTE B14	0	32.0	23.5	23.0	23.0	23.0
LTE B14	1	22.5	23.7	23.0	23.0	23.0
LTE B30	1	16.3	17.9	21.6	23.0	23.0
LTE B30	2	32.0	22.0	23.0	23.0	23.0
LTE B41/38(PC3)**	1	15.5	14.8	19.2	20.0	20.0
LTE B41 (PC2)**						19.9
LTE B41/38(PC3)**	2	26.2	21.0	21.0	21.0	21.0
LTE B41 (PC2)**						20.9
LTE B48**	3	19.0	16.4	18.0	18.0	19.0
LTE B48**	8	23.0	12.5	16.3	17.0	17.0
LTE B71	0	32.5	26.0	23.0	23.0	23.0
LTE B71	1	23.5	26.6	23.0	23.0	23.0
FR1 n2/25	1	15.5	16.5	19.0	23.0	23.0
FR1 n2/25	2	32.2	21.0	23.0	23.0	23.0
FR1 n5/26	0	33.0	24.2	23.0	23.0	23.0
FR1 n5/26	1	24.0	24.0	23.0	23.0	23.0
FR1 n7	1	14.5	14.5	18.0	23.0	23.0
FR1 n12	0	32.7	25.3	23.0	23.0	23.0
FR1 n14	0	32.3	24.5	23.0	23.0	23.0
FR1 n30	1	16.0	16.5	19.5	23.0	23.0
FR1 n30	2	31.8	23.2	22.0	22.0	22.0
FR1 n66	1	16.5	16.5	19.5	23.0	23.0
FR1 n66	2	31.5	20.5	21.5	23.0	23.0
FR1 n70	1	18.0	18.0	19.5	23.0	23.0
FR1 n70	2	33.2	21.5	22.5	23.0	23.0

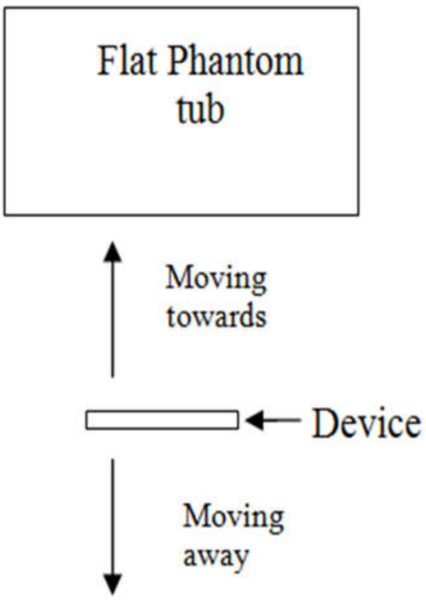
FR1 n71	0	32.5	25.3	23.0	23.0	23.0
FR1 n71	1	25.7	24.8	23.0	23.0	23.0
FR1 n41(PC3)**	0	19.0	15.5	18.0	23.0	23.0
FR1 n41(PC2)**	0	19.0	15.5	18.0	23.0	23.0
FR1 n38/41(PC3)**	1	15.0	14.5	18.5	23.0	23.0
FR1 n41(PC2)**	1	15.0	14.5	18.5	23.0	23.0
FR1 n41(PC3)**	2	29.0	21.5	21.0	23.0	23.0
FR1 n41(PC2)**	2	29.0	21.5	21.0	23.0	23.0
FR1 n41(PC3)**	4	17.0	16.5	20.0	20.0	20.0
FR1 n41(PC2)**	4	17.0	16.5	20.0	20.0	20.0
FR1 n48	3	18.5	17.0	18.0	18.5	23.0
FR1 n48	8	23.0	13.0	17.0	23.0	23.0
FR1 n77/78(PC3)**	3	17.0	15.0	16.0	17.5	23.0
FR1 n77(PC2)**	3	17.0	15.0	16.0	17.5	23.0
FR1 n77/78(PC3)**	7	18.0	14.5	17.5	23.0	23.0
FR1 n77(PC2)**	7	18.0	14.5	17.5	23.0	23.0
FR1 n77/78(PC3)**	8	24.8	12.0	16.0	23.0	23.0
FR1 n77(PC2)**	8	24.8	12.0	16.0	23.0	23.0
FR1 n77/78(PC3)**	9	18.5	14.0	16.5	16.5	23.0
FR1 n77(PC2)**	9	18.5	14.0	16.5	16.5	23.0

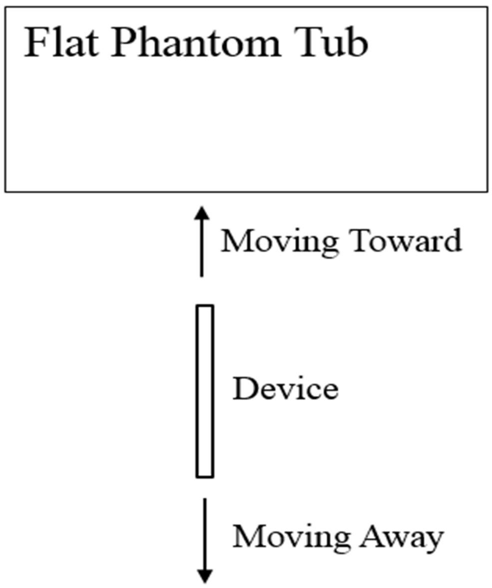
Note:
1) *P_{max} is used for RF tune up procedure. The maximum allowed output power is equal to Pmax + 1.0 dB device uncertainty.
2) All Plimit power levels entered in the Table correspond to average power levels after accounting for duty cycle in the case TDD modulation schemes (for e.g., GSM & LTE TDD & NR TDD).
3) The max allowed output power is the Plimit + 1.0 dB device uncertainty, and if Plimit is higher than Pmax, the device output power will be Pmax instead.
4) For 5GNR n41/n77 HPUE, 5GNR n41/n77 PC2 Maximum Duty Cycle is 50%, using FTM (Factory Test Mode) with 50% duty cycle is considered during SAR testing. For 5G NR other bands test, using FTM (Factory Test Mode) with default 100% duty cycle transmission to perform SAR testing.

6. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance>:

1. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed and the tissue-equivalent medium for highest frequency (5850MHz) and lowest (1750MHz) frequency was used for proximity sensor triggering testing.
2. Capacitive proximity sensors placed coincident with antenna elements at the top and bottom ends of the phone are utilized to determine when the device comes in proximity of the user's body at the front or back of the device.
3. The output power will reduce to body worn power level when top and bottom sensor pad be detected.
4. The sensors used to detect the proximity of the user's body at the front or back surface of the device use a detection threshold distance. The data shown in the sections below shows the distance(s). When front or back body worn condition is detected reduced power will be active.
5. The device employs proximity sensors also can detect the presence of the user's a finger or hand when handheld state at the front/back/top/bottom/left/right sides of the device. When front/back/top/bottom/left/right sides of handheld condition is detected reduced power will be active.
6. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance -1mm was performed:





Sensor/Handheld detection test set-up, Front and Back sides	Handheld detection test set-up, Left Side, Right Side, Bottom Side and Top Side

<P-Sensor>

Proximity Sensor Triggering Distance (mm)				
Position	Front		Back	
	Moving towards	Moving away	Moving towards	Moving away
Minimum	19	21	25	31

<Handheld for ANT0>

Proximity Sensor Triggering Distance (mm)								
Position	Front		Back		Left Side		Bottom Side	
	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
Minimum	11	14	17	19	13	16	14	17

<Handheld for ANT 1>

Proximity Sensor Triggering Distance (mm)								
Position	Front		Back		Left Side		Top Side	
	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
Minimum	10	12	17	20	16	18	11	15

<Handheld for ANT 2>

Proximity Sensor Triggering Distance (mm)								
Position	Front		Back		Right Side		Bottom Side	
	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
Minimum	11	13	16	19	10	13	14	17

<Handheld for ANT 3&8>

Proximity Sensor Triggering Distance (mm)		
Position	Back	
	Moving towards	Moving away
Minimum	10	12

<Handheld for ANT 4&5&7>

Proximity Sensor Triggering Distance (mm)								
Position	Front		Back		Right Side		Top Side	
	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
Minimum	9	11	13	16	15	18	10	13

7. RF Exposure Limits

7.1 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.

7.2 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

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.

8. Specific Absorption Rate (SAR)

8.1 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.

8.2 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:

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

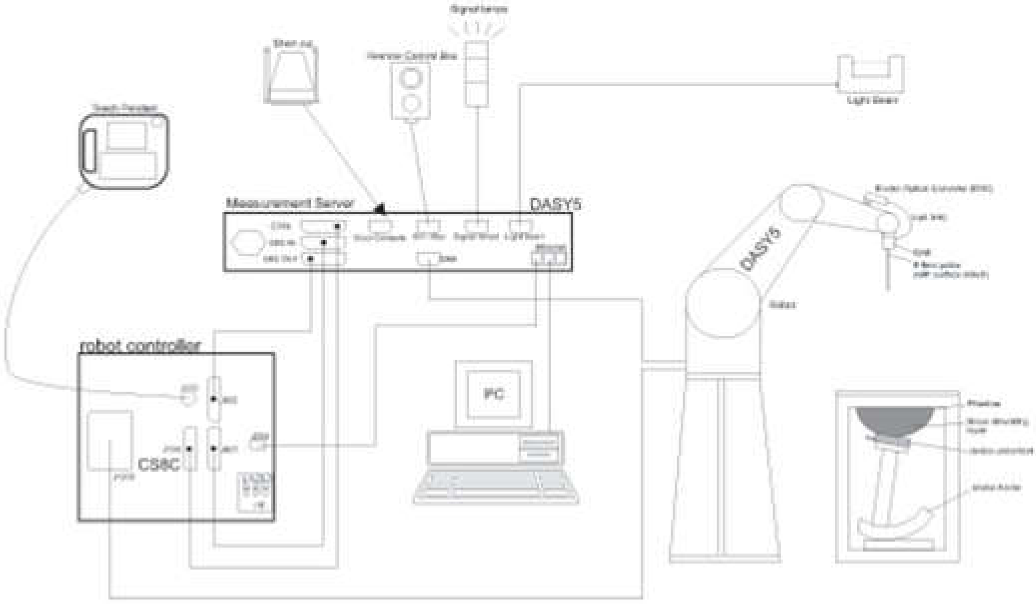
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

9. System Description and Setup

The DASY5 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 Win10 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.

9.1 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 μW/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 μW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 μW/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

9.2 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.

Photo of DAE

9.3 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

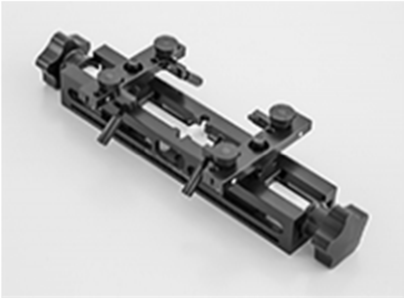
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices or for evaluating transmitters operating at low frequencies. ELI is fully compatible with standard and all known tissue simulating liquids.

9.4 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

10. 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

10.1 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 form 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

10.2 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.

10.3 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.

<table>
<tr><th></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td>Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td>Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

10.4 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: Δx_{Zoom}, Δy_{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 1st 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 *reported* SAR from the *area scan based 1-g SAR estimation* 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.				

10.5 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.

10.6 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.

11. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1099	Dec. 15, 2021	Dec. 14, 2022
SPEAG	835MHz System Validation Kit	D835V2	4d162	Dec. 17, 2021	Dec. 16, 2022
SPEAG	1750MHz System Validation Kit	D1750V2	1137	Oct. 19, 2021	Oct. 18, 2024
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	Dec. 20, 2021	Dec. 19, 2022
SPEAG	2300MHz System Validation Kit	D2300V2	1056	Oct. 20, 2021	Oct. 19, 2024
SPEAG	2450MHz System Validation Kit	D2450V2	924	Sep. 02, 2020	Aug. 31, 2023
SPEAG	2600MHz System Validation Kit	D2600V2	1070	Dec. 20, 2021	Dec. 19, 2022
SPEAG	3500MHz System Validation Kit	D3500V2	1076	May 09, 2022	May 08, 2023
SPEAG	3700MHz System Validation Kit	D3700V2	1037	May 09, 2022	May 08, 2023
SPEAG	3900MHz System Validation Kit	D3900V2	1048	May 14, 2020	May 12, 2023
SPEAG	5000MHz System Validation Kit	D5GHzV2	1341	Dec. 13, 2021	Dec. 12, 2022
SPEAG	Data Acquisition Electronics	DAE4	679	Jun. 06, 2022	Jun. 05, 2023
SPEAG	Data Acquisition Electronics	DAE4	715	Dec. 29, 2021	Dec. 28, 2022
SPEAG	Data Acquisition Electronics	DAE4	1210	Apr. 12, 2022	Apr. 11, 2023
SPEAG	Dosimetric E-Field Probe	ES3DV3	3191	Mar. 03, 2022	Mar. 02, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	3819	May 30, 2022	May 29, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	7576	Jul. 28, 2022	Jul. 27, 2023
SPEAG	SAM Twin Phantom	QD 000 P40 CD	1670	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CD	1795	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CC	1500	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201300653	Jul. 07, 2022	Jul. 06, 2023
Anritsu	Radio communication analyzer	MT8821C	6262314715	Jun. 27, 2022	Jun. 26, 2023
Agilent	Wireless Communication Test Set	E5515C	MY50267224	Jul. 07, 2022	Jul. 06, 2023
Keysight	Network Analyzer	E5071C	MY46523671	Oct. 17, 2022	Oct. 16, 2023
Speag	Dielectric Assessment KIT	DAK-3.5	1071	Jan. 24, 2022	Jan. 23, 2023
Agilent	Signal Generator	N5181A	MY50145381	Dec. 28, 2021	Dec. 27, 2022
Anritsu	Power Sensor	MA2411B	1542004	Dec. 28, 2021	Dec. 27, 2022
Anritsu	Power Meter	ML2495A	1339473	Dec. 28, 2021	Dec. 27, 2022
R&S	Power Sensor	NRP50S	101254	Apr. 07, 2022	Apr. 06, 2023
R&S	Power Sensor	NRP8S	109228	Apr. 07, 2022	Apr. 06, 2023
R&S	CBT BLUETOOTH TESTER	CBT	100963	Dec. 28, 2021	Dec. 27, 2022
R&S	Spectrum Analyzer	FSP7	100818	Jul. 07, 2022	Jul. 06, 2023
TES	Hygrometer	1310	200505600	Jul. 12, 2022	Jul. 11, 2023
Anymetre	Thermo-Hygrometer	JR593	2015030904	Jul. 12, 2022	Jul. 11, 2023
Anymetre	Thermo-Hygrometer	JR593	2015030903	Dec. 30, 2021	Dec. 29, 2022
Anymetre	Thermo-Hygrometer	JR593	2015102801	Dec. 30, 2021	Dec. 29, 2022
SPEAG	Device Holder	N/A	N/A	N/A	N/A
ARRA	Power Divider	A3200-2	N/A	Note 1	
ET Industries	Dual Directional Coupler	C-058-10	N/A	Note 1	
Weinschel	Attenuator 1	3M-10	N/A	Note 1	
Weinschel	Attenuator 2	3M-20	N/A	Note 1	
AR	Amplifier	5S1G4	0333096	Note 1	
mini-circuits	Amplifier	ZVE-3W-83+	599201528	Note 1	

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
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

12. System Verification

12.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, 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. 11.1. 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. 11.2.

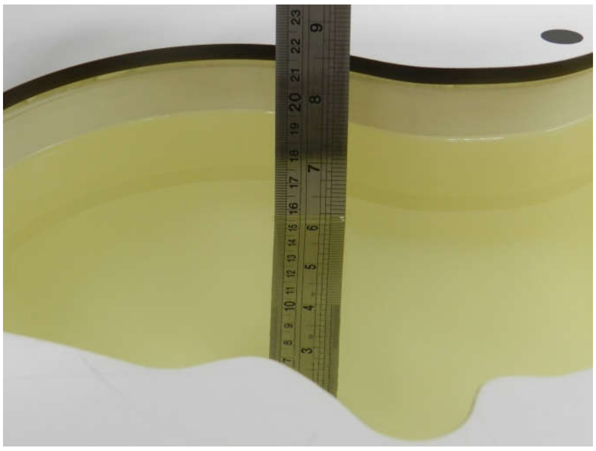


Fig 11.1 Photo of Liquid Height for Head SAR

Fig 11.2 Photo of Liquid Height for Body SAR

12.2 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 (εr)
For Head								
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
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)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.5	0.897	41.612	0.89	41.90	0.79	-0.69	±5	2022/10/22
750	Head	22.2	0.868	41.255	0.89	41.90	-2.47	-1.54	±5	2022/10/28
750	Head	22.3	0.885	40.799	0.89	41.90	-0.56	-2.63	±5	2022/11/11
835	Head	22.4	0.873	40.325	0.90	41.50	-3.00	-2.83	±5	2022/10/24
835	Head	22.3	0.857	40.304	0.90	41.50	-4.78	-2.88	±5	2022/10/29
835	Head	22.5	0.902	42.419	0.90	41.50	0.22	2.21	±5	2022/11/10
1750	Head	22.6	1.416	40.003	1.37	40.10	3.36	-0.24	±5	2022/11/1
1750	Head	22.6	1.375	38.652	1.37	40.10	0.36	-3.61	±5	2022/11/7
1750	Head	22.5	1.355	38.526	1.37	40.10	-1.09	-3.93	±5	2022/11/15
1900	Head	22.7	1.421	38.862	1.40	40.00	1.50	-2.85	±5	2022/11/3
1900	Head	22.7	1.374	38.626	1.40	40.00	-1.86	-3.44	±5	2022/11/11
1900	Head	22.8	1.412	38.427	1.40	40.00	0.86	-3.93	±5	2022/11/22
2300	Head	22.8	1.666	38.779	1.67	39.50	-0.24	-1.83	±5	2022/11/5
2300	Head	22.4	1.687	38.472	1.67	39.50	1.02	-2.60	±5	2022/11/17
2300	Head	22.3	1.661	38.240	1.67	39.50	-0.54	-3.19	±5	2022/11/24
2450	Head	22.9	1.773	38.178	1.80	39.20	-1.50	-2.61	±5	2022/11/7
2450	Head	22.5	1.754	38.287	1.80	39.20	-2.56	-2.33	±5	2022/11/18
2450	Head	22.7	1.779	38.295	1.80	39.20	-1.17	-2.31	±5	2022/11/22
2600	Head	22.5	1.937	37.939	1.96	39.00	-1.17	-2.72	±5	2022/11/3
2600	Head	22.8	1.944	37.195	1.96	39.00	-0.82	-4.63	±5	2022/11/9
2600	Head	22.6	1.954	38.587	1.96	39.00	-0.31	-1.06	±5	2022/11/23
2600	Head	22.4	1.962	38.617	1.96	39.00	0.10	-0.98	±5	2022/11/29
3500	Head	22.3	2.813	39.758	2.91	37.90	-3.33	4.90	±5	2022/10/26
3500	Head	22.6	2.980	39.215	2.91	37.90	2.41	3.47	±5	2022/11/13
3500	Head	22.5	2.912	38.343	2.91	37.90	0.07	1.17	±5	2022/11/26
3700	Head	22.7	3.140	38.955	3.12	37.70	0.64	3.33	±5	2022/10/27
3700	Head	22.6	3.109	35.952	3.12	37.70	-0.35	-4.64	±5	2022/11/6
3700	Head	22.4	3.039	36.561	3.12	37.70	-2.60	-3.02	±5	2022/11/20
3900	Head	22.5	3.313	38.753	3.33	37.51	-0.51	3.31	±5	2022/10/27
3900	Head	22.6	3.227	37.873	3.33	37.51	-3.09	0.97	±5	2022/11/9
3900	Head	22.5	3.198	36.157	3.33	37.51	-3.96	-3.61	±5	2022/11/21
5250	Head	22.6	4.603	36.261	4.71	35.95	-2.27	0.87	±5	2022/10/29
5250	Head	22.5	4.578	37.433	4.71	35.95	-2.80	4.13	±5	2022/11/15
5250	Head	22.4	4.592	36.094	4.71	35.95	-2.51	0.40	±5	2022/11/27
5600	Head	22.3	5.002	35.598	5.07	35.50	-1.34	0.28	±5	2022/10/28
5600	Head	22.5	4.948	35.032	5.07	35.50	-2.41	-1.32	±5	2022/11/17
5600	Head	22.8	4.986	35.465	5.07	35.50	-1.66	-0.10	±5	2022/11/29
5750	Head	22.7	5.159	35.193	5.22	35.35	-1.17	-0.44	±5	2022/10/28
5750	Head	22.7	5.100	34.770	5.22	35.35	-2.30	-1.64	±5	2022/11/19
5750	Head	22.4	5.159	35.193	5.22	35.35	-1.17	-0.44	±5	2022/11/30

12.3 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.

<1g SAR>

Date	Frequency (MHz)	Tissue Type	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 (%)
2022/10/22	750	Head	250	1099	3191	679	1.950	8.540	7.8	-8.67
2022/10/28	750	Head	250	1099	3819	715	2.290	8.540	9.16	7.26
2022/11/11	750	Head	250	1099	7576	679	2.180	8.540	8.72	2.11
2022/10/24	835	Head	250	4d162	3191	679	2.210	9.640	8.84	-8.30
2022/10/29	835	Head	250	4d162	3819	715	2.480	9.640	9.92	2.90
2022/11/10	835	Head	250	4d162	7576	679	2.600	9.640	10.4	7.88
2022/11/1	1750	Head	250	1137	7576	679	9.930	36.500	39.72	8.82
2022/11/7	1750	Head	250	1137	3191	679	8.630	36.500	34.52	-5.42
2022/11/15	1750	Head	250	1137	3819	715	8.820	36.500	35.28	-3.34
2022/11/3	1900	Head	250	5d182	3191	679	9.570	39.600	38.28	-3.33
2022/11/11	1900	Head	250	5d182	3819	715	10.200	39.600	40.8	3.03
2022/11/22	1900	Head	250	5d182	7576	679	10.300	39.600	41.2	4.04
2022/11/5	2300	Head	250	1056	3191	679	12.300	48.800	49.2	0.82
2022/11/17	2300	Head	250	1056	3191	679	11.900	48.800	47.6	-2.46
2022/11/24	2300	Head	250	1056	3819	715	12.200	48.800	48.8	0.00
2022/11/7	2450	Head	250	924	7576	679	13.000	51.400	52	1.17
2022/11/18	2450	Head	250	924	3191	679	12.500	51.400	50	-2.72
2022/11/22	2450	Head	250	924	3819	715	12.800	51.400	51.2	-0.39
2022/11/3	2600	Head	250	1070	7576	1210	12.800	56.200	51.2	-8.90
2022/11/9	2600	Head	250	1070	7576	679	14.100	56.200	56.4	0.36
2022/11/23	2600	Head	250	1070	3191	679	13.600	56.200	54.4	-3.20
2022/11/29	2600	Head	250	1070	3819	715	13.400	56.200	53.6	-4.63
2022/10/26	3500	Head	100	1076	7576	679	7.200	66.200	72	8.76
2022/11/13	3500	Head	100	1076	3819	715	6.930	66.200	69.3	4.68
2022/11/26	3500	Head	100	1076	7576	1210	6.770	66.200	67.7	2.27
2022/10/27	3700	Head	100	1037	3819	715	6.730	66.700	67.3	0.90
2022/11/6	3700	Head	100	1037	7576	1210	6.950	66.700	69.5	4.20
2022/11/20	3700	Head	100	1037	7576	679	7.220	66.700	72.2	8.25
2022/10/27	3900	Head	100	1048	3819	715	7.510	70.200	75.1	6.98
2022/11/9	3900	Head	100	1048	7576	1210	6.990	70.200	69.9	-0.43
2022/11/21	3900	Head	100	1048	7576	679	7.600	70.200	76	8.26
2022/10/29	5250	Head	100	1341	3819	715	8.610	80.700	86.1	6.69
2022/11/15	5250	Head	100	1341	7576	679	8.060	80.700	80.6	-0.12
2022/11/27	5250	Head	100	1341	3819	715	8.590	80.700	85.9	6.44
2022/10/28	5600	Head	100	1341	3819	715	8.340	84.500	83.4	-1.30
2022/11/17	5600	Head	100	1341	7576	679	8.960	84.500	89.6	6.04
2022/11/29	5600	Head	100	1341	3819	715	9.110	84.500	91.1	7.81
2022/10/28	5750	Head	100	1341	3819	715	8.670	80.600	86.7	7.57
2022/11/19	5750	Head	100	1341	7576	679	8.520	80.600	85.2	5.71
2022/11/30	5600	Head	100	1341	3819	715	8.970	84.500	89.7	6.15

<10g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2022/10/22	750	Head	250	1099	3191	679	1.290	5.650	5.16	-8.67
2022/10/28	750	Head	250	1099	3819	715	1.490	5.650	5.96	5.49
2022/11/11	750	Head	250	1099	7576	679	1.450	5.650	5.8	2.65
2022/10/24	835	Head	250	4d162	3191	679	1.430	6.260	5.72	-8.63
2022/10/29	835	Head	250	4d162	3819	715	1.660	6.260	6.64	6.07
2022/11/10	835	Head	250	4d162	7576	679	1.690	6.260	6.76	7.99
2022/11/1	1750	Head	250	1137	7576	679	5.230	19.200	20.92	8.96
2022/11/7	1750	Head	250	1137	3191	679	4.660	19.200	18.64	-2.92
2022/11/15	1750	Head	250	1137	3819	715	4.850	19.200	19.4	1.04
2022/11/3	1900	Head	250	5d182	3191	679	4.970	20.200	19.88	-1.58
2022/11/11	1900	Head	250	5d182	3819	715	5.350	20.200	21.4	5.94
2022/11/22	1900	Head	250	5d182	7576	679	5.360	20.200	21.44	6.14
2022/11/5	2300	Head	250	1056	3191	679	5.890	22.800	23.56	3.33
2022/11/17	2300	Head	250	1056	3191	679	5.860	22.800	23.44	2.81
2022/11/24	2300	Head	250	1056	3819	715	5.680	22.800	22.72	-0.35
2022/11/7	2450	Head	250	924	7576	679	6.060	24.000	24.24	1.00
2022/11/18	2450	Head	250	924	3191	679	5.810	24.000	23.24	-3.17
2022/11/22	2450	Head	250	924	3819	715	5.590	24.000	22.36	-6.83
2022/11/3	2600	Head	250	1070	7576	1210	5.740	24.600	22.96	-6.67
2022/11/9	2600	Head	250	1070	7576	679	6.390	24.600	25.56	3.90
2022/11/23	2600	Head	250	1070	3191	679	6.100	24.600	24.4	-0.81
2022/11/29	2600	Head	250	1070	3819	715	5.770	24.600	23.08	-6.18
2022/10/26	3500	Head	100	1076	7576	679	2.770	25.500	27.7	8.63
2022/11/13	3500	Head	100	1076	3819	715	2.600	25.500	26	1.96
2022/11/26	3500	Head	100	1076	7576	1210	2.640	25.500	26.4	3.53
2022/10/27	3700	Head	100	1037	3819	715	2.470	24.600	24.7	0.41
2022/11/6	3700	Head	100	1037	7576	1210	2.530	24.600	25.3	2.85
2022/11/20	3700	Head	100	1037	7576	679	2.670	24.600	26.7	8.54
2022/10/27	3900	Head	100	1048	3819	715	2.650	24.400	26.5	8.61
2022/11/9	3900	Head	100	1048	7576	1210	2.460	24.400	24.6	0.82
2022/11/21	3900	Head	100	1048	7576	679	2.640	24.400	26.4	8.20
2022/10/29	5250	Head	100	1341	3819	715	2.430	23.100	24.3	5.19
2022/11/15	5250	Head	100	1341	7576	679	2.270	23.100	22.7	-1.73
2022/11/27	5250	Head	100	1341	3819	715	2.420	23.100	24.2	4.76
2022/10/28	5600	Head	100	1341	3819	715	2.330	24.000	23.3	-2.92
2022/11/17	5600	Head	100	1341	7576	679	2.520	24.000	25.2	5.00
2022/11/29	5600	Head	100	1341	3819	715	2.590	24.000	25.9	7.92
2022/10/28	5750	Head	100	1341	3819	715	2.390	22.700	23.9	5.29
2022/11/19	5750	Head	100	1341	7576	679	2.370	22.700	23.7	4.41
2022/11/30	5600	Head	100	1341	3819	715	2.510	24.000	25.1	4.58

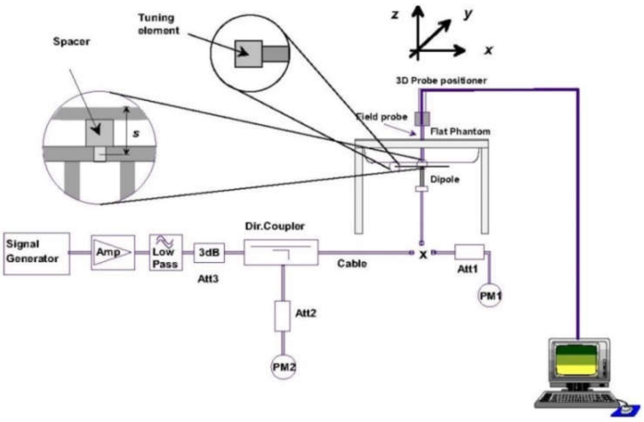


Fig 11.3.1 System Performance Check Setup

Fig 11.3.2 Setup Photo

13. RF Exposure Positions

13.1 Ear and handset reference point

Figure 12.1.1 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 12.1.2 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 12.1.3). 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 12.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

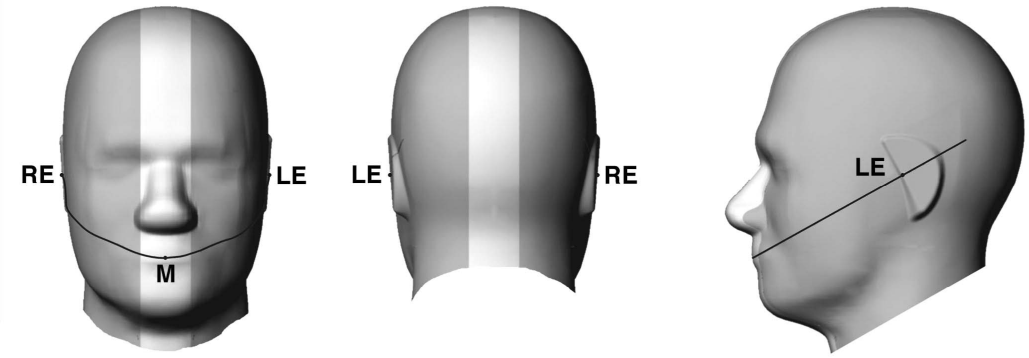


Fig 12.1.1 Front, back, and side views of SAM twin phantom

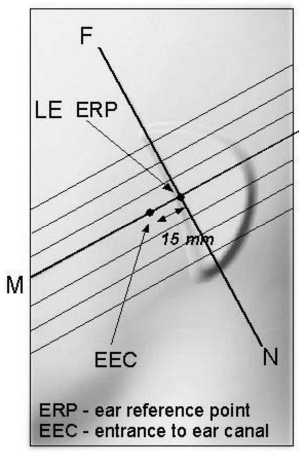


Fig 12.1.2 Close-up side view of phantom showing the ear region.

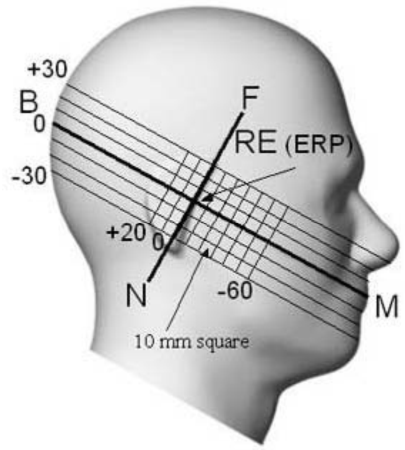


Fig 12.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

13.2 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 wt of the handset at the level of the acoustic output (point A in Figure 12.2.1 and Figure 12.2.2), and the midpoint of the width wb 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 12.2.1). 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 12.2.2), 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 12.2.3), 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 12.2.3. The actual rotation angles should be documented in the test report.

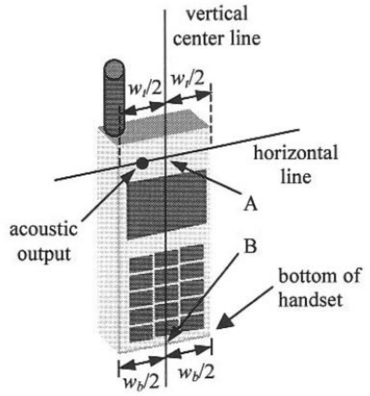


Fig 12.2.1 Handset vertical and horizontal reference lines—"fixed case

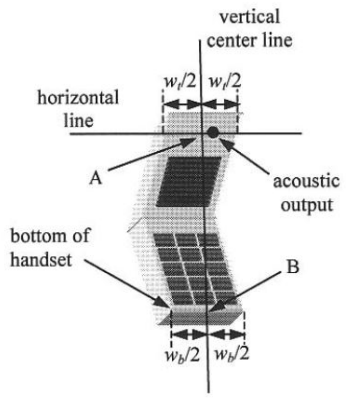


Fig 12.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

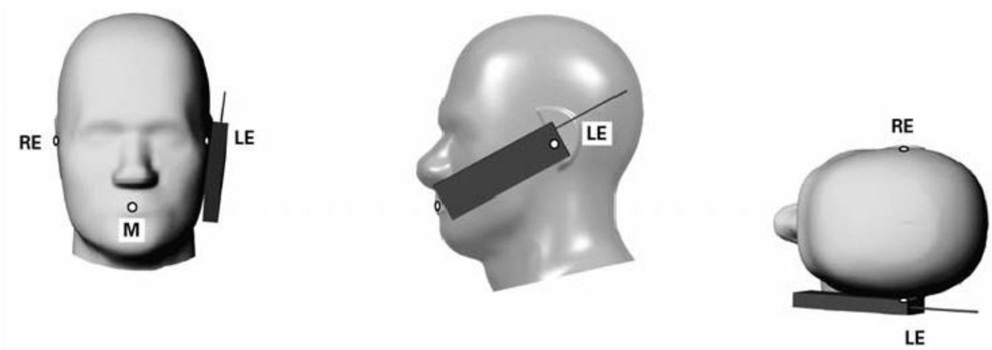


Fig 12.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

13.3 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 12.3.1. 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

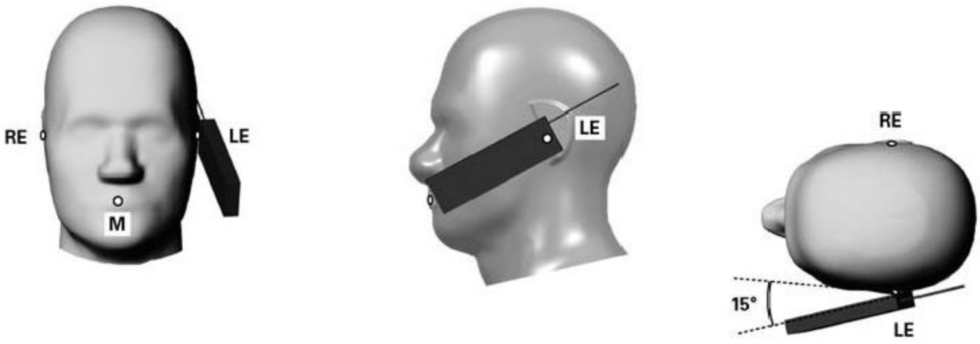


Fig 12.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

13.4 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 11.4). 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. 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.

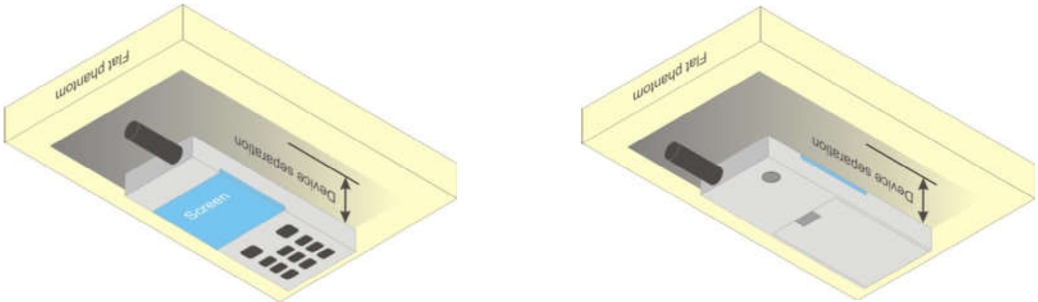


Fig 12.4 Body Worn Position

13.5 Product Specific 10g SAR Exposure

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, that can provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets and support voice calls next to the ear, According to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.

2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.6 The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

13.6 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 form 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.

14. Conducted RF Output Power (Unit: dBm)

The detailed conducted power table can refer to Appendix E.

<GSM Conducted Power>

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.
3. Other configurations of GSM / GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
3. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
    i. Set Gain Factors (β_c and β_d) and parameters were set according to each
    ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
    iii. Set RMC 12.2Kbps + HSDPA mode.
    iv. Set Cell Power = -86 dBm
    v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
    vi. Select HSDPA Uplink Parameters
    vii. Set Delta ACK, Delta NACK and Delta CQI = 8
    viii. Set Ack-Nack Repetition Factor to 3
    ix. Set CQI Feedback Cycle (k) to 4 ms
    x. Set CQI Repetition Factor to 2
    xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c. For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with β_{hs} = 5/15 * β_c.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

Setup Configuration

DC-HSDPA 3GPP release 8 Setup Configuration:

a. The EUT was connected to Base Station referred to the Setup Configuration below
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_d=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification. A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

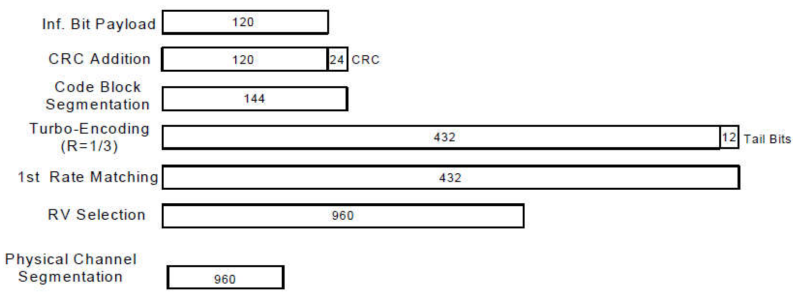


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

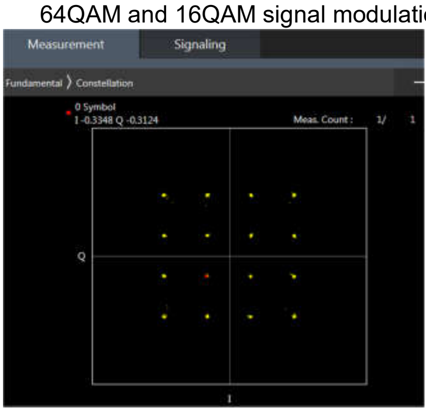
General Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA / DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

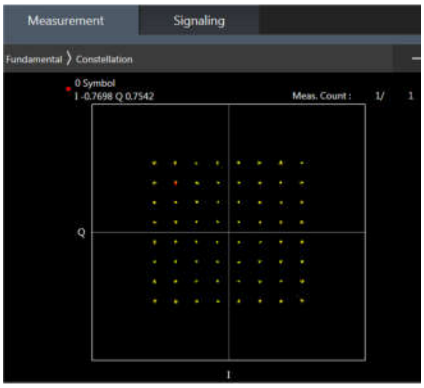
<LTE Conducted Power>

General Note:

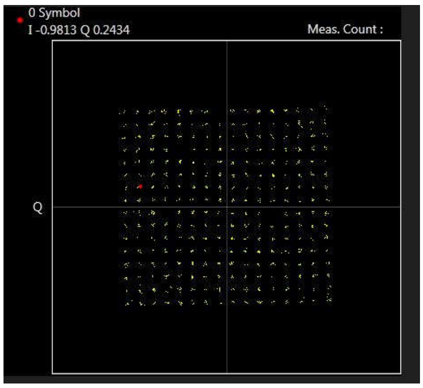
1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK 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.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, for QPSK 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.
6. Per KDB 941225 D05v02r05, 16QAM/64QAM/256QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM/64QAM/256QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > 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; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / B5 / B12 / B17 / B26 / B38 / B71 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE B2 / B4 /B5 / B17 / B38 SAR test was covered by B25 / B66 / B26 / B12 / B41 / B48; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band
10. According to May 2017 TCB workshop, for 16QAM and 64QAM, 256QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >> constellation" mode of the device connect to the MT8821C base station, therefore, the device 256QAM, 64QAM and 16QAM signal modulation are correct.



16QAM



64QAM



256QAM

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. “special subframe S” contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

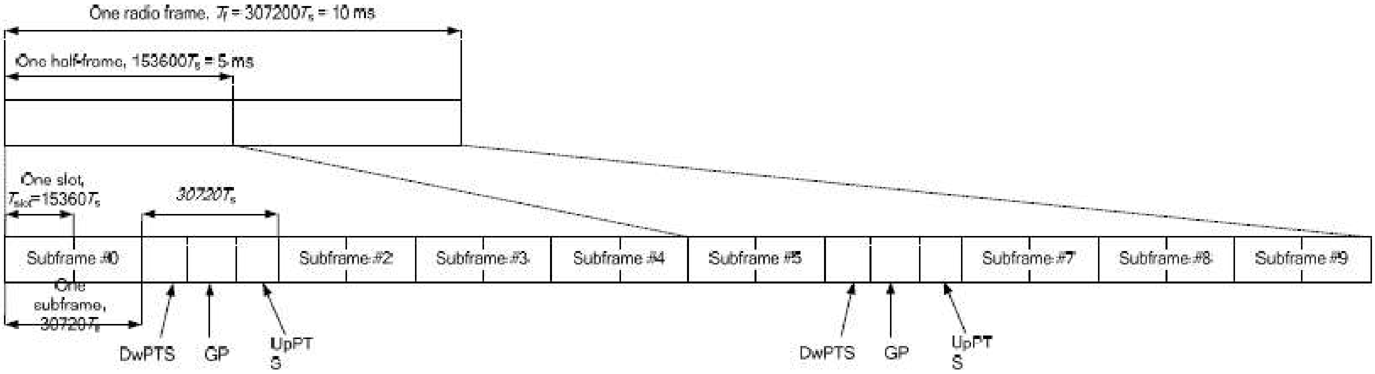


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Special subframe (30720·T_s): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
Uplink duty factor in one special subframe	0~4	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T_s): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
Uplink duty factor in one special subframe	0~3	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

For LTE TDD Power class 2

i. Uplink-downlink configuration: 1. In a half-frame consisted of 5 subfames, uplink operation is in 2 uplink subframes and 1 special subframe.
ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink
iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (2+0.167)/5 = 43.3%
iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (2+0.143)/5 = 42.9%
v. For TDD LTE SAR measurement, the duty cycle 1:2.33 (42.9 %) was used perform testing and considering the theoretical duty cycle of 43.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 42.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 43.3%/42.9% = 1.009 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

For LTE TDD Power class 3

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.
ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink
iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%
iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%
v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

The device can adjust uplink/downlink configuration automatically according to the transmitting power class level, as followings:

LTE TDD Band	Power Class level	support uplink/downlink configuration
LTE Band 41	> 23	1,2,3,4,5
	=23	0,1,2,3,4,5,6
	< 23	0,1,2,3,4,5,6

<LTE Carrier Aggregation>

General Note:

1. This device supports Carrier Aggregation on downlink for inter and intra band. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.
2. In applying the existing power measurement procedures of KDB 941225 D05A for DL CA SAR test exclusion, only the subset with the largest number of combinations of frequency bands and CCs in each row need combination, and for this device that all the configurations were choose to power measurement.
3. The gray color table is covered by other combinations and no need to verify power.

2CC Downlink Carrier Aggregation					3CC Downlink Carrier Aggregation				
Number	Combination	4X4 MIMO	Restriction	Covered by Measurement Superset	Number	Combination	4X4 MIMO	Restriction	Covered by Measurement Superset
1	CA_2A-2A	2A-2A		3CC-1	1	CA_2A-2A-4A	2A-2A-4A		4CC-1
2	CA_2A-4A	2A-4A		3CC-1	2	CA_2A-2A-5A	2A-2A		4CC-2
3	CA_2A-5A	2A		3CC-2	3	CA_2A-2A-12A	2A-2A		4CC-3
4	CA_2A-7A	2A-7A		3CC-18	4	CA_2A-2A-13A	2A-2A		4CC-7
5	CA_2A-12A	2A		3CC-3	5	CA_2A-2A-14A	2A-2A		4CC-9
6	CA_2A-13A	2A		3CC-4	6	CA_2A-2A-29A	2A-2A	LTE B29 SCC Only	4CC-12
7	CA_2A-14A	2A		3CC-5	7	CA_2A-2A-30A	2A-2A-30A		4CC-7
8	CA_2A-29A	2A	LTE B29 SCC Only	3CC-6	8	CA_2A-2A-66A	2A-2A-66A		4CC-8
9	CA_2A-30A	2A-30A		3CC-7	9	CA_2A-2A-71A	2A-2A		4CC-15
10	CA_2A-48A	2A-48A		3CC-30	10	CA_2A-4A-4A	2A-4A-4A		4CC-1
11	CA_2A-66A	2A-66A		3CC-17	11	CA_2A-4A-5A	2A-4A		4CC-2
12	CA_2A-71A	2A		3CC-9	12	CA_2A-4A-12A	2A-4A		4CC-3
13	CA_2C	2C		3CC-41	13	CA_2A-4A-13A	2A-4A		
14	CA_4A-4A	4A-4A		3CC-42	14	CA_2A-4A-71A	2A-4A		4CC-4
15	CA_4A-5A	4A		3CC-42	15	CA_2A-5A-30A	2A-30A		4CC-5
16	CA_4A-12A	4A		3CC-43	16	CA_2A-5A-48A	2A-48A		4CC-19
17	CA_4A-13A	4A		3CC-44	17	CA_2A-5A-66A	2A-66A		4CC-6
18	CA_4A-29A	4A	LTE B29 SCC Only	3CC-48	18	CA_2A-7A-7A	2A-7A-7A		4CC-21
19	CA_4A-30A	4A-30A		3CC-46	19	CA_2A-7A-13A	2A-7A		4CC-21
20	CA_4A-48A	4A-48A			20	CA_2A-7A-66A	2A-7A-66A		4CC-22
21	CA_4A-71A	4A		3CC-45	21	CA_2A-12A-30A	2A-30A		4CC-23
22	CA_5A-5A			3CC-52	22	CA_2A-12A-66A	2A-66A		4CC-23
23	CA_5A-7A	7A		3CC-53	23	CA_2A-13A-48A	2A-48A		4CC-25
24	CA_5A-30A	30A		3CC-54	24	CA_2A-13A-66A	2A-66A		4CC-9
25	CA_5A-48A	48A		3CC-55	25	CA_2A-14A-30A	2A-30A		4CC-10
26	CA_5A-66A	66A		3CC-52	26	CA_2A-14A-66A	2A-66A		4CC-11
27	CA_5B			3CC-49	27	CA_2A-29A-30A	2A-30A	LTE B29 SCC Only	4CC-12
28	CA_7A-7A	7A-7A		3CC-63	28	CA_2A-29A-66A	2A-66A	LTE B29 SCC Only	4CC-30
29	CA_7A-13A	7A		3CC-63	29	CA_2A-30A-66A	2A-30A-66A		4CC-30
30	CA_7A-66A	7A-66A		3CC-64	30	CA_2A-48A-48A	2A-48A-48A		4CC-32
31	CA_7B	7B			31	CA_2A-48A-66A	2A-48A-66A		4CC-32
32	CA_7C	7C		3CC-58	32	CA_2A-66A-66A	2A-66A-66A		4CC-33
33	CA_12A-30A	30A		3CC-68	33	CA_2A-66A-71A	2A-66A		4CC-35
34	CA_12A-48A	48A			34	CA_2A-5B	2A		4CC-36
35	CA_12A-66A	66A		3CC-68	35	CA_2A-12B	2A		4CC-37
36	CA_12B			3CC-72	36	CA_2A-66B	2A-66B		4CC-38
37	CA_13A-48A	48A		3CC-73	37	CA_2A-7C	2A-7C		4CC-54
38	CA_13A-66A	66A		3CC-74	38	CA_2A-48C	2A-48C		4CC-45
39	CA_14A-30A	30A		3CC-79	39	CA_2A-66C	2A-66C		4CC-44
40	CA_14A-66A	66A		3CC-79	40	CA_2C-12A	2C		
41	CA_25A-25A	25A-25A		3CC-81	41	CA_2C-66A	2C-66A		4CC-59
42	CA_25A-26A	25A		3CC-81	42	CA_4A-4A-5A	4A-4A		
43	CA_25A-41A	25A-41A			43	CA_4A-4A-12A	4A-4A		
44	CA_26A-41A	41A			44	CA_4A-4A-13A	4A-4A		
45	CA_29A-30A	30A	LTE B29 SCC Only	3CC-84	45	CA_4A-4A-71A	4A-4A		

46	CA_29A-66A	66A	LTE B29 SCC Only	3CC-85	46	CA_4A-5A-30A	4A-30A		
47	CA_30A-66A	30A-66A		3CC-79	47	CA_4A-12A-30A	4A-30A		
48	CA_41A-41A	41A-41A			48	CA_4A-29A-30A	4A-30A	LTE B29 SCC Only	
49	CA_41C	41C		3CC-87	49	CA_4A-5B	4A		4CC-60
50	CA_48A-48A	48A-48A		3CC-89	50	CA_4A-12B	4A		4CC-61
51	CA_48A-66A	48A-66A		3CC-90	51	CA_4A-48C	4A-48C		
52	CA_48A-71A	48A		3CC-91	52	CA_5A-5A-66A	66A		4CC-63
53	CA_48B	48B			53	CA_5A-7A-66A	7A-66A		4CC-64
54	CA_48C	48C		3CC-96	54	CA_5A-30A-66A	30A-66A		4CC-65
55	CA_66A-66A	66A-66A		3CC-99	55	CA_5A-48A-66A	48A-66A		4CC-66
56	CA_66A-71A	66A		3CC-100	56	CA_5A-66A-66A	66A-66A		4CC-63
57	CA_66B	66B		3CC-101	57	CA_5A-66B	66B		4CC-67
58	CA_66C	66C		3CC-102	58	CA_5A-7C	7C		4CC-69
59	CA_2A-46A	2A	LTE B46 SCC Only	3CC-104	59	CA_5A-48C	48C		4CC-70
60	CA_4A-46A	4A	LTE B46 SCC Only	3CC-111	60	CA_5A-66C	66C		4CC-68
61	CA_5A-46A		LTE B46 SCC Only	3CC-113	61	CA_5B-30A	30A		4CC-72
62	CA_12A-46A		LTE B46 SCC Only		62	CA_5B-66A	66A		4CC-72
63	CA_13A-46A		LTE B46 SCC Only	3CC-117	63	CA_7A-7A-13A	7A-7A		
64	CA_46A-66A	66A	LTE B46 SCC Only	3CC-120	64	CA_7A-7A-66A	7A-7A-66A		
65					65	CA_7A-66A-66A	7A-66A-66A		
66					66	CA_7C-13A	7A		
67					67	CA_7C-66A	7A, 66A		4CC-76
68					68	CA_12A-30A-66A	30A-66A		4CC-77
69					69	CA_12A-66A-66A	66A-66A		4CC-77
70					70	CA_12A-48C			
71					71	CA_12A-66C	66C		4CC-47
72					72	CA_12B-66A	66A		4CC-53&78
73					73	CA_13A-48A-48A	48A-48A		4CC-25
74					74	CA_13A-48A-66A	48A-66A		4CC-26
75					75	CA_13A-66A-66A	66A-66A		4CC-27
76					76	CA_13A-66B	66B		4CC-42
77					77	CA_13A-48C	48C		4CC-48
78					78	CA_13A-66C	66C		4CC-49
79					79	CA_14A-30A-66A	30A-66A		4CC-28
80					80	CA_14A-66A-66A	66A-66A		4CC-29
81					81	CA_25A-25A-26A	25A-25A		
82					82	CA_25A-41C	25A-41C		
83					83	CA_26A-41C	41C		
84					84	CA_29A-30A-66A	30A-66A	LTE B29 SCC Only	4CC-89
85					85	CA_29A-66A-66A	66A-66A	LTE B29 SCC Only	4CC-89
86					86	CA_30A-66A-66A	30A-66A-66A		4CC-89
87					87	CA_41A-41C	41A-41C		
88					88	CA_41D	41D		4CC-88
89					89	CA_48A-48A-48A			
90					90	CA_48A-48A-66A	48A-48A-66A		4CC-79
91					91	CA_48A-48A-71A	48A-48A		
92					92	CA_48A-66A-66A	48A-66A-66A		4CC-90
93					93	CA_48A-66B	48A-66B		4CC-80
94					94	CA_48A-48C	48A-48C		4CC-82
95					95	CA_48A-66C	48A-66C		4CC-83
96					96	CA_48C-66A	48C-66A		4CC-84
97					97	CA_48C-71A	48C		
98					98	CA_48D	48D		4CC-85
99					99	CA_66A-66A-66A	66A-66A-66A		4CC-87
100					100	CA_66A-66A-71A	66A-66A		4CC-35
101					101	CA_66A-66B	66A-66B		4CC-81

102					102	CA_66A-66C	66A-66C		
103					103	CA_66C-71A	66C		4CC-57
104					104	CA_2A-2A-46A	2A-2A		
105					105	CA_2A-5A-46A	2A		
106					106	CA_2A-13A-46A	2A		
107					107	CA_2A-46A-46A	2A		
108					108	CA_2A-46A-48A	2A-48A		
109					109	CA_2A-46A-66A	2A-66A		
110					110	CA_2A-46C	2A		4CC-110
111					111	CA_4A-46A-46A	4A		
112					112	CA_4A-46C	4A		4CC-112
113					113	CA_5A-46A-66A	66A		
114					114	CA_5A-46C			4CC-114
115					115	CA_5B-46A			
116					116	CA_13A-46A-46A			
117					117	CA_13A-46A-66A	66A		
118					118	CA_13A-46C			4CC-117
119					119	CA_46A-48A-66A	48A-66A		
120					120	CA_46A-46A-66A	66A		
121					121	CA_46A-66A-66A	66A-66A		
122					122	CA_46A-66C	66C		
123					123	CA_46C-66A	66A		4CC-122

4CC Downlink Carrier Aggregation					5CC Downlink Carrier Aggregation				
Number	Combination	4X4 MIMO	Restriction	Covered by Measurement Superset	Number	Combination	4X4 MIMO	Restriction	Covered by Measurement Superset
1	CA_2A-2A-4A-4A	2A-2A-4A-4A			1	CA_2A-2A-5A-30A-66A	2A-2A-30A-66A		
2	CA_2A-2A-4A-5A	2A-2A-4A			2	CA_2A-2A-5A-66A-66A	2A-2A-66A-66A		
3	CA_2A-2A-4A-12A	2A-2A-4A			3	CA_2A-2A-12A-30A-66A	2A-2A-30A-66A		
4	CA_2A-2A-4A-71A	2A-2A-4A			4	CA_2A-2A-12A-66A-66A	2A-2A-66A-66A		
5	CA_2A-2A-5A-30A	2A-2A-30A		5CC-1	5	CA_2A-2A-13A-66A-66A	2A-2A-66A-66A		
6	CA_2A-2A-5A-66A	2A-2A-66A		5CC-1	6	CA_2A-2A-14A-30A-66A	2A-2A-30A-66A		
7	CA_2A-2A-12A-30A	2A-2A-30A		5CC-3	7	CA_2A-2A-14A-66A-66A	2A-2A-66A-66A		
8	CA_2A-2A-12A-66A	2A-2A-66A		5CC-3	8	CA_2A-2A-29A-30A-66A	2A-2A-30A-66A		
9	CA_2A-2A-13A-66A	2A-2A-66A		5CC-5	9	CA_2A-2A-29A-66A-66A	2A-2A-66A-66A		
10	CA_2A-2A-14A-30A	2A-2A-30A		5CC-6	10	CA_2A-5A-30A-66A-66A	2A-30A-66A-66A		
11	CA_2A-2A-14A-66A	2A-2A-66A		5CC-6	11	CA_2A-5A-48A-66A-66A	2A-48A-66A-66A		
12	CA_2A-2A-29A-30A	2A-2A-30A	LTE B29 SCC Only	5CC-8	12	CA_2A-12A-30A-66A-66A	2A-30A-66A-66A		
13	CA_2A-2A-30A-66A	2A-2A-30A-66A		5CC-8	13	CA_2A-13A-48A-48A-66A	2A-48A-48A-66A		
14	CA_2A-2A-66A-66A	2A-2A-66A-66A		5CC-4	14	CA_2A-14A-30A-66A-66A	2A-30A-66A-66A		
15	CA_2A-2A-66A-71A	2A-2A-66A			15	CA_2A-14A-66A-66A-66A	2A-66A-66A-66A		
16	CA_2A-4A-4A-5A	2A-4A-4A			16	CA_2A-2A-5A-66B	2A-2A-66B		
17	CA_2A-4A-4A-12A	2A-4A-4A			17	CA_2A-13A-66A-66B	2A-66A-66B		
18	CA_2A-5A-30A-66A	2A-30A-66A		5CC-1	18	CA_2A-2A-5A-66C	2A-2A-66C		
19	CA_2A-5A-48A-66A	2A-48A-66A		5CC-11	19	CA_2A-13A-48A-48C	2A-48A-48C		
20	CA_2A-5A-66A-66A	2A-66A-66A		5CC-11	20	CA_2A-2A-5B-66A	2A-2A-66A		
21	CA_2A-7A-7A-13A	2A-7A-7A			21	CA_2A-2A-12B-66A	2A-2A-66A		
22	CA_2A-7A-7A-66A	2A-7A-7A-66A			22	CA_2A-5A-48C-66A	2A-48C-66A		
23	CA_2A-12A-30A-66A	2A-30A-66A		5CC-12	23	CA_2A-13A-48C-66A	2A-48C-66A		
24	CA_2A-12A-66A-66A	2A-66A-66A		5CC-12	24	CA_2A-48A-48C-66A	2A-48A-48C-66A		
25	CA_2A-13A-48A-48A	2A-48A-48A		5CC-13	25	CA_2A-5B-30A-66A	2A-30A-66A		
26	CA_2A-13A-48A-66A	2A-48A-66A		5CC-13	26	CA_2A-5B-66A-66A	2A-66A-66A		
27	CA_2A-13A-66A-66A	2A-66A-66A			27	CA_2A-12B-66A-66A	2A-66A-66A		
28	CA_2A-14A-30A-66A	2A-30A-66A		5CC-14	28	CA_2A-5A-48D	2A-48D		
29	CA_2A-14A-66A-66A	2A-66A-66A		5CC-14	29	CA_2A-13A-48D	2A-48D		
30	CA_2A-29A-30A-66A	2A-30A-66A	LTE B29 SCC Only	5CC-8	30	CA_2A-48A-48D	2A-48A-48D		

31	CA_2A-30A-66A-66A	2A-30A-66A-66A		5CC-12	31	CA_2A-5B-66B	2A-66B		
32	CA_2A-48A-48A-66A	2A-48A-48A-66A		5CC-13	32	CA_2A-5B-66C	2A-66C		
33	CA_2A-48A-66A-66A	2A-48A-66A-66A			33	CA_2A-48C-48C	2A-48C-48C		
34	CA_2A-66A-66A-66A	2A-66A-66A-66A		5CC-4	34	CA_2A-48D-66A	2A-48D-66A		
35	CA_2A-66A-66A-71A	2A-66A-66A			35	CA_2A-48E	2A-48E		6CC-1
36	CA_2A-2A-5B	2A-2A		5CC-20	36	CA_4A-48E	4A-48E		
37	CA_2A-2A-12B	2A-2A		5CC-21	37	CA_5A-48D-66A	48D-66A		
38	CA_2A-2A-66B	2A-2A-66B		5CC-16	38	CA_5A-7C-66A-66A	7C-66A-66A		
39	CA_2A-4A-5B	2A-4A			39	CA_13A-48A-48C-66A	48A-48C-66A		
40	CA_2A-4A-12B	2A-4A			40	CA_13A-48A-48D	48A-48D		
41	CA_2A-5A-66B	2A-66B		5CC-16	41	CA_13A-48C-48C	48C-48C		
42	CA_2A-13A-66B	2A-66B		5CC-17	42	CA_13A-48D-66A	48D-66A		
43	CA_2A-66A-66B	2A-66A-66B		5CC-17	43	CA_13A-48E	48E		
44	CA_2A-2A-66C	2A-2A-66C		5CC-18	44	CA_48A-48C-66B	48A-48C-66B		
45	CA_2A-5A-48C	2A-48C		5CC-22	45	CA_48A-48C-66C	48A-48C-66C		
46	CA_2A-5A-66C	2A-66C		5CC-18	46	CA_48A-48D-66A	48A-48D-66A		
47	CA_2A-12A-66C	2A-66C			47	CA_48A-48E	48A-48E		
48	CA_2A-13A-48C	2A-48C		5CC-23	48	CA_48C-48C-66A	48C-48C-66A		
49	CA_2A-13A-66C	2A-66C			49	CA_48C-48D	48C-48D		
50	CA_2A-48A-48C	2A-48A-48C		5CC-19	50	CA_48E-66A	48E-66A		6CC-1
51	CA_2A-5B-30A	2A-30A		5CC-25	51	CA_13A-46D-66A	66A	LTE B46 SCC Only	
52	CA_2A-5B-66A	2A-66A		5CC-25	52	CA_2A-13A-46D	2A	LTE B46 SCC Only	
53	CA_2A-12B-66A	2A-66A		5CC-27	53	CA_2A-2A-46D	2A-2A	LTE B46 SCC Only	
54	CA_2A-7C-13A	2A-7C			54	CA_2A-46A-46C-66A	2A-66A	LTE B46 SCC Only	
55	CA_2A-7C-66A	2A-7C-66A			55	CA_2A-46A-46D	2A	LTE B46 SCC Only	
56	CA_2A-48C-66A	2A-48C-66A		5CC-24	56	CA_2A-46A-48C-66A	2A-48C-66A	LTE B46 SCC Only	
57	CA_2A-66C-71A	2A-66C			57	CA_2A-46A-48D	2A-48D	LTE B46 SCC Only	6CC-2
58	CA_2A-48D	2A-48D		5CC-29	58	CA_2A-46C-48A-66A	2A-48A-66A	LTE B46 SCC Only	
59	CA_2C-66A-66A	2C-66A-66A			59	CA_2A-46C-48C	2A-48C	LTE B46 SCC Only	6CC-4
60	CA_4A-4A-5B	4A-4A			60	CA_2A-46D-48A	2A-48A	LTE B46 SCC Only	6CC-6
61	CA_4A-4A-12B	4A-4A			61	CA_2A-46D-66A	2A-66A	LTE B46 SCC Only	6CC-6
62	CA_4A-48D	4A-48D			62	CA_2A-46E	2A	LTE B46 SCC Only	6CC-9
63	CA_5A-5A-66A-66A	66A-66A			63	CA_2A-5A-46D	2A	LTE B46 SCC Only	
64	CA_5A-7A-66A-66A	7A-66A-66A			64	CA_46A-46D-66A	66A	LTE B46 SCC Only	
65	CA_5A-30A-66A-66A	30A-66A-66A		5CC-10	65	CA_46A-48D-66A	48D-66A	LTE B46 SCC Only	6CC-2
66	CA_5A-48A-66A-66A	48A-66A-66A		5CC-11	66	CA_46C-48C-66A	48C-66A	LTE B46 SCC Only	6CC-4
67	CA_5A-5A-66B	66B			67	CA_46D-48A-66A	48A-66A	LTE B46 SCC Only	6CC-6
68	CA_5A-5A-66C	66C			68	CA_46D-66A-66A	66A-66A	LTE B46 SCC Only	6CC-8
69	CA_5A-7C-66A	7C-66A		5CC-38	69	CA_46E-66A	66A	LTE B46 SCC Only	6CC-10
70	CA_5A-48C-66A	48C-66A		5CC-22	70	CA_4A-46A-46D	4A	LTE B46 SCC Only	
71	CA_5A-48D	48D		5CC-28	71	CA_5A-46D-66A	66A	LTE B46 SCC Only	
72	CA_5B-30A-66A	30A-66A		5CC-25	72	CA_5A-46E		LTE B46 SCC Only	
73	CA_5B-66A-66A	66A-66A		5CC-26	73	CA_5B-46D		LTE B46 SCC Only	
74	CA_5B-66B	66B		5CC-31	74				
75	CA_5B-66C	66C		5CC-32	75				
76	CA_7C-66A-66A	7C-66A-66A		5CC-38	76				
77	CA_12A-30A-66A-66A	30A-66A-66A		5CC-12	77				
78	CA_12B-66A-66A	66A-66A		5CC-27	78				
79	CA_13A-48A-48A-66A	48A-48A-66A		5CC-13	79				
80	CA_13A-48A-66B	48A-66B			80				
81	CA_13A-66A-66B	66A-66B		5CC-17	81				
82	CA_13A-48A-48C	48A-48C		5CC-39	82				
83	CA_13A-48A-66C	48A-66C			83				
84	CA_13A-48C-66A	48C-66A		5CC-39	84				
85	CA_13A-48D	48D		5CC-40	85				
86	CA_14A-30A-66A-66A	30A-66A-66A		5CC-14	86				

87	CA_14A-66A-66A-66A	66A-66A-66A		5CC-15	87				
88	CA_25A-41D	25A-41D			88				
89	CA_29A-30A-66A-66A	30A-66A-66A	LTE B29 SCC Only		89				
90	CA_48A-48A-66A-66A	48A-48A-66A-66A			90				
91	CA_48A-48A-66B	48A-48A-66B			91				
92	CA_48A-48A-66C	48A-48A-66C			92				
93	CA_48A-48C-66A	48A-48C-66A		5CC-24	93				
94	CA_48A-48D	48A-48D		5CC-30	94				
95	CA_48C-66A-66A	48C-66A-66A			95				
96	CA_48C-66B	48C-66B		5CC-44	96				
97	CA_48C-48C	48C-48C		5CC-41	97				
98	CA_48C-66C	48C-66C		5CC-45	98				
99	CA_48D-66A	48D-66A		5CC-34	99				
100	CA_48E	48E		6CC-1	100				
101	CA_2A-2A-46C	2A-2A			101				
102	CA_2A-5A-46C	2A			102				
103	CA_2A-13A-46C	2A			103				
104	CA_2A-46A-46A-66A	2A-66A			104				
105	CA_2A-46A-46C	2A		5CC-54	105				
106	CA_2A-46A-48A-66A	2A-48A-66A			106				
107	CA_2A-46A-48C	2A-48C		5CC-56	107				
108	CA_2A-46A-66A-66A	2A-66A-66A			108				
109	CA_2A-46C-48A	2A-48A		5CC-58	109				
110	CA_2A-46C-66A	2A-66A		5CC-58	110				
111	CA_2A-46D	2A		5CC-55	111				
112	CA_4A-46A-46C	4A			112				
113	CA_4A-46D	4A		5CC-70	113				
114	CA_5A-46C-66A	66A			114				
115	CA_5A-46D			5CC-71	115				
116	CA_5B-46C				116				
117	CA_13A-46C-66A	66A			117				
118	CA_13A-46D			5CC-52	118				
119	CA_46A-48C-66A	48C-66A		5CC-56	119				
120	CA_46C-48A-66A	48A-66A		5CC-58	120				
121	CA_46A-46C-66A	66A		5CC-54	121				
122	CA_46C-66A-66A	66A-66A			122				
123	CA_46D-66A	66A		5CC-71	123				

6CC Downlink Carrier Aggregation					7CC Downlink Carrier Aggregation				
Number	Combination	4X4 MIMO	Restriction	Covered by Measurement Superset	Number	Combination	4X4 MIMO	Restriction	Covered by Measurement Superset
1	CA_2A-48E-66A	48E			1	CA_2A-46C-48D-66A	48D	LTE B46 SCC Only	
2	CA_2A-46A-48D-66A	48D-66A, 2A-48D	LTE B46 SCC Only		2	CA_2A-46C-48E	2A	LTE B46 SCC Only	
3	CA_2A-46A-48E	48E	LTE B46 SCC Only		3	CA_2A-46D-48C-66A	48C-66A, 2A-48C	LTE B46 SCC Only	
4	CA_2A-46C-48C-66A	2A-48C-66A	LTE B46 SCC Only		4	CA_2A-46E-48A-66A	2A-48A-66A	LTE B46 SCC Only	
5	CA_2A-46C-48D	2A-48D	LTE B46 SCC Only	7CC-1	5	CA_2A-46E-48C	2A-48C	LTE B46 SCC Only	
6	CA_2A-46D-48A-66A	2A-48A-66A	LTE B46 SCC Only		6	CA_2A-46E-66A-66A	2A-66A-66A	LTE B46 SCC Only	
7	CA_2A-46D-48C	2A-48C	LTE B46 SCC Only	7CC-3	7	CA_46C-48E-66A	66A	LTE B46 SCC Only	
8	CA_2A-46D-66A-66A	2A-66A-66A	LTE B46 SCC Only		8	CA_46E-48C-66A	48C-66A	LTE B46 SCC Only	
9	CA_2A-46E-48A	2A-48A	LTE B46 SCC Only	7CC-4	9				
10	CA_2A-46E-66A	2A-66A	LTE B46 SCC Only	7CC-4	10				
11	CA_46A-48E-66A	48E	LTE B46 SCC Only		11				
12	CA_46C-48D-66A	48D-66A	LTE B46 SCC Only	7CC-1	12				
13	CA_46D-48C-66A	48C-66A	LTE B46 SCC Only	7CC-3	13				
14	CA_46E-48A-66A	48A-66A	LTE B46 SCC Only	7CC-4	14				
15	CA_46E-66A-66A	66A-66A	LTE B46 SCC Only	7CC-6	15				

LTE Carrier Aggregation Conducted Power (Downlink)

i. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.

ii. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.

iii. The device supports downlink seven carrier aggregation. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.

iv. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.

v. For inter-band CA, the SCC selected highest bandwidth and near the middle of its transmission band. For SCC DL RB size and offset will base on the PCC corresponding RB allocation.

vi. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.

vii. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lfloor \frac{BW_{Channel(1)} + BW_{Channel(2)} - 0.1\left|BW_{Channel(1)} - BW_{Channel(2)}\right|}{0.6} \right\rfloor 0.3 \ \ [\text{MHz}]$$

LTE 4x4 MIMO (Downlink)

This device supports downlink 4x4 MIMO operations for LTE Band 2/4/7/25/30/41/46/48/66 only. Uplink transmission is limited to a single output stream. Power measurements were performed with downlink 4x4 MIMO active for the configuration with highest measured maximum conducted power with 4x4 downlink MIMO inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.

Per FCC Guidance, SAR for downlink 4x4 MIMO was not needed since the maximum average output power in 4x4 downlink MIMO mode was not > 0.25 dB higher than the maximum output power with downlink 4x4 MIMO inactive. When carrier aggregation is applicable, power measurements were performed with the downlink carrier aggregation and 4x4 DL MIMO active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.

4X4 MIMO	Band
	LTE Band 2/4/7/25/30/41/46/48/66

LTE Carrier Aggregation Conducted Power (Uplink)

LTE Uplink CA	2CC Uplink Carrier Aggregation	
Intra-band	Main Antenna Tx	ASDiv Tx
CA_5B	Ant 0	Ant1
CA_7C	Ant 2	Ant1
CA_66B	Ant 2	Ant1
CA_66C	Ant 2	Ant1
CA_41C	Ant 2	Ant 1
CA_48C	Ant 3	Ant 8

<Intra-band>

General Note:

i. The device supports intra-band uplink carrier aggregation for LTE B5/7/66/41/48 with a maximum of two uplink component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre 3GPP requirement.

ii. The device supports uplink carrier aggregation with a maximum of two uplink component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre the 3GPP requirement.

iii. According Nov. 2017 TCB workshop, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.

iv. Additional SAR measurement for LTE UL CA whit other DL CA combinations active were not required since the maximum output power for this configuration was not > 0.25dB higher than the maximum output power for UL CA active.

v. LTE CA_66B test was covered by CA_66C; therefore, SAR was only assessed for CA_66C.

<Inter-band uplink carrier aggregation consideration>

LTE Uplink CA	2CC Uplink Carrier Aggregation		
Inter-band	Main Antenna Tx	ASDiv Tx	
CA_2A-4A	Ant 2 + Ant 1	Ant 1 + Ant 2	
CA_2A-5A	Ant 1 + Ant 0	Ant 2 + Ant 0	Ant 2 + Ant 1
CA_2A-7A	Ant 2 + Ant 1	Ant 1 + Ant 2	
CA_2A-12A	Ant 1 + Ant 0	Ant 2 + Ant 0	Ant 2 + Ant 1
CA_2A-13A	Ant 1 + Ant 0	Ant 2 + Ant 0	Ant 2 + Ant 1
CA_2A-14A	Ant 1 + Ant 0	Ant 2 + Ant 0	Ant 2 + Ant 1
CA_2A-30A	Ant 2 + Ant 1	Ant 1 + Ant 2	
CA_2A-66A	Ant 2 + Ant 1	Ant 1 + Ant 2	
CA_4A-5A	Ant 1 + Ant 0	Ant 2 + Ant 0	Ant 2 + Ant 1
CA_4A-12A	Ant 1 + Ant 0	Ant 2 + Ant 0	Ant 2 + Ant 1
CA_4A-13A	Ant 1 + Ant 0	Ant 2 + Ant 0	Ant 2 +Ant 1
CA_5A-7A	Ant 0 + Ant 2	Ant 1 + Ant 2	Ant 0 + Ant 1
CA_5A-30A	Ant 0 + Ant 1	Ant 0 + Ant 2	Ant 1 + Ant 2
CA_5A-66A	Ant 0 + Ant 2	Ant 1 + Ant 2	Ant 0 + Ant 1
CA_12A-30A	Ant 0 + Ant 1	Ant 0 + Ant 2	Ant 1 + Ant 2
CA_12A-66A	Ant 0 + Ant 2	Ant 1 + Ant 2	Ant 0 + Ant 1
CA_13A-66A	Ant 0 + Ant 2	Ant 1 + Ant 2	Ant 0 + Ant 1
CA_14A-30A	Ant 0 + Ant 1	Ant 0 + Ant 2	Ant 1 + Ant 2
CA_14A-66A	Ant 0 + Ant 2	Ant 1 + Ant 2	Ant 0 + Ant 1

General Note:

1. The single carrier of inter band CA uplink power level is the same as Non-CA standalone LTE power level.
2. 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.
3. For LTE inter-band CA mode, Qualcomm Smart Transmit algorithm in WWAN adds directly the time-averaged RF exposure between two LTE bands. Smart Transmit algorithm controls the total RF exposure base on LTE inter CA bands to not exceed FCC limit. In Part 1 Report, simultaneous transmission compliance was evaluated with other Radios (WLAN or BT) using standalone LTE SAR mode.

5G NR Output Power (Unit: dBm)

General Note:

1. 5G NR n2/n5/n7/n12/n25/n30/n66/n71/n41/n77/n78 is NSA mode.
2. 5G NR n2/n5/n7/n12/n14/n25/n26/n30/n66/n70/n71/n38/n41/n48/n77/n78 is SA mode.
3. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
   a. For DFT-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class2 and 3, the CP-OFDM mode will not higher than DFT-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 QPSK and the reported SAR for the DFT-s QPSK configuration is ≤ 1.45 W/kg; CP-OFDM testing is not required.
   b. For DFT-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class2 and 3, for 16QAM/64QAM/256QAM and smaller bandwidth output power will spot check largest channel bandwidth worst RB configuration to ensure the 16QAM/64QAM/256QAM and smaller bandwidth output power will not ½ dB higher than the same configuration in the largest supported bandwidth.
   c. SAR testing start with the largest channel bandwidth and measure SAR for QPSK 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 QPSK SAR testing follows 1RB QPSK allocation procedure
   e. QPSK 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. PI/2 BPSK/16QAM/64QAM/256QAM output powers according to 3GPP MPR will not ½ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configuration is less than 1.45 W/kg, PI/2 BPSK /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
4. This device supports HPUE for 5GNR n41/n77 with class 2 level, HPUE power has been measured separately. For HPUE power is higher than power class 3 but with lower duty cycle, the maximum average power for class 2 and class 3 is almost the same, so we chose power class 3 full SAR testing and power class 2 verify the worst case of power class 3 SAR.
5. For 5GNR n41/n77 HPUE, 5GNR n41/n77 PC2 Maximum Duty Cycle is 50%, using FTM (Factory Test Mode) with 50% duty cycle is considered during SAR testing. For 5G NR other bands test, using FTM (Factory Test Mode) with default 100% duty cycle transmission to perform SAR testing.
6. NSA and SA mode should perform SAR separately. For the maximum power of NSA mode is the same as SA total power level, so SA SAR can represent NSA mode SAR.
7. 5GNR NSA mode, the power level is the same as 5GNR SA mode, so 5GNR NSA mode and SA mode power table only show one time.
8. 5G NR supports CP-OFDM and DFT-s-OFDM modulation, for DFT-s-OFDM power is higher than CP-OFDM, so only show DFT-s-OFDM power table and chose DFT-s-OFDM to perform SAR testing.
9. For DFT-s-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for the CP-OFDM mode will not higher than DFT-s-OFDM mode, therefore, CP-OFDM measurement is unnecessary.
10. 5G NR n41 supports UL MIMO at Antenna 1 and Antenna 2, and 5G NR n48/n77 supports UL MIMO at Antenna 3 and Antenna 8.
11. The device supports HPUE (power class 2) under SISO mode and HPUE (power class 1.5) under UL MIMO mode for 5G NR n41/n77.

<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]	≤ 1.2[1]	≤ 0.2[1]
		≤ 0.5[2]	≤ 0.5[2]	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		

ENDC	Main Antenna Tx		ASDiv Tx		ASDiv Tx		ASDiv Tx	
	LTE TX	NR TX	LTE TX	NR TX	LTE TX	NR TX	LTE TX	NR TX
DC_12A_n25A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_12A_n2A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_12A_n30A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_12A_n66A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_12A_n77A	Ant 0	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_13A_n2A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_13A_n66A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_13A_n77A	Ant 0	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_14A_n2A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_14A_n30A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_14A_n66A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_14A_n77A	Ant 0	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_2A_n12A	Ant 2	Ant 0	Ant 1	Ant 0				
DC_2A_n30A	Ant 2	Ant 1	Ant 1	Ant 2				
DC_2A_n41A	Ant 1	Ant 2	Ant 2	Ant 0	Ant 2	Ant 1	Ant 2	Ant 4
DC_2A_n5A	Ant 1	Ant 0	Ant 2	Ant 1				
DC_2A_n66A	Ant 2	Ant 1	Ant 1	Ant 2				
DC_2A_n71A	Ant 1	Ant 0	Ant 2	Ant 1				
DC_2A_n77A	Ant 2	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_30A_n2A	Ant 1	Ant 2	Ant 2	Ant 1				
DC_30A_5A	Ant 1	Ant 0	Ant 2	Ant 1				
DC_30A_n66A	Ant 1	Ant 2	Ant 2	Ant 1				
DC_30A_n77A	Ant 1	Ant 8	Ant 2	Ant 3	Ant 2	Ant 7	Ant 2	Ant 9
DC_48A_n5A	Ant 3	Ant 0	Ant 8	Ant 0				
DC_48A_n66A	Ant 3	Ant 2	Ant 8	Ant 1				
DC_48A_n71A	Ant 3	Ant 0	Ant 8	Ant 1				
DC_5A_n2A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_5A_n30A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_5A_n66A	Ant 0	Ant 1	Ant 1	Ant 2				
DC_5A_n77A	Ant 0	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_5A_n78A	Ant 0	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_66A_n12A	Ant 1	Ant 0	Ant 2	Ant 0				
DC_66A_n25A	Ant 2	Ant 1	Ant 1	Ant 2				
DC_66A_n2A	Ant 2	Ant 1	Ant 1	Ant 2				
DC_66A_n30A	Ant 2	Ant 1	Ant 1	Ant 2				
DC_66A_n41A	Ant 1	Ant 2	Ant 2	Ant 0	Ant 2	Ant 1	Ant 2	Ant 4
DC_66A_n5A	Ant 1	Ant 0	Ant 2	Ant 1				
DC_66A_n71A	Ant 1	Ant 0	Ant 2	Ant 1				
DC_66A_n77A	Ant 2	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_66A_n78A	Ant 2	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_66A_n7A	Ant 2	Ant 1						
DC_7A_n66A	Ant 2	Ant 1	Ant 1	Ant 2				
DC_7A_n77A	Ant 2	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9
DC_7A _n78A	Ant 2	Ant 3	Ant 1	Ant 7	Ant 1	Ant 8	Ant 1	Ant 9

<NR carrier aggregation consideration>

Uplink CA	NR Uplink Carrier Aggregation			
Inter-band	Main Antenna Tx	ASDiv Tx		
CA_n2A-n48A	Ant 2 + Ant 3	Ant 1 + Ant 8		
CA_n2A-n77A	Ant 1 + Ant 8	Ant 2 + Ant 3	Ant 2 + Ant 7	Ant 2 + Ant 9
CA_n5A-n48A	Ant 0 + Ant 3	Ant 1 + Ant 8		
CA_n5A-n77A	Ant 0 + Ant 3	Ant 1 + Ant 7	Ant 1 + Ant 8	Ant 1 + Ant 9
CA_n12A-n77A	Ant 0 + Ant 3	Ant 0 + Ant 7	Ant 0 + Ant 8	Ant 0 + Ant 9
CA_n14A-n77A	Ant 0 + Ant 3	Ant 0 + Ant 7	Ant 0 + Ant 8	Ant 0 + Ant 9
CA_n25A-n41A	Ant 1 + Ant 2	Ant 2 + Ant 0	Ant 2 + Ant 1	Ant 2 + Ant 4
CA_n25A-n48A	Ant 2 + Ant 3	Ant 1 + Ant 8		
CA_n25A-n77A	Ant 1 + Ant 8	Ant 2 + Ant 3	Ant 2 + Ant 7	Ant 2 + Ant 9
CA_n30A-n77A	Ant 1 + Ant 8	Ant 2 + Ant 3	Ant 2 + Ant 7	Ant 2 + Ant 9
CA_n66A-n77A	Ant 1 + Ant 8	Ant 2 + Ant 3	Ant 2 + Ant 7	Ant 2 + Ant 9
CA_n71A-n77A	Ant 0 + Ant 3	Ant 1 + Ant 7	Ant 1 + Ant 8	Ant 1 + Ant 9
CA_n41A-n66A	Ant 2 + Ant 1	Ant 1 + Ant 2	Ant 0 + Ant 1	Ant 4 + Ant 1
CA_n41A-n71A	Ant 1 + Ant 0	Ant 2 + Ant 1	Ant 0 + Ant 1	Ant 4 + Ant 1
CA_n48A-n66A	Ant 3 + Ant 1	Ant 8 + Ant 2		
CA_n48A-n70A	Ant 8 + Ant 1	Ant 8 + Ant 2		
CA_n48A-n71A	Ant 3 + Ant 0	Ant 8 + Ant 1		

NR UL MIMO Bands Configuration:

NR UL MIMO	TX Ant	TX Ant
FR1 n41	Ant2	Ant1
FR1 n48	Ant3	Ant8
FR1 n77	Ant3	Ant8

<WLAN Conducted Power>

General Note:

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18

The initial test position procedure is described in the following:

a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.

b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.

c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

5. 802.11ax full tone and partial tone supported for WLAN2.4GHz/WLAN5GHz, after verification for the partial tone power level is far less than full tone power level, so we chose full tone power to be measured in this report.

6. The 2.4GHz/5GHz/6GHz WLAN can transmit in MIMO antenna mode only and it has no SISO antenna mode.