FCC SAR TEST REPORT

FCC ID	:	**E2KT99W175**
Equipment	:	**5G WWAN Module**
Brand Name	:	**DELL**
Model Name	:	**T99W175**
Applicant	:	**Dell Inc.** **One Dell Way, Round Rock, Texas 78682, USA**
Standard	:	**FCC 47 CFR Part 2 (2.1093)**

The product was installed into Portable Computer (Brand Name DELL, Model Name: P115F) during test.

The product was received on Jan. 06, 2022 and testing was started from Jan. 20, 2022 and completed on Feb. 08, 2022. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been pass the FCC requirement.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Cona Huang

Approved by: Cona Huang / Deputy Manager

Testing Laboratory
1190

Sporton International Inc. EMC & Wireless Communications Laboratory

No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FA1D2143	01	Initial issue of report	Mar. 22, 2022

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Dell Inc., 5G WWAN Module, T99W175, are as follows.

Frequency Band		Highest SAR Summary Body 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
LTE	LTE Band 2	0.05	1.14
	LTE Band 7	0.06	
	LTE Band 48	0.03	
	LTE Band 66	0.07	
FR1	FR1 n2	0.03	
	FR1 n7	0.04	
	FR1 n41	0.04	
	FR1 n66	0.05	
Date of Testing:		2022/1/20 ~ 2022/2/8	

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093), Human Exposure to RF Radiation Limits (1.0 mW/cm^2=10 W/m^2) specified in FCC 47 CFR part 1.1310 and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

Reviewed by: Jason Wang
Report Producer: Carlie Tsai

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, the below KDB standard may not including in the TAF code without accreditation.

- 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 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- IEC/IEEE 62209-1528:2020

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	5G WWAN Module
Brand Name	DELL
Model Name	T99W175
FCC ID	E2KT99W175
Wireless Technology and Frequency Range	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 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 n41 : 2496 MHz ~ 2690 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz
Mode	RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM

Remark:
1. This device has two antenna vendors; RF exposure evaluation selects WNC as the main test, Hong-Bo will spot check worst case found in WNC.

WWAN Antenna Information					
Manufacturer	Wistron NeWeb Corporation		Peak gain(dbi)	4.40
Part number	Antenna 0	81ELA115.G23 (DC33002MV1L)	Type	PIFA
	Antenna 2	81ELA115.G23 (DC33002MV1L)		
Manufacturer	Hong-BO Co., Ltd		Peak gain (dbi)	4.42
Part number	Antenna 0	350-24015 (DC33002OH0L)	Type	PIFA
	Antenna 2	350-24015 (DC33002OH0L)		

Host Information	
Equipment Name	Portable Computer
Brand Name	DELL
Model Name	P115F
FCC ID	PD9AX211D2
Integrated WLAN Module	Brand Name: Intel® Wi-Fi 6 AX211 Model Name: AX211D2W
Wireless Technology and Frequency Range	WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz WLAN 6E: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE

Remark:
1. The Intel AX211D2W (FCC ID: PD9AX211D2) WLAN/BT module is also integrated into DELL P115F host. In this report section14.2 additional WLAN/BT SAR to evaluated Sim-Tx analysis with WWAN transmitter, the detail WLAN/BT SAR will include in the Intel RF exposure report.

3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	E2KT99W175
Equipment Name	5G WWAN Module
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz
Channel Bandwidth	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
uplink modulations used	QPSK / 16QAM / 64QAM / 256QAM
LTE Voice / Data requirements	Data only
LTE MPR permanently built-in by design	**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3**

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
LTE Carrier Aggregation Combinations	Inter-Band and Intra-Band possible combinations and the detail power measurement please referred to section 10.
LTE Carrier Aggregation Additional Information	This device supports maximum of 6 carriers in the downlink and 2 carriers in the uplink. Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	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	23230	782
M	23230	782		
H	23255	784.5		

LTE Band 14

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

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

3.3 General 5G NR SAR Test and Reporting Considerations

5G NR Information	
FCC	E2KT99W175
Equipment Name	5G WWAN Module
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 n41: 2496 MHz ~ 2690 MHz 5G NR n66: 1710 MHz ~ 1780 MHz
Channel Bandwidth	5G NR n2: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n5: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n7: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n12: 5MHz, 10MHz, 15MHz 5G NR n41: 20MHz, 40MHz, 50MHz, 60MHz, 80MHz, 90MHz, 100MHz 5G NR n66: 5MHz, 10MHz, 15MHz, 20MHz
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 B5/12/13/48
LTE Anchor Bands for n5	LTE B2/7/48/66
LTE Anchor Bands for n7	LTE B5/12
LTE Anchor Bands for n12	LTE B2/66
LTE Anchor Bands for n41	LTE B2/25/26/66
LTE Anchor Bands for n66	LTE B5/12/13/48

NR Band 2

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	370500	1852.5	371000	1855	371500	1857.5	372000	1860
M	376000	1880	376000	1880	376000	1880	376000	1880
H	381500	1907.5	381000	1905	380500	1902.5	380000	1900

NR Band 5

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	165300	826.5	165800	829	166300	831.5	166800	834
M	167300	836.5	167300	836.5	167300	836.5	167300	836.5
H	169300	846.5	168800	844	168300	841.5	167800	839

NR Band 7

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	500500	2502.5	501000	2505	501500	2507.5	502000	2510
M	507000	2535	507000	2535	507000	2535	507000	2535
H	513500	2567.5	513000	2565	512500	2562.5	512000	2560

NR Band 12

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz	
	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 41

	Bandwidth20MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	501204	2506.02	503202	2516.01	504204	2521.02	505200	2526	507204	2536.02	508200	2541	509202	2546.01
M	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99
H	535998	2679.99	534000	2670	532998	2664.99	531996	2659.98	529998	2649.99	528996	2644.98	528000	2640

NR Band 66

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

4. RF Exposure Limits

4.1 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.

4.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

5. Specific Absorption Rate (SAR)

5.1 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.

5.2 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:

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

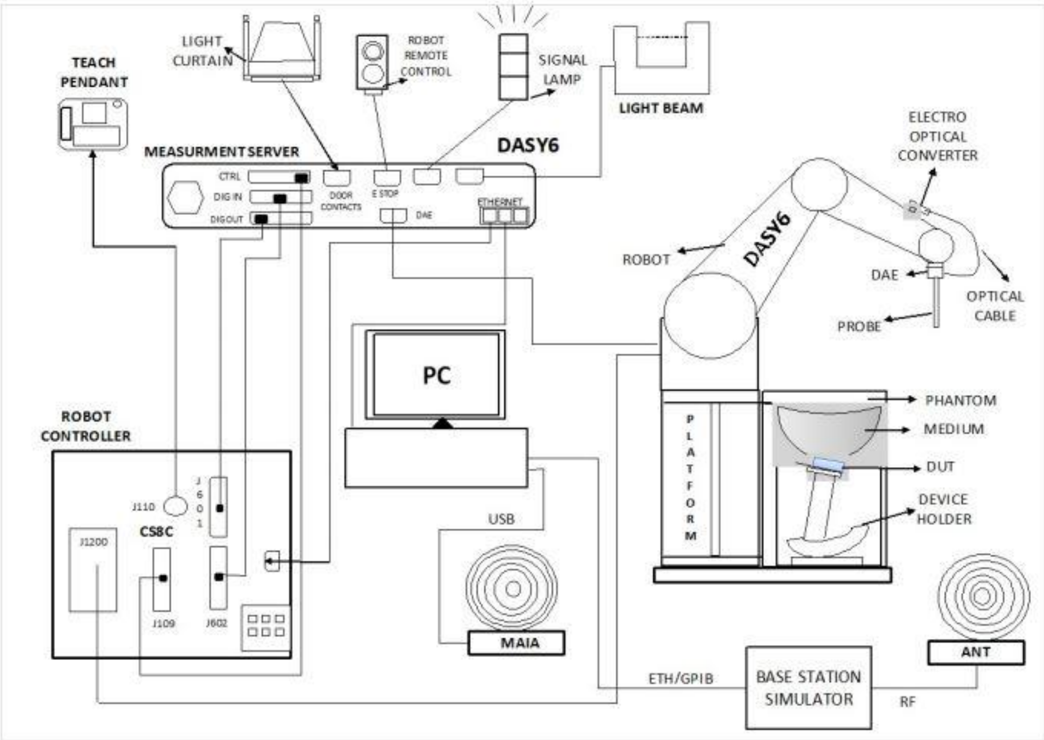
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

6. System Description and Setup

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



- The DASY system in DASY6/DASY5 V5.2 SAR Configuration is shown above
- 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 windows software and the DASY5/DASY6 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.

6.1 Test Site Location

The SAR measurement facilities used to collect data are within both Sporton Lab list below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 3786) and the FCC designation No. TW1190 and TW3786 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

Test Site	EMC & Wireless Communications Laboratory		Wensan Laboratory		
Test Site Location	TW1190 No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan		TW3786 No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan		
Test Site No.	SAR01-HY	SAR03-HY	SAR08-HY	SAR09-HY	SAR15-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY	
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	

6.2 E-Field Probe

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

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 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	

6.3 Data Acquisition Electronics (DAE)

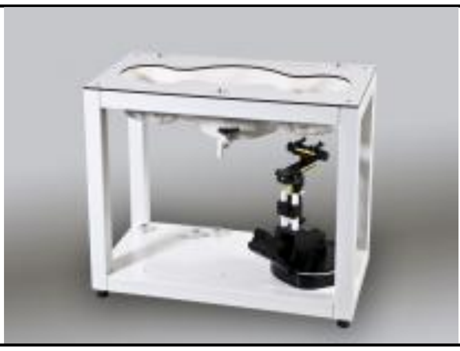
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

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

Fig 5.1 Photo of DAE

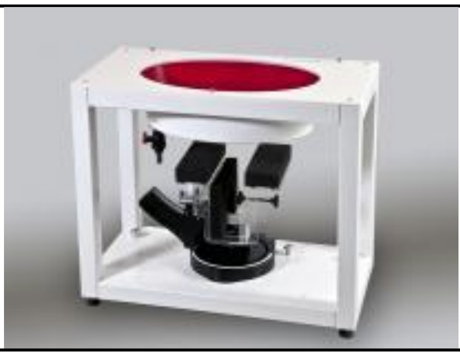
6.4 Phantom

<SAM Twin Phantom>

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

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

<ELI Phantom>

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

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

6.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

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

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

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

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

Mounting Device for Laptops

7. 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

7.1 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

7.2 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.

7.3 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>

7.4 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.

<table>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>$>$ 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">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 <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 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.</td></tr>
</table>

7.5 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.

7.6 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.

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	1750MHz System Validation Kit(2)	D1750V2	1112	Mar. 07, 2019	Mar. 04, 2022
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Aug. 19, 2021	Aug. 18, 2022
SPEAG	1900MHz System Validation Kit(2)	D1900V2	5d185	Mar. 07, 2019	Mar. 04, 2022
SPEAG	2450MHz System Validation Kit(2)	D2450V2	929	Nov. 21, 2019	Nov. 18, 2022
SPEAG	2600MHz System Validation Kit(2)	D2600V2	1078	Mar. 06, 2019	Mar. 03, 2022
SPEAG	3500MHz System Validation Kit(2)	D3500V2	1014	Jan. 29, 2019	Jan. 26, 2022
SPEAG	3700MHz System Validation Kit(2)	D3700V2	1006	Mar. 05, 2019	Mar. 02, 2022
SPEAG	5GHz System Validation Kit	D5GHzV2	1006	Sep. 15, 2021	Sep. 14, 2022
SPEAG	6500MHz System Validation Kit	D6.5GHzV2	1003	Sep. 24, 2021	Sep. 23, 2022
SPEAG	Data Acquisition Electronics	DAE4	853	Jul. 14, 2021	Jul. 13, 2022
SPEAG	Data Acquisition Electronics	DAE4	854	Aug. 19, 2021	Aug. 18, 2022
SPEAG	Dosimetric E-Field Probe	EX3DV4	3642	Apr. 26, 2021	Apr. 25, 2022
SPEAG	Dosimetric E-Field Probe	EX3DV4	7350	Dec. 20, 2021	Dec. 19, 2022
SPEAG	Dosimetric E-Field Probe	EX3DV4	7590	Mar. 25, 2021	Mar. 24, 2022
RCPTWN	Thermometer	HTC-1	TM685-1	Oct. 28, 2021	Oct. 27, 2022
RCPTWN	Thermometer	HTC-1	TM560-2	Oct. 28, 2021	Oct. 27, 2022
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Oct. 21, 2021	Oct. 20, 2022
Keysight	Wireless Communication Test Set	E5515C	MY50267236	Mar. 21, 2021	Mar. 20, 2022
R&S	BT Base Station	CBT	100815	Feb. 19, 2021	Feb. 18, 2022
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Oct. 24, 2021	Oct. 23, 2022
Keysight	ENA Network Analyzer	E5071C	MY46316648	Jul. 22, 2021	Jul. 21, 2022
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 24, 2021	Sep. 23, 2022
LINE SEIKI	Digital Thermometer	DTM3000-spezial	3252	Jul. 15, 2021	Jul. 14, 2022
Anritsu	Power Meter	ML2495A	1419002	Aug. 18, 2021	Aug. 17, 2022
Anritsu	Power Sensor	MA2411B	1911176	Aug. 18, 2021	Aug. 17, 2022
Anritsu	Power Meter	ML2496A	2119003	Jun. 09, 2021	Jun. 08, 2022
Anritsu	Power Sensor	MA2411B	1726150	Oct. 09, 2021	Oct. 08, 2022
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jul. 16, 2021	Jul. 15, 2022
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 19, 2021	Aug. 18, 2022
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 12, 2021	Oct. 11, 2022
Mini-Circuits	Power Amplifier	ZVE-8G+	479102029	Sep. 06, 2021	Sep. 05, 2022
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

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

9. System Verification

9.1 Tissue Verification

The tissue dielectric parameters of tissue-equivalent media used for SAR measurements must be characterized within a temperature range of 18℃ to 25℃, measured with calibrated instruments and apparatuses, such as network analyzers and temperature probes. The temperature of the tissue-equivalent medium during SAR measurement must also be within 18℃ to 25℃ and within ± 2℃ of the temperature when the tissue parameters are characterized. The tissue dielectric measurement system must be calibrated before use. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements.
The liquid tissue depth was at least 15cm in the phantom for all SAR testing

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
1750	22.3	1.358	40.523	1.37	40.10	-0.88	1.05	±5	2022/1/20
1750	22.3	1.358	40.523	1.37	40.10	-0.88	1.05	±5	2022/1/20
1900	22.3	1.435	38.975	1.40	40.00	2.50	-2.56	±5	2022/1/20
1900	22.3	1.435	38.975	1.40	40.00	2.50	-2.56	±5	2022/1/20
1900	22.4	1.429	39.060	1.40	40.00	2.07	-2.35	±5	2022/1/24
2450	22.3	1.830	38.987	1.80	39.20	1.67	-0.54	±5	2022/1/23
2600	22.5	1.971	39.158	1.96	39.00	0.56	0.41	±5	2022/1/22
2600	22.3	1.981	38.231	1.96	39.00	1.07	-1.97	±5	2022/1/25
3500	22.3	2.912	37.372	2.91	37.90	0.07	-1.39	±5	2022/1/22
3700	22.3	3.096	37.073	3.12	37.70	-0.77	-1.66	±5	2022/1/22
5250	22.3	4.623	35.929	4.71	35.95	-1.85	-0.06	±5	2022/1/23
5600	22.3	4.962	35.399	5.07	35.50	-2.13	-0.28	±5	2022/1/23
5750	22.3	5.135	35.208	5.22	35.35	-1.63	-0.40	±5	2022/1/23
6500	22.5	6.150	35.700	6.07	34.50	1.32	3.48	±5	2022/2/8

9.2 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.

Test Site	Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
SAR04	2022/1/20	1750	50	D1750V2-1112	EX3DV4 - SN7350	DAE4 Sn853	1.88	36.70	37.6	2.45
SAR01	2022/1/20	1750	250	D1750V2-1112	EX3DV4 - SN7590	DAE4 Sn853	8.47	36.70	33.88	-7.68
SAR04	2022/1/20	1900	50	D1900V2-5d041	EX3DV4 - SN7350	DAE4 Sn853	2.03	40.60	40.6	0.00
SAR01	2022/1/20	1900	250	D1900V2-5d185	EX3DV4 - SN7590	DAE4 Sn853	9.18	39.40	36.72	-6.80
SAR01	2022/1/24	1900	250	D1900V2-5d185	EX3DV4 - SN7590	DAE4 Sn853	9.14	39.40	36.56	-7.21
SAR01	2022/1/23	2450	250	D2450V2-929	EX3DV4 - SN7590	DAE4 Sn853	13.50	53.10	54	1.69
SAR01	2022/1/22	2600	250	D2600V2-1078	EX3DV4 - SN7590	DAE4 Sn853	14.10	57.60	56.4	-2.08
SAR01	2022/1/25	2600	250	D2600V2-1078	EX3DV4 - SN7590	DAE4 Sn853	14.20	57.60	56.8	-1.39
SAR01	2022/1/22	3500	50	D3500V2-1014	EX3DV4 - SN7590	DAE4 Sn853	3.11	67.90	62.2	-8.39
SAR01	2022/1/22	3700	50	D3700V2-1006	EX3DV4 - SN7590	DAE4 Sn853	3.16	67.30	63.2	-6.09
SAR01	2022/1/23	5250	100	D5GHzV2-1006-5250	EX3DV4 - SN7590	DAE4 Sn853	7.74	81.70	77.4	-5.26
SAR01	2022/1/23	5600	100	D5GHzV2-1006-5600	EX3DV4 - SN7590	DAE4 Sn853	8.16	85.10	81.6	-4.11
SAR01	2022/1/23	5750	100	D5GHzV2-1006-5750	EX3DV4 - SN7590	DAE4 Sn853	7.38	81.40	73.8	-9.34
SAR06	2022/2/8	6500	100	D6.5GHzV2-1003	EX3DV4 - SN3642	DAE4 Sn854	28.90	292.00	289	-1.03

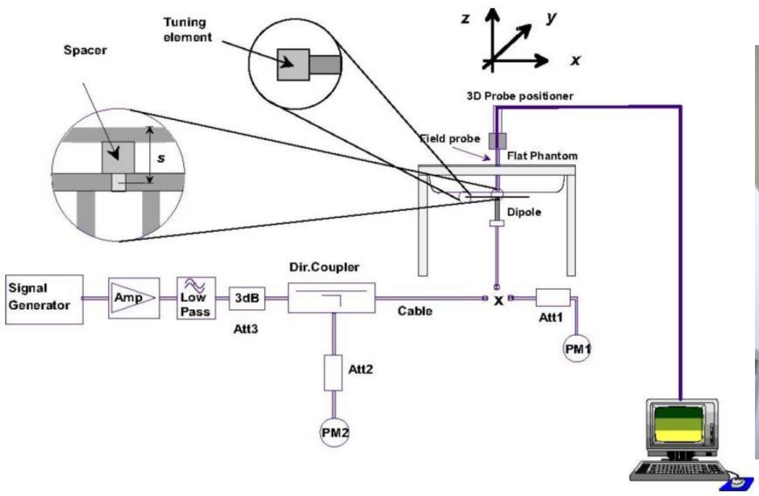


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

10. LTE Output Power (Unit: dBm)

<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 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 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.

<LTE Band 2 Ant 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				18700	18900	19100	
Frequency (MHz)				1860	1880	1900	
20	QPSK	1	0	22.56	22.66	22.64	24
20	QPSK	1	49	22.41	22.43	22.39	
20	QPSK	1	99	22.54	22.62	22.53	
20	QPSK	50	0	21.65	21.74	21.64	23
20	QPSK	50	24	21.88	21.89	21.86	
20	QPSK	50	50	21.84	21.94	21.94	
20	QPSK	100	0	21.75	21.85	21.79	
20	16QAM	1	0	21.86	21.94	21.94	23
20	16QAM	1	49	21.98	22.03	21.97	
20	16QAM	1	99	21.88	21.97	21.97	
20	16QAM	50	0	20.69	20.79	20.75	22
20	16QAM	50	24	20.84	20.92	20.86	
20	16QAM	50	50	20.84	20.88	20.88	
20	16QAM	100	0	20.84	20.89	20.84	
20	64QAM	1	0	20.58	20.60	20.56	22
20	64QAM	1	49	20.80	20.83	20.81	
20	64QAM	1	99	20.81	20.86	20.83	
20	64QAM	50	0	19.65	19.74	19.67	21
20	64QAM	50	24	19.90	19.95	19.90	
20	64QAM	50	50	19.87	19.89	19.83	
20	64QAM	100	0	19.85	19.90	19.89	
20	256QAM	1	0	17.52	17.54	17.48	19
20	256QAM	1	49	17.70	17.77	17.79	
20	256QAM	1	99	17.80	17.78	17.82	
20	256QAM	50	0	17.62	17.69	17.58	19
20	256QAM	50	24	17.84	17.85	17.80	
20	256QAM	50	50	17.80	17.80	17.77	
20	256QAM	100	0	17.84	17.87	17.88	
Channel				18675	18900	19125	Tune-up limit (dBm)
Frequency (MHz)				1857.5	1880	1902.5	
15	QPSK	1	0	22.50	22.63	22.56	24
15	QPSK	1	37	22.39	22.43	22.36	
15	QPSK	1	74	22.54	22.55	22.47	
15	QPSK	36	0	21.59	21.64	21.59	23
15	QPSK	36	20	21.88	21.81	21.86	
15	QPSK	36	39	21.74	21.94	21.89	
15	QPSK	75	0	21.69	21.75	21.76	
15	16QAM	1	0	21.82	21.89	21.90	23
15	16QAM	1	37	21.94	22.02	21.94	
15	16QAM	1	74	21.86	21.94	21.88	
15	16QAM	36	0	20.59	20.77	20.71	22
15	16QAM	36	20	20.76	20.91	20.76	
15	16QAM	36	39	20.79	20.78	20.80	
15	16QAM	75	0	20.81	20.86	20.80	
15	64QAM	1	0	20.58	20.57	20.55	22
15	64QAM	1	37	20.75	20.82	20.74	
15	64QAM	1	74	20.73	20.78	20.74	
15	64QAM	36	0	19.60	19.65	19.67	21
15	64QAM	36	20	19.83	19.93	19.85	
15	64QAM	36	39	19.81	19.88	19.78	
15	64QAM	75	0	19.75	19.81	19.82	

15	256QAM	1	0	17.48	17.59	17.47	19
15	256QAM	1	37	17.80	17.79	17.71	
15	256QAM	1	74	17.81	17.86	17.82	
15	256QAM	36	0	17.65	17.64	17.66	19
15	256QAM	36	20	17.86	17.88	17.80	
15	256QAM	36	39	17.82	17.86	17.75	
15	256QAM	75	0	17.76	17.81	17.80	
Channel				18650	18900	19150	Tune-up limit (dBm)
Frequency (MHz)				1855	1880	1905	
10	QPSK	1	0	22.53	22.65	22.57	24
10	QPSK	1	25	22.32	22.36	22.37	
10	QPSK	1	49	22.48	22.58	22.48	
10	QPSK	25	0	21.65	21.70	21.59	23
10	QPSK	25	12	21.84	21.87	21.77	
10	QPSK	25	25	21.81	21.84	21.90	
10	QPSK	50	0	21.70	21.81	21.77	
10	16QAM	1	0	21.85	21.87	21.93	23
10	16QAM	1	25	21.88	22.02	21.96	
10	16QAM	1	49	21.82	21.92	21.88	
10	16QAM	25	0	20.59	20.76	20.74	22
10	16QAM	25	12	20.75	20.83	20.77	
10	16QAM	25	25	20.81	20.79	20.87	
10	16QAM	50	0	20.77	20.85	20.84	
10	64QAM	1	0	20.57	20.54	20.51	22
10	64QAM	1	25	20.74	20.81	20.76	
10	64QAM	1	49	20.80	20.80	20.82	
10	64QAM	25	0	19.61	19.73	19.67	21
10	64QAM	25	12	19.88	19.88	19.89	
10	64QAM	25	25	19.87	19.80	19.83	
10	64QAM	50	0	19.84	19.89	19.86	
10	256QAM	1	0	17.56	17.53	17.51	19
10	256QAM	1	25	17.75	17.76	17.73	
10	256QAM	1	49	17.74	17.83	17.75	
10	256QAM	25	0	17.64	17.73	17.61	19
10	256QAM	25	12	17.80	17.91	17.85	
10	256QAM	25	25	17.86	17.80	17.73	
10	256QAM	50	0	17.77	17.88	17.89	
Channel				18625	18900	19175	Tune-up limit (dBm)
Frequency (MHz)				1852.5	1880	1907.5	
5	QPSK	1	0	22.55	22.59	22.64	24
5	QPSK	1	12	22.32	22.34	22.39	
5	QPSK	1	24	22.58	22.55	22.45	
5	QPSK	12	0	21.58	21.73	21.62	23
5	QPSK	12	7	21.78	21.86	21.79	
5	QPSK	12	13	21.76	21.91	21.94	
5	QPSK	25	0	21.75	21.83	21.77	
5	16QAM	1	0	21.86	21.87	21.85	23
5	16QAM	1	12	21.88	21.95	21.95	
5	16QAM	1	24	21.85	21.93	21.88	
5	16QAM	12	0	20.62	20.76	20.66	22
5	16QAM	12	7	20.84	20.87	20.86	
5	16QAM	12	13	20.84	20.88	20.86	
5	16QAM	25	0	20.77	20.81	20.77	
5	64QAM	1	0	20.58	20.57	20.52	22
5	64QAM	1	12	20.74	20.73	20.75	
5	64QAM	1	24	20.75	20.76	20.78	

5	64QAM	12	0	19.58	19.73	19.58	21
5	64QAM	12	7	19.82	19.88	19.87	
5	64QAM	12	13	19.87	19.89	19.77	
5	64QAM	25	0	19.77	19.84	19.80	
5	256QAM	1	0	17.53	17.56	17.47	19
5	256QAM	1	12	17.74	17.75	17.76	
5	256QAM	1	24	17.71	17.83	17.73	
5	256QAM	12	0	17.61	17.68	17.64	19
5	256QAM	12	7	17.89	17.85	17.89	
5	256QAM	12	13	17.78	17.88	17.76	
5	256QAM	25	0	17.81	17.86	17.87	
Channel				18615	18900	19185	Tune-up limit (dBm)
Frequency (MHz)				1851.5	1880	1908.5	
3	QPSK	1	0	22.54	22.64	22.64	24
3	QPSK	1	8	22.32	22.33	22.36	
3	QPSK	1	14	22.57	22.56	22.44	
3	QPSK	8	0	21.57	21.71	21.58	23
3	QPSK	8	4	21.83	21.87	21.85	
3	QPSK	8	7	21.82	21.92	21.90	
3	QPSK	15	0	21.71	21.81	21.69	
3	16QAM	1	0	21.79	21.88	21.88	23
3	16QAM	1	8	21.94	22.00	21.93	
3	16QAM	1	14	21.79	21.91	21.90	
3	16QAM	8	0	20.64	20.73	20.68	22
3	16QAM	8	4	20.77	20.83	20.84	
3	16QAM	8	7	20.80	20.88	20.83	
3	16QAM	15	0	20.81	20.85	20.79	
3	64QAM	1	0	20.55	20.56	20.56	22
3	64QAM	1	8	20.79	20.73	20.79	
3	64QAM	1	14	20.71	20.76	20.83	
3	64QAM	8	0	19.64	19.73	19.64	21
3	64QAM	8	4	19.88	19.90	19.88	
3	64QAM	8	7	19.82	19.85	19.80	
3	64QAM	15	0	19.83	19.88	19.84	
3	256QAM	1	0	17.55	17.54	17.54	19
3	256QAM	1	8	17.74	17.76	17.76	
3	256QAM	1	14	17.72	17.83	17.73	
3	256QAM	8	0	17.61	17.66	17.59	19
3	256QAM	8	4	17.80	17.92	17.83	
3	256QAM	8	7	17.77	17.86	17.80	
3	256QAM	15	0	17.83	17.84	17.89	
Channel				18607	18900	19193	Tune-up limit (dBm)
Frequency (MHz)				1850.7	1880	1909.3	
1.4	QPSK	1	0	22.49	22.63	22.55	24
1.4	QPSK	1	3	22.31	22.43	22.29	
1.4	QPSK	1	5	22.50	22.57	22.53	
1.4	QPSK	3	0	22.51	22.61	22.59	
1.4	QPSK	3	1	22.38	22.40	22.29	
1.4	QPSK	3	3	22.54	22.62	22.52	
1.4	QPSK	6	0	21.74	21.76	21.69	23
1.4	16QAM	1	0	21.86	21.93	21.92	23
1.4	16QAM	1	3	21.94	22.00	21.88	
1.4	16QAM	1	5	21.85	21.87	21.97	
1.4	16QAM	3	0	21.84	21.94	21.90	
1.4	16QAM	3	1	21.88	21.98	21.90	
1.4	16QAM	3	3	21.87	21.93	21.90	

1.4	16QAM	6	0	20.75	20.84	20.75	22
1.4	64QAM	1	0	20.56	20.50	20.47	22
1.4	64QAM	1	3	20.74	20.83	20.78	
1.4	64QAM	1	5	20.75	20.83	20.83	
1.4	64QAM	3	0	20.55	20.58	20.46	
1.4	64QAM	3	1	20.70	20.82	20.75	
1.4	64QAM	3	3	20.76	20.77	20.73	
1.4	64QAM	6	0	19.85	19.82	19.80	21
1.4	256QAM	1	0	17.52	17.53	17.55	19
1.4	256QAM	1	3	17.73	17.80	17.78	
1.4	256QAM	1	5	17.81	17.79	17.77	
1.4	256QAM	3	0	17.59	17.64	17.64	
1.4	256QAM	3	1	17.81	17.88	17.84	
1.4	256QAM	3	3	17.83	17.84	17.76	
1.4	256QAM	6	0	17.75	17.86	17.89	19

<LTE Band 7 Ant 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				20850	21100	21350	
Frequency (MHz)				2510	2535	2560	
20	QPSK	1	0	22.44	22.56	22.51	24
20	QPSK	1	49	22.42	22.53	22.49	
20	QPSK	1	99	22.40	22.52	22.42	
20	QPSK	50	0	21.87	21.88	21.87	23
20	QPSK	50	24	21.81	21.82	21.81	
20	QPSK	50	50	21.84	21.86	21.86	
20	QPSK	100	0	21.75	21.84	21.81	
20	16QAM	1	0	22.00	22.00	21.93	23
20	16QAM	1	49	21.89	21.95	21.91	
20	16QAM	1	99	21.90	21.93	21.88	
20	16QAM	50	0	20.81	20.88	20.82	22
20	16QAM	50	24	20.79	20.82	20.73	
20	16QAM	50	50	20.80	20.87	20.79	
20	16QAM	100	0	20.82	20.85	20.83	
20	64QAM	1	0	20.70	20.70	20.63	22
20	64QAM	1	49	20.69	20.72	20.68	
20	64QAM	1	99	20.70	20.73	20.64	
20	64QAM	50	0	19.77	19.86	19.78	21
20	64QAM	50	24	19.85	19.88	19.84	
20	64QAM	50	50	19.91	19.93	19.84	
20	64QAM	100	0	19.85	19.85	19.76	
20	256QAM	1	0	17.61	17.61	17.60	19
20	256QAM	1	49	17.63	17.67	17.67	
20	256QAM	1	99	17.61	17.63	17.57	
20	256QAM	50	0	17.73	17.78	17.68	19
20	256QAM	50	24	17.80	17.79	17.78	
20	256QAM	50	50	17.83	17.86	17.78	
20	256QAM	100	0	17.79	17.77	17.69	
Channel				20825	21100	21375	Tune-up limit (dBm)
Frequency (MHz)				2507.5	2535	2562.5	
15	QPSK	1	0	22.44	22.54	22.43	24
15	QPSK	1	37	22.38	22.43	22.46	
15	QPSK	1	74	22.50	22.52	22.33	

15	QPSK	36	0	21.88	21.87	21.78	23
15	QPSK	36	20	21.72	21.72	21.77	
15	QPSK	36	39	21.83	21.95	21.76	
15	QPSK	75	0	21.65	21.80	21.73	
15	16QAM	1	0	21.90	21.92	21.92	23
15	16QAM	1	37	21.87	21.87	21.89	
15	16QAM	1	74	21.87	21.84	21.79	
15	16QAM	36	0	20.81	20.83	20.82	22
15	16QAM	36	20	20.77	20.73	20.69	
15	16QAM	36	39	20.80	20.87	20.77	
15	16QAM	75	0	20.78	20.76	20.76	
15	64QAM	1	0	20.70	20.66	20.58	22
15	64QAM	1	37	20.63	20.67	20.67	
15	64QAM	1	74	20.66	20.67	20.59	
15	64QAM	36	0	19.67	19.82	19.72	21
15	64QAM	36	20	19.76	19.78	19.74	
15	64QAM	36	39	19.89	19.84	19.81	
15	64QAM	75	0	19.76	19.81	19.69	
15	256QAM	1	0	17.68	17.69	17.61	19
15	256QAM	1	37	17.62	17.67	17.66	
15	256QAM	1	74	17.66	17.72	17.58	
15	256QAM	36	0	17.77	17.86	17.70	19
15	256QAM	36	20	17.80	17.78	17.79	
15	256QAM	36	39	17.84	17.84	17.78	
15	256QAM	75	0	17.76	17.78	17.66	
Channel				20800	21100	21400	Tune-up limit (dBm)
Frequency (MHz)				2505	2535	2565	
10	QPSK	1	0	22.37	22.54	22.41	24
10	QPSK	1	25	22.38	22.44	22.42	
10	QPSK	1	49	22.47	22.43	22.39	
10	QPSK	25	0	21.78	21.85	21.84	23
10	QPSK	25	12	21.78	21.75	21.72	
10	QPSK	25	25	21.83	21.92	21.79	
10	QPSK	50	0	21.70	21.84	21.79	
10	16QAM	1	0	21.93	21.97	21.87	23
10	16QAM	1	25	21.81	21.91	21.90	
10	16QAM	1	49	21.86	21.87	21.82	
10	16QAM	25	0	20.77	20.82	20.76	22
10	16QAM	25	12	20.76	20.74	20.69	
10	16QAM	25	25	20.71	20.77	20.75	
10	16QAM	50	0	20.76	20.83	20.82	
10	64QAM	1	0	20.69	20.66	20.61	22
10	64QAM	1	25	20.63	20.71	20.67	
10	64QAM	1	49	20.63	20.66	20.64	
10	64QAM	25	0	19.74	19.82	19.78	21
10	64QAM	25	12	19.83	19.83	19.78	
10	64QAM	25	25	19.90	19.83	19.81	
10	64QAM	50	0	19.78	19.84	19.67	
10	256QAM	1	0	17.66	17.61	17.58	19
10	256QAM	1	25	17.68	17.62	17.65	
10	256QAM	1	49	17.60	17.69	17.62	
10	256QAM	25	0	17.70	17.77	17.73	19
10	256QAM	25	12	17.77	17.83	17.83	
10	256QAM	25	25	17.84	17.89	17.79	
10	256QAM	50	0	17.78	17.78	17.76	
Channel				20775	21100	21425	Tune-up limit

Frequency (MHz)				2502.5	2535	2567.5	(dBm)
5	QPSK	1	0	22.36	22.47	22.44	
5	QPSK	1	12	22.44	22.45	22.45	24
5	QPSK	1	24	22.44	22.45	22.39	
5	QPSK	12	0	21.88	21.84	21.83	
5	QPSK	12	7	21.72	21.78	21.78	23
5	QPSK	12	13	21.82	21.93	21.80	
5	QPSK	25	0	21.66	21.77	21.79	
5	16QAM	1	0	21.99	21.95	21.91	
5	16QAM	1	12	21.89	21.85	21.82	23
5	16QAM	1	24	21.87	21.93	21.81	
5	16QAM	12	0	20.77	20.83	20.81	
5	16QAM	12	7	20.78	20.81	20.73	22
5	16QAM	12	13	20.74	20.80	20.72	
5	16QAM	25	0	20.75	20.85	20.80	
5	64QAM	1	0	20.65	20.69	20.56	
5	64QAM	1	12	20.59	20.67	20.68	22
5	64QAM	1	24	20.70	20.70	20.63	
5	64QAM	12	0	19.75	19.83	19.73	
5	64QAM	12	7	19.82	19.82	19.74	21
5	64QAM	12	13	19.89	19.85	19.83	
5	64QAM	25	0	19.81	19.80	19.76	
5	256QAM	1	0	17.67	17.67	17.56	
5	256QAM	1	12	17.68	17.67	17.64	19
5	256QAM	1	24	17.69	17.65	17.63	
5	256QAM	12	0	17.76	17.83	17.75	
5	256QAM	12	7	17.80	17.86	17.76	19
5	256QAM	12	13	17.90	17.90	17.76	
5	256QAM	25	0	17.77	17.81	17.69	

<LTE Band 66 Ant 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				132072	132322	132572	
Frequency (MHz)				1720	1745	1770	
20	QPSK	1	0	23.50	23.41	23.51	
20	QPSK	1	49	23.28	23.37	23.30	24
20	QPSK	1	99	23.31	23.33	23.33	
20	QPSK	50	0	22.59	22.59	22.51	
20	QPSK	50	24	22.54	22.58	22.55	23
20	QPSK	50	50	22.57	22.56	22.53	
20	QPSK	100	0	22.51	22.53	22.48	
20	16QAM	1	0	22.85	22.92	22.92	
20	16QAM	1	49	22.81	22.90	22.84	23
20	16QAM	1	99	22.82	22.86	22.77	
20	16QAM	50	0	21.56	21.62	21.58	
20	16QAM	50	24	21.49	21.52	21.50	22
20	16QAM	50	50	21.66	21.69	21.69	
20	16QAM	100	0	21.56	21.60	21.54	
20	64QAM	1	0	21.52	21.52	21.50	
20	64QAM	1	49	21.52	21.56	21.52	22
20	64QAM	1	99	21.68	21.69	21.62	
20	64QAM	50	0	20.59	20.61	20.52	21
20	64QAM	50	24	20.63	20.63	20.61	

20	64QAM	50	50	20.64	20.69	20.62	
20	64QAM	100	0	20.60	20.60	20.52	
20	256QAM	1	0	18.51	18.50	18.46	
20	256QAM	1	49	18.52	18.55	18.49	19
20	256QAM	1	99	18.58	18.64	18.54	
20	256QAM	50	0	17.52	17.51	17.46	
20	256QAM	50	24	17.59	17.54	17.53	19
20	256QAM	50	50	17.63	17.59	17.52	
20	256QAM	100	0	17.59	17.51	17.43	
Channel				132047	132322	132597	Tune-up limit (dBm)
Frequency (MHz)				1717.5	1745	1772.5	
15	QPSK	1	0	23.48	23.35	23.50	
15	QPSK	1	37	23.21	23.31	23.30	24
15	QPSK	1	74	23.30	23.30	23.27	
15	QPSK	36	0	22.57	22.56	22.43	
15	QPSK	36	20	22.49	22.58	22.49	23
15	QPSK	36	39	22.51	22.61	22.58	
15	QPSK	75	0	22.44	22.49	22.42	
15	16QAM	1	0	22.82	22.89	22.82	
15	16QAM	1	37	22.75	22.90	22.78	23
15	16QAM	1	74	22.80	22.78	22.74	
15	16QAM	36	0	21.52	21.58	21.56	
15	16QAM	36	20	21.44	21.43	21.46	22
15	16QAM	36	39	21.63	21.61	21.65	
15	16QAM	75	0	21.52	21.58	21.45	
15	64QAM	1	0	21.51	21.52	21.43	
15	64QAM	1	37	21.44	21.54	21.49	22
15	64QAM	1	74	21.67	21.65	21.54	
15	64QAM	36	0	20.51	20.61	20.49	
15	64QAM	36	20	20.57	20.58	20.52	21
15	64QAM	36	39	20.61	20.64	20.57	
15	64QAM	75	0	20.60	20.57	20.49	
15	256QAM	1	0	18.51	18.45	18.50	
15	256QAM	1	37	18.45	18.47	18.49	19
15	256QAM	1	74	18.67	18.66	18.58	
15	256QAM	36	0	17.55	17.59	17.46	
15	256QAM	36	20	17.56	17.54	17.52	19
15	256QAM	36	39	17.57	17.68	17.58	
15	256QAM	75	0	17.52	17.52	17.50	
Channel				132022	132322	132622	Tune-up limit (dBm)
Frequency (MHz)				1715	1745	1775	
10	QPSK	1	0	23.40	23.33	23.50	
10	QPSK	1	25	23.23	23.37	23.22	24
10	QPSK	1	49	23.25	23.25	23.32	
10	QPSK	25	0	22.50	22.51	22.48	
10	QPSK	25	12	22.52	22.57	22.47	23
10	QPSK	25	25	22.52	22.62	22.61	
10	QPSK	50	0	22.51	22.50	22.44	
10	16QAM	1	0	22.85	22.91	22.84	
10	16QAM	1	25	22.76	22.88	22.82	23
10	16QAM	1	49	22.80	22.85	22.69	
10	16QAM	25	0	21.47	21.58	21.55	
10	16QAM	25	12	21.45	21.42	21.44	22
10	16QAM	25	25	21.60	21.69	21.66	
10	16QAM	50	0	21.52	21.50	21.51	
10	64QAM	1	0	21.49	21.44	21.48	22

10	64QAM	1	25	21.51	21.46	21.52	
10	64QAM	1	49	21.59	21.66	21.61	
10	64QAM	25	0	20.57	20.57	20.52	21
10	64QAM	25	12	20.62	20.61	20.53	
10	64QAM	25	25	20.55	20.65	20.56	
10	64QAM	50	0	20.60	20.57	20.52	
10	256QAM	1	0	18.43	18.51	18.43	19
10	256QAM	1	25	18.51	18.56	18.52	
10	256QAM	1	49	18.65	18.64	18.56	
10	256QAM	25	0	17.54	17.59	17.49	19
10	256QAM	25	12	17.58	17.57	17.60	
10	256QAM	25	25	17.58	17.66	17.62	
10	256QAM	50	0	17.57	17.58	17.43	
Channel				131997	132322	132647	Tune-up limit (dBm)
Frequency (MHz)				1712.5	1745	1777.5	
5	QPSK	1	0	23.40	23.38	23.42	24
5	QPSK	1	12	23.24	23.28	23.28	
5	QPSK	1	24	23.24	23.24	23.30	
5	QPSK	12	0	22.56	22.56	22.42	23
5	QPSK	12	7	22.47	22.49	22.49	
5	QPSK	12	13	22.53	22.65	22.60	
5	QPSK	25	0	22.46	22.48	22.42	
5	16QAM	1	0	22.81	22.82	22.91	23
5	16QAM	1	12	22.78	22.80	22.82	
5	16QAM	1	24	22.76	22.77	22.71	
5	16QAM	12	0	21.56	21.59	21.54	22
5	16QAM	12	7	21.48	21.42	21.41	
5	16QAM	12	13	21.61	21.62	21.64	
5	16QAM	25	0	21.56	21.58	21.50	
5	64QAM	1	0	21.45	21.48	21.47	22
5	64QAM	1	12	21.48	21.46	21.48	
5	64QAM	1	24	21.66	21.59	21.62	
5	64QAM	12	0	20.57	20.57	20.45	21
5	64QAM	12	7	20.62	20.55	20.55	
5	64QAM	12	13	20.57	20.68	20.53	
5	64QAM	25	0	20.52	20.60	20.52	
5	256QAM	1	0	18.44	18.46	18.43	19
5	256QAM	1	12	18.44	18.51	18.45	
5	256QAM	1	24	18.64	18.69	18.57	
5	256QAM	12	0	17.56	17.53	17.43	19
5	256QAM	12	7	17.55	17.54	17.61	
5	256QAM	12	13	17.60	17.61	17.62	
5	256QAM	25	0	17.57	17.60	17.42	
Channel				131987	132322	132657	Tune-up limit (dBm)
Frequency (MHz)				1711.5	1745	1778.5	
3	QPSK	1	0	23.49	23.34	23.41	24
3	QPSK	1	8	23.22	23.36	23.26	
3	QPSK	1	14	23.26	23.31	23.24	
3	QPSK	8	0	22.50	22.57	22.41	23
3	QPSK	8	4	22.49	22.51	22.49	
3	QPSK	8	7	22.53	22.57	22.54	
3	QPSK	15	0	22.45	22.49	22.40	
3	16QAM	1	0	22.80	22.88	22.86	23
3	16QAM	1	8	22.79	22.90	22.75	
3	16QAM	1	14	22.78	22.79	22.74	
3	16QAM	8	0	21.51	21.58	21.52	22

3	16QAM	8	4	21.49	21.46	21.44	
3	16QAM	8	7	21.63	21.65	21.69	
3	16QAM	15	0	21.52	21.53	21.48	
3	64QAM	1	0	21.46	21.52	21.49	
3	64QAM	1	8	21.44	21.51	21.46	22
3	64QAM	1	14	21.67	21.69	21.58	
3	64QAM	8	0	20.54	20.58	20.48	
3	64QAM	8	4	20.56	20.55	20.60	21
3	64QAM	8	7	20.60	20.62	20.60	
3	64QAM	15	0	20.53	20.52	20.44	
3	256QAM	1	0	18.50	18.46	18.40	
3	256QAM	1	8	18.47	18.46	18.44	19
3	256QAM	1	14	18.67	18.64	18.57	
3	256QAM	8	0	17.55	17.54	17.48	
3	256QAM	8	4	17.55	17.56	17.58	19
3	256QAM	8	7	17.57	17.60	17.52	
3	256QAM	15	0	17.50	17.56	17.43	
Channel				131979	132322	132665	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1745	1779.3	
1.4	QPSK	1	0	23.48	23.41	23.41	
1.4	QPSK	1	3	23.25	23.27	23.29	
1.4	QPSK	1	5	23.25	23.33	23.23	24
1.4	QPSK	3	0	23.47	23.31	23.45	
1.4	QPSK	3	1	23.22	23.30	23.25	
1.4	QPSK	3	3	23.31	23.27	23.24	
1.4	QPSK	6	0	22.44	22.44	22.39	23
1.4	16QAM	1	0	22.76	22.91	22.89	
1.4	16QAM	1	3	22.80	22.83	22.74	
1.4	16QAM	1	5	22.73	22.81	22.68	23
1.4	16QAM	3	0	22.81	22.85	22.85	
1.4	16QAM	3	1	22.78	22.85	22.74	
1.4	16QAM	3	3	22.82	22.83	22.74	
1.4	16QAM	6	0	21.51	21.50	21.50	22
1.4	64QAM	1	0	21.42	21.42	21.48	
1.4	64QAM	1	3	21.50	21.54	21.44	
1.4	64QAM	1	5	21.63	21.64	21.57	22
1.4	64QAM	3	0	21.51	21.44	21.45	
1.4	64QAM	3	1	21.51	21.54	21.44	
1.4	64QAM	3	3	21.59	21.65	21.59	
1.4	64QAM	6	0	20.53	20.51	20.43	21
1.4	256QAM	1	0	18.44	18.51	18.47	
1.4	256QAM	1	3	18.46	18.52	18.46	
1.4	256QAM	1	5	18.66	18.61	18.62	19
1.4	256QAM	3	0	18.46	18.46	18.46	
1.4	256QAM	3	1	18.47	18.52	18.44	
1.4	256QAM	3	3	18.60	18.60	18.56	
1.4	256QAM	6	0	17.60	17.50	17.52	19

<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.

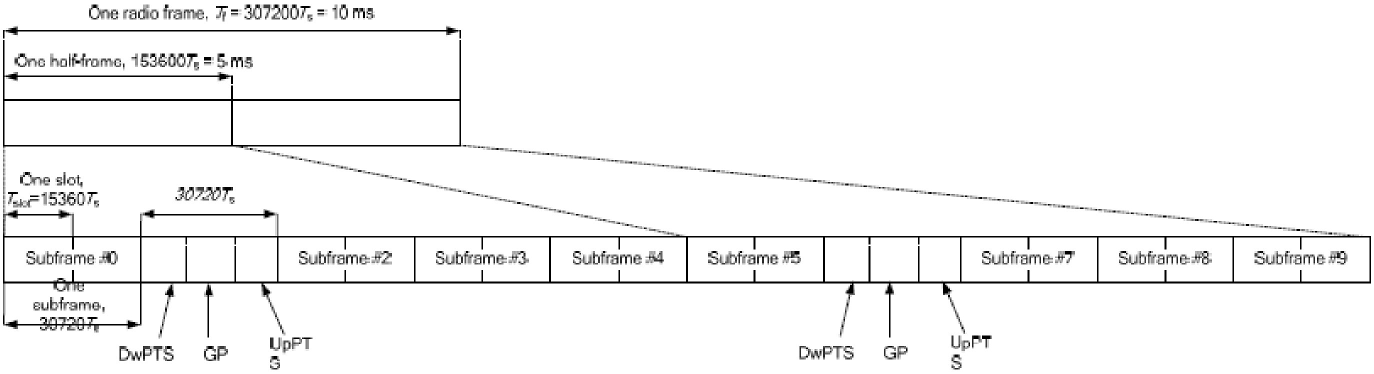


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

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	$6592 \cdot T_s$			$7680 \cdot T_s$		
1	$19760 \cdot T_s$			$20480 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
2	$21952 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$		
5	$6592 \cdot T_s$			$20480 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$12800 \cdot T_s$		
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:

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.

<LTE Band 48 Ant 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				55340	55830	56150	56640	
Frequency (MHz)				3560	3609	3641	3690	
20	QPSK	1	0	20.80	20.70	20.72	20.53	22
20	QPSK	1	49	20.55	20.52	20.44	20.37	
20	QPSK	1	99	20.49	20.48	20.37	20.43	
20	QPSK	50	0	19.93	19.67	19.56	19.71	21
20	QPSK	50	24	19.80	19.62	19.62	19.60	
20	QPSK	50	50	19.74	19.52	19.43	19.33	
20	QPSK	100	0	19.71	19.58	19.53	19.58	
20	16QAM	1	0	19.84	19.82	19.75	19.72	21
20	16QAM	1	49	19.74	19.53	19.45	19.53	
20	16QAM	1	99	19.62	19.62	19.51	19.31	
20	16QAM	50	0	18.93	18.72	18.63	18.56	20
20	16QAM	50	24	18.71	18.72	18.54	18.37	
20	16QAM	50	50	18.73	18.57	18.44	18.30	
20	16QAM	100	0	18.79	18.56	18.58	18.48	
20	64QAM	1	0	18.65	18.73	18.67	18.69	20
20	64QAM	1	49	18.47	18.56	18.51	18.50	
20	64QAM	1	99	18.42	18.48	18.43	18.40	
20	64QAM	50	0	17.60	17.66	17.64	17.66	19
20	64QAM	50	24	17.67	17.70	17.66	17.70	
20	64QAM	50	50	17.37	17.43	17.35	17.33	
20	64QAM	100	0	17.71	17.80	17.79	17.71	
20	256QAM	1	0	15.64	15.67	15.55	15.73	17
20	256QAM	1	49	15.46	15.49	15.41	15.47	
20	256QAM	1	99	15.39	15.47	15.41	15.45	
20	256QAM	50	0	15.57	15.66	15.50	15.60	17
20	256QAM	50	24	15.57	15.62	15.67	15.66	
20	256QAM	50	50	15.35	15.33	15.31	15.35	
20	256QAM	100	0	15.68	15.73	15.69	15.76	
Channel				55315	55820	56160	56665	Tune-up limit (dBm)
Frequency (MHz)				3557.5	3608	3642	3692.5	
15	QPSK	1	0	20.76	20.62	20.64	20.46	22
15	QPSK	1	37	20.52	20.42	20.43	20.29	
15	QPSK	1	74	20.41	20.38	20.37	20.37	
15	QPSK	36	0	19.86	19.59	19.49	19.65	21
15	QPSK	36	20	19.73	19.56	19.60	19.54	
15	QPSK	36	39	19.71	19.49	19.33	19.32	
15	QPSK	75	0	19.65	19.50	19.47	19.57	
15	16QAM	1	0	19.79	19.78	19.71	19.72	21
15	16QAM	1	37	19.69	19.51	19.39	19.49	
15	16QAM	1	74	19.60	19.60	19.51	19.30	
15	16QAM	36	0	18.85	18.72	18.57	18.48	20
15	16QAM	36	20	18.68	18.71	18.50	18.36	
15	16QAM	36	39	18.71	18.52	18.42	18.21	
15	16QAM	75	0	18.70	18.47	18.48	18.38	
15	64QAM	1	0	18.60	18.73	18.67	18.62	20
15	64QAM	1	37	18.43	18.54	18.44	18.40	
15	64QAM	1	74	18.33	18.40	18.35	18.38	
15	64QAM	36	0	17.58	17.58	17.61	17.59	19
15	64QAM	36	20	17.62	17.65	17.65	17.68	
15	64QAM	36	39	17.36	17.41	17.25	17.29	
15	64QAM	75	0	17.65	17.78	17.76	17.61	

15	256QAM	1	0	15.54	15.62	15.48	15.64	17
15	256QAM	1	37	15.41	15.44	15.41	15.41	
15	256QAM	1	74	15.33	15.38	15.31	15.39	
15	256QAM	36	0	15.55	15.58	15.42	15.53	17
15	256QAM	36	20	15.52	15.52	15.59	15.61	
15	256QAM	36	39	15.26	15.29	15.23	15.29	
15	256QAM	75	0	15.64	15.73	15.67	15.76	
Channel				55290	55815	56165	56690	Tune-up limit (dBm)
Frequency (MHz)				3555	3607.5	3642.5	3695	
10	QPSK	1	0	20.75	20.69	20.69	20.43	22
10	QPSK	1	25	20.47	20.50	20.44	20.29	
10	QPSK	1	49	20.41	20.42	20.30	20.41	
10	QPSK	25	0	19.89	19.57	19.49	19.70	21
10	QPSK	25	12	19.73	19.56	19.61	19.60	
10	QPSK	25	25	19.68	19.52	19.36	19.28	
10	QPSK	50	0	19.64	19.55	19.50	19.57	
10	16QAM	1	0	19.81	19.73	19.71	19.67	21
10	16QAM	1	25	19.72	19.53	19.40	19.48	
10	16QAM	1	49	19.59	19.58	19.51	19.26	
10	16QAM	25	0	18.89	18.62	18.57	18.54	20
10	16QAM	25	12	18.62	18.67	18.48	18.28	
10	16QAM	25	25	18.70	18.54	18.40	18.29	
10	16QAM	50	0	18.77	18.56	18.55	18.40	
10	64QAM	1	0	18.60	18.71	18.65	18.59	20
10	64QAM	1	25	18.41	18.49	18.49	18.41	
10	64QAM	1	49	18.34	18.38	18.38	18.30	
10	64QAM	25	0	17.59	17.56	17.57	17.61	19
10	64QAM	25	12	17.60	17.65	17.60	17.67	
10	64QAM	25	25	17.35	17.34	17.25	17.25	
10	64QAM	50	0	17.61	17.74	17.73	17.62	
10	256QAM	1	0	15.57	15.60	15.48	15.68	17
10	256QAM	1	25	15.42	15.48	15.41	15.46	
10	256QAM	1	49	15.37	15.44	15.41	15.40	
10	256QAM	25	0	15.49	15.61	15.42	15.52	17
10	256QAM	25	12	15.54	15.59	15.62	15.57	
10	256QAM	25	25	15.25	15.26	15.26	15.26	
10	256QAM	50	0	15.60	15.68	15.61	15.70	
Channel				55265	55810	56170	56715	Tune-up limit (dBm)
Frequency (MHz)				3552.5	3607	3643	3697.5	
5	QPSK	1	0	20.71	20.70	20.65	20.43	22
5	QPSK	1	12	20.52	20.47	20.35	20.30	
5	QPSK	1	24	20.43	20.41	20.34	20.34	
5	QPSK	12	0	19.83	19.67	19.48	19.69	21
5	QPSK	12	7	19.75	19.55	19.59	19.56	
5	QPSK	12	13	19.64	19.51	19.38	19.27	
5	QPSK	25	0	19.70	19.53	19.45	19.57	
5	16QAM	1	0	19.84	19.82	19.69	19.67	21
5	16QAM	1	12	19.73	19.43	19.41	19.44	
5	16QAM	1	24	19.57	19.58	19.47	19.28	
5	16QAM	12	0	18.88	18.64	18.54	18.46	20
5	16QAM	12	7	18.70	18.68	18.51	18.29	
5	16QAM	12	13	18.71	18.57	18.35	18.29	
5	16QAM	25	0	18.78	18.50	18.53	18.48	
5	64QAM	1	0	18.63	18.66	18.62	18.60	20
5	64QAM	1	12	18.42	18.46	18.51	18.40	
5	64QAM	1	24	18.34	18.47	18.37	18.35	

5	64QAM	12	0	17.52	17.59	17.60	17.61	19
5	64QAM	12	7	17.61	17.67	17.64	17.68	
5	64QAM	12	13	17.34	17.38	17.31	17.23	
5	64QAM	25	0	17.66	17.71	17.75	17.69	
5	256QAM	1	0	15.56	15.62	15.52	15.63	17
5	256QAM	1	12	15.39	15.39	15.37	15.37	
5	256QAM	1	24	15.30	15.45	15.41	15.37	
5	256QAM	12	0	15.57	15.64	15.43	15.60	17
5	256QAM	12	7	15.53	15.52	15.65	15.56	
5	256QAM	12	13	15.25	15.23	15.30	15.35	
5	256QAM	25	0	15.64	15.69	15.59	15.70	

<LTE Carrier Aggregation combinations>

General Note:

1. This device supports Carrier Aggregation on downlink only for inter and intra band. For the device supports combination bands and configurations are according to 3GPP.
2. In applying the existing power measurement procedure of KDB 941225 D05A for DL CA SAR test exclusion, only the subset with the largest number of combinations of the frequency band and CCs in each row need consideration, and that configurations require power measurement should be highlighted in the below table.

2CC Downlink Carrier Aggregation			3CC Downlink Carrier Aggregation		
Number	Combination	Covered by Measurement Superset	Number	Combination	Covered by Measurement Superset
1	12A-12A	3CC-87	69	12A-30A-66A	4CC-191
2	12A-25A		70	12A-66A-66A	4CC-192
3	12A-30A	3CC-69	71	12A-66C	4CC-210
4	12A-66A	3CC-70	72	12B-66A	4CC-192
5	12B	3CC-72	73	13A-48A-48A	4CC-194
6	13A-48A	3CC-73	74	13A-48A-66A	4CC-196
7	13A-66A	3CC-76	75	13A-48C	4CC-197
8	14A-30A	3CC-79	76	13A-66A-66A	4CC-199
9	14A-66A	3CC-80	77	13A-66B	4CC-195
10	25A-25A	3CC-81	78	13A-66C	4CC-196
11	25A-26A	3CC-82	79	14A-30A-66A	4CC-203
12	25A-41A	3CC-83	80	14A-66A-66A	4CC-204
13	26A-41A	3CC-86	81	25A-25A-25A	
14	2A-12A	3CC-87	82	25A-25A-26A	
15	2A-13A	3CC-91	83	25A-25A-41A	
16	2A-14A	3CC-93	84	25A-26A-41A	
17	2A-2A	3CC-95	85	25A-41C	4CC-205
18	2A-30A	3CC-98	86	26A-41C	4CC-206
19	2A-48A	3CC-105	87	2A-12A-12A	4CC-219
20	2A-4A	3CC-108	88	2A-12A-30A	4CC-220
21	2A-5A	3CC-115	89	2A-12A-66A	4CC-210
22	2A-66A	3CC-120	90	2A-12B	4CC-222
24	2A-7A	3CC-126	91	2A-13A-48A	4CC-211
25	2C	3CC-128	92	2A-13A-66A	4CC-214
26	30A-66A	3CC-132	93	2A-14A-30A	4CC-217
27	38A-40A	3CC-133	94	2A-14A-66A	4CC-218
28	38C		95	2A-2A-12A	4CC-219
29	41A-41A	3CC-134	96	2A-2A-13A	4CC-223
30	41A-42A	3CC-137	97	2A-2A-14A	4CC-224
31	41A-48A		98	2A-2A-30A	4CC-226
32	41C	5CC-380	99	2A-2A-4A	4CC-228
33	42A-42A	3CC-136	100	2A-2A-5A	4CC-231
34	42C	5CC-379	101	2A-2A-66A	4CC-234
35	48A-48A	3CC-142	103	2A-2A-7A	4CC-238
36	48A-66A	3CC-142	104	2A-30A-66A	4CC-226
38	48C	3CC-107	105	2A-48A-48A	4CC-240
39	4A-12A	3CC-108	106	2A-48A-66A	4CC-240
40	4A-13A	3CC-109	107	2A-48C	4CC-242
41	4A-30A	3CC-110	108	2A-4A-12A	4CC-244
42	4A-48A		109	2A-4A-13A	
43	4A-4A	3CC-111	110	2A-4A-30A	4CC-249
44	4A-5A	3CC-112	111	2A-4A-4A	4CC-247
46	4A-7A	3CC-114	112	2A-4A-5A	4CC-249
47	5A-25A		114	2A-4A-7A	4CC-251

48	5A-30A	3CC-115	115	2A-5A-30A	4CC-254
49	5A-38A		116	2A-5A-48A	4CC-255
50	5A-40A	3CC-166	117	2A-5A-66A	4CC-256
51	5A-41A		118	2A-5A-7A	
52	5A-48A	3CC-116	119	2A-5B	4CC-233
53	5A-5A	3CC-169	120	2A-66A-66A	4CC-234
54	5A-66A	3CC-170	122	2A-66B	4CC-236
55	5A-7A	3CC-173	123	2A-66C	4CC-237
56	5B	3CC-119	124	2A-7A-12A	4CC-251
57	66A-66A	3CC-132	125	2A-7A-66A	4CC-238
59	66B	3CC-145	126	2A-7A-7A	4CC-252
60	66C	3CC-146	127	2A-7C	4CC-253
61	7A-12A	3CC-124	128	2C-12A	4CC-272
62	7A-42A		129	2C-30A	4CC-261
63	7A-66A	3CC-125	130	2C-5A	4CC-273
64	7A-7A	3CC-126	131	2C-66A	4CC-274
65	7B		132	30A-66A-66A	4CC-239
66	7C	3CC-127	133	41A-41A-41A	4CC-275
67	4A-17A		134	41A-41C	4CC-275
68	2A-17A		135	41A-42A-42A	4CC-277
			136	41A-42C	4CC-277
			137	41C-42A	4CC-280
			138	41D	4CC-276
			139	42A-42C	4CC-277
			140	42D	4CC-278
			141	48A-48A-66A	4CC-286
			143	48A-48C	4CC-289
			144	48A-66A-66A	4CC-286
			145	48A-66B	4CC-287
			146	48A-66C	4CC-288
			147	48C-66A	4CC-289
			149	48D	4CC-290
			150	4A-12A-12A	4CC-299
			151	4A-12A-30A	4CC-300
			152	4A-12B	4CC-301
			153	4A-48C	
			154	4A-4A-12A	4CC-299
			155	4A-4A-13A	
			156	4A-4A-30A	4CC-300
			157	4A-4A-5A	4CC-303
			159	4A-4A-7A	
			160	4A-5A-30A	4CC-302
			161	4A-5B	4CC-303
			162	4A-7A-12A	4CC-251
			163	4A-7A-7A	4CC-252
			164	4A-7C	4CC-253
			165	5A-30A-66A	4CC-305
			166	5A-48A-48A	4CC-306
			167	5A-48A-66A	4CC-306
			168	5A-48C	4CC-308
			169	5A-5A-66A	4CC-310
			170	5A-66A-66A	4CC-310
			171	5A-66B	4CC-311
			172	5A-66C	4CC-312
			173	5A-7A-7A	
			174	5A-7C	

			175	5B-30A	4CC-316
			176	5B-66A	4CC-317
			177	66A-66A-66A	4CC-263
			179	66A-66B	4CC-313
			180	66A-66C	4CC-314
			182	66D	4CC-268
			183	7A-12A-66A	4CC-269
			184	7A-12B	4CC-320
			185	7A-66A-66A	4CC-326
			186	7C-66A	4CC-321
			187	2A-48A-66A	4CC-325
			188	48A-66B	4CC-195
			189	7A-7A-66A	4CC-326
			190	7A-7A-13A	4CC-328

4CC Downlink Carrier Aggregation			5CC Downlink Carrier Aggregation		
Number	Combination	Covered by Measurement Superset	Covered by Measurement Superset	Combination	Covered by Measurement Superset
191	12A-30A-66A-66A	5CC-338	329	13A-48A-48C-66A	
192	12B-66A-66A	5CC-402	330	13A-48A-48D	
193	13A-48A-48A-66A	5CC-339	331	13A-48C-48C	
194	13A-48A-48C	5CC-329	332	13A-48C-66B	
195	13A-48A-66B		333	13A-48C-66C	
196	13A-48A-66C		334	13A-48D-66A	
197	13A-48C-66A	5CC-341	335	13A-48E	5CC-407
198	13A-48D	5CC-334	336	25A-25A-41D	
199	13A-66A-66A-66A		337	25A-41E	
200	13A-66A-66B	5CC-343	338	2A-12A-30A-66A-66A	
201	13A-66A-66C	5CC-344	339	2A-13A-48A-48A-66A	
202	13A-66D	5CC-345	340	2A-13A-48A-48C	
203	14A-30A-66A-66A	5CC-346	341	2A-13A-48C-66A	
204	14A-66A-66A-66A	5CC-347	342	2A-13A-48D	
205	25A-25A-41C		343	2A-13A-66A-66B	
206	25A-26A-41C		344	2A-13A-66A-66C	
207	25A-41D	5CC-336	345	2A-13A-66D	
208	2A-12A-30A-66A	5CC-338	346	2A-14A-30A-66A-66A	
209	2A-12A-66A-66A	5CC-349	347	2A-14A-66A-66A-66A	
210	2A-12A-66C		348	2A-2A-12A-30A-66A	
211	2A-13A-48A-48A	5CC-339	349	2A-2A-12A-66A-66A	
212	2A-13A-48A-66A	5CC-339	350	2A-2A-12B-66A	
213	2A-13A-48C	5CC-341	351	2A-2A-13A-66A-66A	
214	2A-13A-66A-66A	5CC-351	352	2A-2A-13A-66B	
215	2A-13A-66B	5CC-352	353	2A-2A-14A-30A-66A	
216	2A-13A-66C	5CC-344	354	2A-2A-14A-66A-66A	
217	2A-14A-30A-66A	5CC-346	355	2A-2A-5A-30A-66A	
218	2A-14A-66A-66A	5CC-347	356	2A-2A-5A-66A-66A	
219	2A-2A-12A-12A		357	2A-2A-5A-66B	
220	2A-2A-12A-30A	5CC-348	358	2A-2A-5A-66C	
221	2A-2A-12A-66A	5CC-349	359	2A-2A-5B-66A	
222	2A-2A-12B	5CC-350	360	2A-2A-66A-66B	
223	2A-2A-13A-66A	5CC-351	361	2A-2A-66A-66C	
224	2A-2A-14A-30A	5CC-353	362	2A-2A-7A-12A-66A	
225	2A-2A-14A-66A	5CC-354	363	2A-48A-48C-66A	
226	2A-2A-30A-66A	5CC-355	364	2A-48A-48D	
227	2A-2A-4A-12A		365	2A-48C-48C	
228	2A-2A-4A-4A		366	2A-48D-66A	

229	2A-2A-4A-5A		367	2A-48E	5CC-405
231	2A-2A-5A-30A	5CC-355	368	2A-4A-5B-30A	
232	2A-2A-5A-66A	5CC-356	369	2A-5A-30A-66A-66A	
233	2A-2A-5B	5CC-359	370	2A-5A-48A-48A-66A	
234	2A-2A-66A-66A		371	2A-5A-48A-48C	
236	2A-2A-66B	5CC-360	372	2A-5A-48C-66A	
237	2A-2A-66C	5CC-361	373	2A-5A-48D	
238	2A-2A-7A-66A	5CC-362	374	2A-5B-30A-66A	
239	2A-30A-66A-66A	5CC-338	375	2A-5B-66A-66A	
240	2A-48A-48A-66A	5CC-370	376	2A-5B-66B	
241	2A-48A-48C	5CC-363	377	2A-5B-66C	
242	2A-48C-66A	5CC-363	378	2A-7A-12B-66A	
243	2A-48D	5CC-366	379	2C-5B-30A	
244	2A-4A-12A-12A		380	41A-42C-42C	
245	2A-4A-12A-30A		381	41C-41D	
246	2A-4A-12B		382	41C-42A-42C	
247	2A-4A-4A-12A		383	41D-42C	
248	2A-4A-4A-5A		384	48A-48C-66B	
249	2A-4A-5A-30A		385	48A-48C-66C	
250	2A-4A-5B	5CC-368	386	48A-48D-66A	
251	2A-4A-7A-12A		387	48C-48C-66A	
252	2A-4A-7A-7A		388	48C-48D	
253	2A-4A-7C		389	48C-66A-66A-66A	
254	2A-5A-30A-66A	5CC-369	390	48E-66A	
255	2A-5A-48A-48A	5CC-370	391	48F	
256	2A-5A-48A-66A	5CC-370	392	4A-48E	
257	2A-5A-48C	5CC-372	393	4A-4A-5B-30A	
258	2A-5A-66A-66A	5CC-356	394	5A-48A-48C-66A	
259	2A-5A-66B	5CC-357	395	5A-48C-48C	
260	2A-5A-66C	5CC-358	396	5A-48E	
261	2A-5B-30A	5CC-374	397	5B-30A-66A-66A	
262	2A-5B-66A	5CC-375	398	5B-66A-66B	
263	2A-66A-66A-66A	5CC-347	399	5B-66A-66C	
265	2A-66A-66B	5CC-360	400	5A-48A-48D	
266	2A-66A-66C	5CC-361	401	5A-48D-66A	
268	2A-66D	5CC-345	402	2A-12B-66A-66A	
269	2A-7A-12A-66A	5CC-362	403	2A-7C-66A-66A	
270	2A-7A-12B	5CC-378	404	2A-7A-7A-66A-66A	
271	2A-7A-66A-66A	5CC-404			
272	2C-12A-30A				
273	2C-5A-30A		6CC Downlink Carrier Aggregation		
274	2C-66A-66A		Number	Combination	Covered by
275	41A-41A-41C				Covered by
276	41A-41D		405	2A-48E-66A	
277	41A-42A-42C		406	41C-42C-42C	
278	41A-42D		407	13A-48E-66A	
279	41C-41C				
280	41C-42C	5CC-382			
281	41D-42A				
282	41E	5CC-337			
283	42A-42D				
284	42C-42C	5CC-380			
285	42E				
286	48A-48A-66A-66A				
287	48A-48A-66B				
288	48A-48A-66C				

289	48A-48C-66A	5CC-394			
290	48A-48D	5CC-400			
291	48A-66A-66A-66A				
292	48C-48C	5CC-395			
293	48C-66A-66A				
294	48C-66B	5CC-384			
295	48C-66C	5CC-385			
296	48D-66A	5CC-401			
297	48E	5CC-396			
298	4A-48D				
299	4A-4A-12A-12A				
300	4A-4A-12A-30A				
301	4A-4A-12B				
302	4A-4A-5A-30A				
303	4A-4A-5B	5CC-393			
304	4A-5B-30A	5CC-393			
305	5A-30A-66A-66A	5CC-369			
306	5A-48A-48A-66A	5CC-370			
307	5A-48A-48C	5CC-371			
308	5A-48C-66A	5CC-372			
309	5A-48D	5CC-373			
310	5A-5A-66A-66A				
311	5A-5A-66B				
312	5A-5A-66C				
313	5A-66A-66B				
314	5A-66A-66C				
315	5A-66D				
316	5B-30A-66A	5CC-397			
317	5B-66A-66A	5CC-397			
318	5B-66B	5CC-376			
319	5B-66C	5CC-377			
320	7A-12B-66A	5CC-378			
321	7C-66A-66A	5CC-403			
322	2A-12B-66A	5CC-350			
323	2A-7A-7A-66A	5CC-404			
324	2A-7C-66A	5CC-403			
325	2A-48A-66A-66A				
326	7A-7A-66A-66A	5CC-404			
327	2A-2A-7A-12A	5CC-362			
328	2A-7A-7A-13A				

<Power verification when LTE Carrier Aggregation Active>

General Note:

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

vi. 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.

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

<Two Carrier power verification>

Configure		PCC							SCC				Power	
		LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
Inter-Band		2	20	1860	18700	QPSK	1	0	17	10	740	5790	22.51	23.13
		4	20	1745	20300	QPSK	1	0	17	10	740	5790	22.57	23.24
		4	20	1745	20300	QPSK	1	0	48	20	3609	55830	22.64	23.24
		5	10	829	20450	QPSK	1	0	25	20	1960	8340	22.81	23.35
		5	10	829	20450	QPSK	1	0	38	20	2595	38000	22.82	23.35
		5	10	829	20450	QPSK	1	0	41	20	2593	40620	22.84	23.35
		7	20	2560	21350	QPSK	1	0	42	20	3575	43340	22.55	23.09
		12	10	711	23130	QPSK	1	0	25	20	1960	8340	22.48	22.95
		41	20	2636.5	41055	QPSK	1	0	48	20	3609	55830	22.74	23.25
Intra-Band	Contiguous	7	15	2562.5	21375	QPSK	1	0	7	5	2691.80	3468	22.49	23.03
		38	20	2610	38150	QPSK	1	0	38	20	2629.80	38348	22.59	23.17

<Three Carrier power verification>

Configure	PCC							SCC1				SCC2				Power	
	LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
Inter-Band	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	13	10	751	5230	22.50	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	7	20	2655	3100	22.55	23.13
	4	20	1732.5	20175	QPSK	1	0	4	5	2112.5	1975	7	20	2655	3100	22.59	23.17
	4	20	1732.5	20175	QPSK	1	0	4	5	2112.5	1975	13	10	751	5230	22.58	23.17
	4	20	1732.5	20175	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	22.64	23.17
	5	10	829	20450	QPSK	1	0	7	20	2655	3100	7	5	2622.5	2775	22.82	23.35
	5	10	829	20450	QPSK	1	0	7	20	2655	3100	7	20	2674.8	3298	22.79	23.35
	25	20	1860	26140	QPSK	1	0	25	5	1992.5	8665	25	20	1985	8590	22.43	22.94
	25	20	1860	26140	QPSK	1	0	25	5	1992.5	8665	26	15	876.5	8865	22.39	22.94
	25	20	1860	26140	QPSK	1	0	25	5	1992.5	8665	41	20	2593	40620	22.47	22.94
	25	20	1860	26140	QPSK	1	0	26	15	876.5	8865	41	20	2593	40620	22.47	22.94

<Four Carrier power verification>

Configure	PCC							SCC1				SCC2				SCC3				Power	
	LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	4	20	2132.5	2175	12	10	737.5	5095	22.52	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	4	20	2132.5	2175	4	5	2112.5	1975	22.54	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	4	20	2132.5	2175	5	10	881.5	2525	22.49	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	12	5	737.5	5095	12	5	731.5	5035	22.50	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	66	20	2155	66886	66	5	2112.5	66461	22.47	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	4	5	2112.5	1975	5	10	881.5	2525	22.54	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	4	5	2112.5	1975	12	10	737.5	5095	22.50	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	5	10	881.5	2525	30	10	9820	2355	22.53	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	7	20	2655	3100	7	5	2622.5	2775	22.49	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	7	20	2655	3100	12	10	737.5	5095	22.51	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	7	20	2655	3100	7	20	2674.8	3298	22.54	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	12	5	737.5	5095	12	5	731.5	5035	22.51	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	12	10	737.5	5095	30	10	9820	2355	22.52	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	12	5	737.5	5095	12	10	744.7	5167	22.49	23.13
	2	20	1860	18700	QPSK	1	0	12	10	737.5	5095	66	20	2155	66886	66	20	2174.8	67084	22.46	23.13
	2	20	1860	18700	QPSK	1	0	7	20	2655	3100	7	5	2622.5	2775	13	10	751	5230	22.45	23.13
	2	20	1860	18700	QPSK	1	0	48	20	3697.5	56715	66	20	2155	66886	66	5	2112.5	66461	22.48	23.13
	2	20	1860	18700	QPSK	1	0	2	20	1959.8	898	5	10	881.5	2525	30	10	9820	2355	22.46	23.13
	2	20	1860	18700	QPSK	1	0	2	20	1959.8	898	12	10	737.5	5095	30	10	9820	2355	22.46	23.13
	2	20	1860	18700	QPSK	1	0	2	20	1959.8	898	66	20	2155	66886	66	5	2112.5	66461	22.50	23.13
	4	20	1732.5	20175	QPSK	1	0	4	5	2112.5	1975	5	10	881.5	2525	30	10	9820	2355	22.57	23.17
	4	20	1732.5	20175	QPSK	1	0	4	5	2112.5	1975	12	5	737.5	5095	12	5	731.5	5035	22.58	23.17
	4	20	1732.5	20175	QPSK	1	0	4	5	2112.5	1975	12	10	737.5	5095	30	10	9820	2355	22.65	23.17
	4	20	1732.5	20175	QPSK	1	0	4	5	2112.5	1975	12	5	737.5	5095	12	10	744.7	5167	22.59	23.17
Inter-Band	4	20	1732.5	20175	QPSK	1	0	48	20	3697.5	56715	48	20	3717.3	56913	48	20	3737.1	57111	22.61	23.17
	5	10	829	20450	QPSK	1	0	5	5	891.5	2625	66	20	2155	66886	66	5	2112.5	66461	22.81	23.35
	5	10	829	20450	QPSK	1	0	5	5	891.5	2625	66	15	2155	66886	66	5	2164.3	66979	22.82	23.35
	5	10	829	20450	QPSK	1	0	5	5	891.5	2625	66	20	2155	66886	66	20	2174.8	67084	22.85	23.35
	5	10	829	20450	QPSK	1	0	66	20	2155	66886	66	5	2112.5	66461	66	15	2121.8	66554	22.82	23.35
	5	10	829	20450	QPSK	1	0	66	20	2155	66886	66	5	2112.5	66461	66	20	2124.2	66578	22.84	23.35
	5	10	829	20450	QPSK	1	0	66	20	2155	66886	66	20	2174.8	67084	66	20	2194.6	67282	22.82	23.35
	13	10	782	23230	QPSK	1	0	48	20	3697.5	56715	66	15	2155	66886	66	5	2164.3	66979	22.61	23.01
	13	10	782	23230	QPSK	1	0	48	20	3697.5	56715	66	20	2155	66886	66	20	2174.8	67084	22.66	23.01
	13	10	782	23230	QPSK	1	0	66	20	2155	66886	66	5	2112.5	66461	66	20	2190	67236	22.65	23.01
	25	20	1860	26140	QPSK	1	0	25	5	1992.5	8665	41	20	2593	40620	41	20	2612.8	40818	22.48	22.94
	25	20	1860	26140	QPSK	1	0	26	15	1960	8340	41	20	2593	40620	41	20	2612.8	40818	22.42	22.94
	41	20	2593	40620	QPSK	1	0	41	5	2687.5	41565	41	20	2506	39750	41	20	2525.8	39948	22.68	23.13
	41	20	2593	40620	QPSK	1	0	41	5	2687.5	41565	41	20	2699.2	41682	41	20	2719	41880	22.73	23.13
	41	20	2593	40620	QPSK	1	0	42	20	3575	43340	42	5	3552.5	43115	42	20	3564.2	43232	22.67	23.13
	41	20	2593	40620	QPSK	1	0	42	20	3575	43340	42	20	3594.8	43538	42	20	3614.6	43736	22.73	23.13
	41	20	2593	40620	QPSK	1	0	41	20	2612.8	40818	41	5	2687.5	41565	41	20	2699.2	41682	22.68	23.13
	41	20	2593	40620	QPSK	1	0	41	20	2612.8	40818	41	20	2632.6	41016	42	20	3575	43340	22.70	23.13
	42	20	3590	43490	QPSK	1	0	42	5	3552.5	43115	42	20	3564.2	43232	42	20	3584	43430	22.87	23.26
	42	20	3590	43490	QPSK	1	0	42	20	3570.2	43292	42	20	3550.4	43094	42	20	3530.6	42896	22.90	23.26
	48	20	3609	55830	QPSK	1	0	48	5	3697.5	56715	66	20	2155	66886	66	5	2112.5	66461	20.36	20.70
	48	20	3609	55830	QPSK	1	0	48	5	3697.5	56715	66	15	2155	66886	66	5	2164.3	66979	20.40	20.70
	48	20	3609	55830	QPSK	1	0	48	5	3697.5	56715	66	20	2155	66886	66	20	2174.8	67084	20.39	20.70
	48	20	3609	55830	QPSK	1	0	66	20	2155	66886	66	5	2112.5	66461	66	20	2190	67236	20.43	20.70
	48	20	3609	55830	QPSK	1	0	48	20	3628.8	56028	66	20	2155	66886	66	5	2112.5	66461	20.39	20.70

<Five Carrier power verification>

Configure	PCC							SCC1				SCC2				SCC3				SCC4				Power	
	LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
Inter-Band	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	12	10	737.5	5095	30	10	2355	9820	66	20	2155	66886	22.51	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	12	10	737.5	5095	66	20	2155	66886	66	5	2112.5	66461	22.52	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	12	5	737.5	5095	12	10	744.7	5167	66	20	2155	66886	22.52	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	13	10	751	5230	66	20	2155	66886	66	5	2112.5	66461	22.48	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	13	10	751	5230	66	15	2155	66886	66	5	2164.3	66979	22.53	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	14	10	763	5330	30	10	2355	9820	66	20	2155	66886	22.46	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	14	10	763	5330	66	20	2155	66886	66	5	2112.5	66461	22.51	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	5	10	881.5	2525	30	10	2355	9820	66	20	2155	66886	22.46	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	5	10	881.5	2525	66	20	2155	66886	66	5	2112.5	66461	22.47	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	5	10	881.5	2525	66	15	2155	66886	66	5	2164.3	66979	22.54	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	5	10	881.5	2525	66	20	2155	66886	66	20	2174.8	67084	22.51	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	5	10	881.5	2525	5	10	891.4	2624	66	20	2155	66886	22.51	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	66	20	2155	66886	66	5	2112.5	66461	66	15	2121.8	66554	22.51	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	66	20	2155	66886	66	5	2112.5	66461	66	20	2124.2	66578	22.52	23.13
	2	20	1860	18700	QPSK	1	0	2	5	1987.5	1175	7	20	2655	3100	12	10	737.5	5095	66	20	2155	66886	22.52	23.13
	2	20	1860	18700	QPSK	1	0	2	20	1959.8	898	5	10	881.5	2525	5	10	891.4	2624	30	10	2355	9820	22.51	23.13
	2	20	1860	18700	QPSK	1	0	4	20	2132.5	2175	5	10	881.5	2525	5	10	891.4	2624	30	10	2355	9820	22.46	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	30	10	2355	9820	66	20	2155	66886	66	5	2112.5	66461	22.50	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	48	20	3609	55830	48	5	3697.5	56715	66	20	2155	66886	22.54	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	48	20	3609	55830	48	5	3697.5	56715	48	20	3709.2	56832	22.49	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	48	20	3609	55830	48	20	3628.8	56028	66	20	2155	66886	22.55	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	22.51	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	5	10	891.4	2624	30	10	2355	9820	66	20	2155	66886	22.46	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	5	10	891.4	2624	66	20	2155	66886	66	5	2112.5	66461	22.48	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	5	10	891.4	2624	66	15	2155	66886	66	5	2164.3	66979	22.48	23.13
	2	20	1860	18700	QPSK	1	0	5	10	881.5	2525	5	10	891.4	2624	66	20	2155	66886	66	20	2174.8	67084	22.55	23.13
	2	20	1860	18700	QPSK	1	0	7	20	2655	3100	12	5	737.5	5095	12	10	744.7	5167	66	20	2155	66886	22.46	23.13
	2	20	1860	18700	QPSK	1	0	7	20	2655	3100	7	20	2674.8	3298	66	20	2155	66886	66	5	2112.5	66461	22.55	23.13
	2	20	1860	18700	QPSK	1	0	7	20	2655	3100	7	5	2622.5	2775	66	20	2155	66886	66	5	2112.5	66461	22.55	23.13
	2	20	1860	18700	QPSK	1	0	12	5	737.5	5095	12	10	744.7	5167	66	20	2155	66886	66	5	2112.5	66461	22.55	23.13
	2	20	1860	18700	QPSK	1	0	12	10	737.5	5095	30	10	2355	9820	66	20	2155	66886	66	5	2112.5	66461	22.53	23.13
	2	20	1860	18700	QPSK	1	0	13	10	751	5230	48	20	3609	55830	48	5	3697.5	56715	66	20	2155	66886	22.45	23.13
	2	20	1860	18700	QPSK	1	0	13	10	751	5230	48	20	3609	55830	48	5	3697.5	56715	48	20	3709.2	56832	22.51	23.13
	2	20	1860	18700	QPSK	1	0	13	10	751	5230	48	20	3609	55830	48	20	3628.8	56028	66	20	2155	66886	22.52	23.13
	2	20	1860	18700	QPSK	1	0	13	10	751	5230	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	22.49	23.13
	2	20	1860	18700	QPSK	1	0	13	10	751	5230	66	20	2155	66886	66	5	2112.5	66461	66	15	2121.8	66554	22.45	23.13
	2	20	1860	18700	QPSK	1	0	13	10	751	5230	66	20	2155	66886	66	5	2112.5	66461	66	20	2124.2	66578	22.45	23.13
	2	20	1860	18700	QPSK	1	0	13	10	751	5230	66	20	2155	66886	66	20	2174.8	67084	66	20	2194.6	67282	22.47	23.13
	2	20	1860	18700	QPSK	1	0	14	10	763	5330	30	10	2355	9820	66	20	2155	66886	66	5	2112.5	66461	22.55	23.13
	2	20	1860	18700	QPSK	1	0	14	10	763	5330	66	20	2155	66886	66	5	2112.5	66461	66	20	2190	67236	22.46	23.13
	2	20	1860	18700	QPSK	1	0	48	20	3609	55830	48	5	3697.5	56715	48	20	3709.2	56832	66	20	2155	66886	22.53	23.13
	2	20	1860	18700	QPSK	1	0	48	20	3609	55830	48	5	3697.5	56715	48	20	3709.2	56832	48	20	3729	57030	22.50	23.13
	2	20	1860	18700	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	5	3697.5	56715	48	20	3709.2	56832	22.53	23.13
	2	20	1860	18700	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	66	20	2155	66886	22.53	23.13
	4	20	1732.5	20175	QPSK	1	0	4	5	2112.5	1975	5	10	881.5	2525	5	10	891.4	2624	30	10	2355	9820	22.57	23.17
	4	20	1732.5	20175	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	48	20	3668.4	56424	22.59	23.17
	5	10	829	20450	QPSK	1	0	5	10	883.9	2549	66	20	2155	66886	66	5	2112.5	66461	66	15	2121.8	66554	22.88	23.35
	5	10	829	20450	QPSK	1	0	5	10	883.9	2549	66	20	2155	66886	66	5	2112.5	66461	66	20	2124.2	66578	22.81	23.35
	5	10	829	20450	QPSK	1	0	5	10	883.9	2549	30	10	2355	9820	66	20	2155	66886	66	5	2112.5	66461	22.83	23.35
	5	10	829	20450	QPSK	1	0	48	20	3609	55830	48	5	3697.5	56715	48	20	3709.2	56832	66	20	2155	66886	22.84	23.35
	5	10	829	20450	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	5	3697.5	56715	48	20	3709.2	56832	22.80	23.35
	5	10	829	20450	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	48	20	3668.4	56424	22.78	23.35

	5	10	829	20450	QPSK	1	0	48	20	3609	55830	48	5	3697.5	56715	48	20	3709.2	56832	48	20	3729	57030	22.81	23.35
	5	10	829	20450	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	66	20	2155	66886	22.78	23.35
	13	10	782	23230	QPSK	1	0	48	20	3609	55830	48	5	3697.5	56715	48	20	3709.2	56832	66	20	2155	66886	22.68	23.01
	13	10	782	23230	QPSK	1	0	48	20	3609	55830	48	5	3697.5	56715	48	20	3709.2	56832	48	20	3729	57030	22.67	23.01
	13	10	782	23230	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	5	3697.5	56715	48	20	3709.2	56832	22.67	23.01
	13	10	782	23230	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	66	15	2155	66886	66	5	2164.3	66979	22.60	23.01
	13	10	782	23230	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	66	20	2155	66886	66	20	2174.8	67084	22.61	23.01
	13	10	782	23230	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	66	20	2155	66886	22.58	23.01
	25	20	1860	26140	QPSK	1	0	25	5	1932.5	8065	41	20	2593	40620	41	20	2612.8	40818	41	20	2632.6	41016	22.47	22.94
	25	20	1860	26140	QPSK	1	0	41	20	2593	40620	41	20	2612.8	40818	41	20	2632.6	41016	41	20	2652.4	41214	22.43	22.94
	41	20	2593	40620	QPSK	1	0	41	20	2612.8	40818	41	5	2687.5	41565	41	20	2667.7	41367	41	20	2647.9	41169	22.72	23.13
	41	20	2593	40620	QPSK	1	0	41	20	2612.8	40818	42	20	3575	43340	42	5	3552.5	43115	42	20	3564.2	43232	22.66	23.13
	41	20	2593	40620	QPSK	1	0	41	20	2612.8	40818	41	20	2632.6	41016	42	20	3575	43340	42	20	3594.8	43538	22.74	23.13
	41	20	2593	40620	QPSK	1	0	42	20	3575	43340	42	20	3594.8	43538	42	5	3552.5	43115	42	20	3564.2	43232	22.76	23.13
	48	20	3609	55830	QPSK	1	0	48	5	3697.5	56715	48	20	3709.2	56832	66	15	2155	66886	66	5	2164.3	66979	20.43	20.70
	48	20	3609	55830	QPSK	1	0	48	5	3697.5	56715	48	20	3709.2	56832	66	20	2155	66886	66	20	2174.8	67084	20.44	20.70
	48	20	3609	55830	QPSK	1	0	48	5	3697.5	56715	48	20	3709.2	56832	48	20	3729	57030	66	20	2155	66886	20.40	20.70
	48	20	3609	55830	QPSK	1	0	48	20	3628.8	56028	48	5	3697.5	56715	48	20	3709.2	56832	66	20	2155	66886	20.36	20.70
	48	20	3609	55830	QPSK	1	0	48	20	3628.8	56028	48	5	3697.5	56715	48	20	3709.2	56832	48	20	3729	57030	20.44	20.70
	48	20	3609	55830	QPSK	1	0	48	20	3628.8	56028	66	20	2155	66886	66	5	2112.5	66461	66	20	2190	67236	20.37	20.70
	48	20	3609	55830	QPSK	1	0	48	20	3628.8	56028	48	20	3648.6	56226	48	20	3668.4	56424	66	20	2155	66886	20.40	20.70
	48	20	3609	55830	QPSK	1	0	48	20	3628.8	56028	48	20	3648.6	56226	48	20	3668.4	56424	48	20	3688.2	56622	20.42	20.70

<u><Six Carrier power verification></u>

Configure	PCC							SCC1				SCC2				SCC3				SCC4				SCC5				Power	
	LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
Inter-Band	2	20	1860	18700	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	48	20	3648.6	56226	66	20	2155	66886	22.55	23.13
	13	10	782	23230	QPSK	1	0	48	20	3609	55830	48	20	3628.8	56028	48	20	3648.6	56226	48	20	3648.6	56226	66	20	2155	66886	22.68	23.01
	41	20	2593	40620	QPSK	1	0	41	20	2612.8	40818	42	20	3575	43340	42	20	3594.8	43538	42	5	3552.5	43115	42	20	3564.2	43232	22.76	23.13

<LTE Uplink carrier aggregation>

2CC Uplink Carrier Aggregation	
Number	Combination
1	5B
2	7B
3	66B
4	66C
5	38C
6	41C
7	48C

<Intra-band>

General Note:

i. The device supports intra-band uplink carrier aggregation with a maximum of two 20MHz 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 20MHz 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 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. According 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.

v. 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.

vi. Since the uplink CA for 5B/7B/66B/66C/38C/41C is only operate at WWAN Ant 0 and SAR test exclusion is applied for Ant 0 according to KDB 447498 D01, therefore, the uplink CA only assessment for LTE B48 Ant 2

CA_48C_Ant 2										
Combination 20MHz+20MHz (100RB+100RB)										
PCC Channel	SCC Channel	Modulation	PCC		SCC		Total RB Size	Target MPR Level (dB)	Measured Power (dBm)	Tune up Power (dBm) Typ. target power with tolerance: +1dbm
			RB Size	RB offset	RB Size	RB offset				
55340	55538	QPSK	1	0	0	0	1	0	20.06	22
55830	55632	QPSK	1	0	1	99	2	0	20.02	22
56150	55952	QPSK	1	0	1	99	2	0	20.03	22

11. 5G NR Output Power (Unit: dBm)

General Note:

1. Referencing the procedure in KDB 941225, the test procedures are outlined as below
    a. For DFT-OFDM output power measurement, full measurement was done for Pi/2 BPSK and QPSK and for the largest supported bandwidth, repeat test for 16QAM/64QAM/256QAM under 1RB 1Offset configuration. For smaller bandwidth, measure conducted power for Pi/2 BPSK and 1RB 1Offset configuration.
    b. According to the tune-up, CP-OFDM output power is not ½ dB higher than DFT-OFDM mode, and the reported SAR of DFT-OFDM mode reported SAR is ≤ 1.45 W/kg, SAR test and thus conducted power for CP-OFDM mode is not required.
    c. To start SAR test for the largest channel bandwidth for PI/2 BPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. Also do SAR test for 50% RB allocation for PI/2 BPSK SAR testing using 1RB PI/2 BPSK allocation procedure
    d. For PI/2 BPSK with 100% RB allocation, SAR test 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.
    e. For higher modulation QPSK/16QAM/64QAM/256QAM, according to tune-up document the power level is not ½ dB higher than the same configuration in PI/2 BPSK, also reported SAR for the PI/2 BPSK configuration is less than 1.45 W/kg, QPSK/16QAM/64QAM/256QAM SAR testing are not required.
    f. Smaller bandwidth output power for each RB allocation configuration for this device 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, smaller bandwidth SAR testing is not required for this device
2. Due to test setup limitations, SAR testing for NR was performed using Factory Test Mode software to establish the connection and perform SAR with 100% transmission.

<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		

<n2 Ant 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				372000	376000	380000	
Frequency (MHz)				1860	1880	1900	
20	PI/2 BPSK	1	1	23.06	23.07	23.02	
20	PI/2 BPSK	1	53	22.85	23.04	23.03	24.0
20	PI/2 BPSK	1	104	23.04	23.02	23.06	
20	PI/2 BPSK	50	0	22.85	22.99	22.90	24.0
20	PI/2 BPSK	50	28	22.75	22.97	22.93	24.0
20	PI/2 BPSK	50	56	22.81	22.95	22.92	24.0
20	PI/2 BPSK	100	0	22.86	22.87	22.77	
20	QPSK	1	1	22.98	22.94	22.97	
20	QPSK	1	53	22.87	22.98	22.90	24.0
20	QPSK	1	104	22.90	23.04	23.04	
20	QPSK	50	0	22.53	22.64	22.47	24.0
20	QPSK	50	28	22.90	22.90	22.95	24.0
20	QPSK	50	56	22.65	22.68	22.57	24.0
20	QPSK	100	0	22.52	22.67	22.62	
20	16QAM	1	1	22.55	22.70	22.59	23.0
20	64QAM	1	1	20.84	20.91	20.97	21.5
20	256QAM	1	1	19.11	19.12	19.08	19.5
Channel				371500	376000	380500	Tune-up limit (dBm)
Frequency (MHz)				1857.5	1880	1902.5	
15	PI/2 BPSK	1	1	23.13	23.05	23.11	24.0
Channel				371000	376000	381000	Tune-up limit (dBm)
Frequency (MHz)				1855	1880	1905	
10	PI/2 BPSK	1	1	23.09	23.04	23.09	24.0
Channel				370500	376000	381500	Tune-up limit (dBm)
Frequency (MHz)				1852.5	1880	1907.5	
5	PI/2 BPSK	1	1	23.06	23.02	23.08	24.0

<n7 Ant 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				502000	507000	512000	Tune-up limit (dBm)
Frequency (MHz)				2510	2535	2560	
20	PI/2 BPSK	1	1	23.30	23.58	23.56	24.0
20	PI/2 BPSK	1	53	23.40	23.55	23.41	
20	PI/2 BPSK	1	104	23.35	23.41	23.29	
20	PI/2 BPSK	50	0	23.15	23.21	23.12	24.0
20	PI/2 BPSK	50	28	23.16	23.14	23.10	24.0
20	PI/2 BPSK	50	56	23.13	23.11	23.17	24.0
20	PI/2 BPSK	100	0	23.24	23.21	23.19	
20	QPSK	1	1	23.38	23.48	23.52	24.0
20	QPSK	1	53	23.28	23.28	23.39	
20	QPSK	1	104	23.47	23.41	23.39	
20	QPSK	50	0	22.91	23.12	23.02	24.0
20	QPSK	50	28	23.35	23.45	23.30	24.0
20	QPSK	50	56	23.15	23.16	23.20	24.0
20	QPSK	100	0	22.90	22.97	23.09	
20	16QAM	1	1	22.95	22.96	22.85	23.0
20	64QAM	1	1	21.31	21.44	21.48	21.5
20	256QAM	1	1	19.31	19.33	19.37	19.5
Channel				501500	507000	512500	Tune-up limit (dBm)
Frequency (MHz)				2507.5	2535	2562.5	
15	PI/2 BPSK	1	1	23.29	23.56	23.54	24.0
Channel				501000	507000	513000	Tune-up limit (dBm)
Frequency (MHz)				2505	2535	2565	
10	PI/2 BPSK	1	1	23.28	23.54	23.53	24.0
Channel				500500	507000	513500	Tune-up limit (dBm)
Frequency (MHz)				2502.5	2535	2567.5	
5	PI/2 BPSK	1	1	23.25	23.52	23.51	24.0

<n41 Ant 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				509202	518598	528000	
Frequency (MHz)				2546.01	2592.99	2640	
100	PI/2 BPSK	1	1	22.94	23.16	23.00	24.0
100	PI/2 BPSK	1	137	22.82	23.06	23.00	
100	PI/2 BPSK	1	271	22.83	22.80	22.68	
100	PI/2 BPSK	135	0	22.85	23.07	22.94	24.0
100	PI/2 BPSK	135	69	23.00	23.06	22.93	24.0
100	PI/2 BPSK	135	138	22.86	22.99	22.80	24.0
100	PI/2 BPSK	270	0	23.06	23.02	22.92	
100	QPSK	1	1	23.13	23.10	23.07	24.0
100	QPSK	1	137	23.04	23.13	22.97	
100	QPSK	1	271	23.08	23.08	22.87	
100	QPSK	135	0	22.91	23.05	23.07	24.0
100	QPSK	135	69	22.91	23.13	22.98	
100	QPSK	135	138	22.99	23.05	23.09	
100	QPSK	270	0	22.74	23.00	22.92	24.0
100	16QAM	1	1	22.86	22.99	22.93	23.0
100	64QAM	1	1	20.43	20.41	20.38	21.5
100	256QAM	1	1	19.05	19.03	18.96	19.5
Channel				508200	518598	528996	Tune-up limit (dBm)
Frequency (MHz)				2541	2592.99	2644.98	
90	PI/2 BPSK	1	1	22.93	23.15	22.99	24.0
Channel				507204	518598	529998	Tune-up limit (dBm)
Frequency (MHz)				2536.02	2592.99	2649.99	
80	PI/2 BPSK	1	1	22.91	23.09	22.87	24.0
Channel				505200	518598	531996	Tune-up limit (dBm)
Frequency (MHz)				2526	2592.99	2659.98	
60	PI/2 BPSK	1	1	22.89	23.06	22.85	24.0
Channel				504204	518598	532998	Tune-up limit (dBm)
Frequency (MHz)				2521.02	2592.99	2664.99	
50	PI/2 BPSK	1	1	22.87	23.06	22.83	24.0
Channel				503202	518598	534000	Tune-up limit (dBm)
Frequency (MHz)				2516.01	2592.99	2670	
40	PI/2 BPSK	1	1	22.88	23.08	22.81	24.0
Channel				501204	518598	535998	Tune-up limit (dBm)
Frequency (MHz)				2506.02	2592.99	2679.99	
20	PI/2 BPSK	1	1	22.84	22.11	22.76	24.0

<n66 Ant 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				344000	349000	354000	Tune-up limit (dBm)
Frequency (MHz)				1720	1745	1770	
20	PI/2 BPSK	1	1	23.16	23.23	23.26	24.0
20	PI/2 BPSK	1	53	23.18	23.24	23.20	
20	PI/2 BPSK	1	104	23.20	23.20	23.16	
20	PI/2 BPSK	50	0	23.12	23.15	23.17	24.0
20	PI/2 BPSK	50	28	22.94	23.11	22.95	24.0
20	PI/2 BPSK	50	56	23.03	22.99	22.89	24.0
20	PI/2 BPSK	100	0	23.02	23.04	23.08	
20	QPSK	1	1	23.06	23.07	23.09	24.0
20	QPSK	1	53	23.07	23.20	23.06	
20	QPSK	1	104	22.89	23.16	22.93	
20	QPSK	50	0	22.89	22.85	22.95	24.0
20	QPSK	50	28	23.04	23.07	23.15	24.0
20	QPSK	50	56	22.65	22.84	22.71	24.0
20	QPSK	100	0	22.70	22.88	22.90	
20	16QAM	1	1	22.64	22.83	22.73	23.0
20	64QAM	1	1	21.11	21.07	21.03	21.5
20	256QAM	1	1	19.34	19.39	19.36	19.5
Channel				343500	349000	354500	Tune-up limit (dBm)
Frequency (MHz)				1717.5	1745	1772.5	
15	PI/2 BPSK	1	1	23.15	23.31	23.24	24.0
Channel				343000	349000	355000	Tune-up limit (dBm)
Frequency (MHz)				1715	1745	1775	
10	PI/2 BPSK	1	1	23.14	23.29	23.21	24.0
Channel				342500	349000	355500	Tune-up limit (dBm)
Frequency (MHz)				1712.5	1745	1777.5	
5	PI/2 BPSK	1	1	23.12	23.28	23.19	24.0

12. WiFi/Bluetooth Output Power (Unit: dBm)

General Note:

1. For each antenna, transmit power in SISO operation is larger than (or equal to) the power in MIMO operation, RF exposure compliance of MIMO mode can be deduced from the compliance simultaneous transmission of antennas operating in SISO mode.
2. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
3. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. For "Not required", SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) 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 in the initial test configuration, additional output power measurements were not necessary.
4. 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.
5. 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).
6. 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.
7. 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.
8. Per 201904 TCBC workshops, General principles of FCC KDB Publication 248227 D01 can be applied to determine the SAR Initial Test Configurations and test reduction for 802.11ax SAR testing. For the table below the 802.11ax maximum power is SU (non-OFDMA), and the SU maximum power also higher than RU (OFDMA)
9. In applying the test guidance, the IEEE 802.11 mode with the maximum output power (out of all modes) should be considered for testing
10. For modes with the same maximum output power, the guidance from section 5.3.2 a) of FCC KDB Publication 248227 D01 should be applied, with 802.11ax being considered as the highest 802.11 mode for the appropriate frequency bands
11. When SAR testing for 802.11ax is required
    a. If the maximum output power is highest for OFDMA scenarios, choose the tone size with the maximum number of tones and the highest maximum output power
    b. Otherwise, consider the fully allocated channel for SAR testing
    c. When SAR testing is required on RU sizes less than the fully allocated channel, use the RU number closest to the middle of the channel, choosing the higher RU number when two RUs are equidistant to the middle of the channel

<u><2.4GHz WLAN></u>

2.4GHz WLAN				Ant 1			Ant 2			Ant 1+2		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
		1	2412	20.50	20.50		20.30	20.50				
		6	2437	20.40	20.50		20.40	20.50				
	802.11b 1Mbps	11	2462	20.40	20.50	99.50	20.40	20.50	97.80			
		12	2467	18.90	19.00		18.90	19.00				
		13	2472	16.00	16.00		15.90	16.00				
		1	2412		19.00			19.00				
		6	2437		20.50			20.50				
	802.11g 6Mbps	11	2462		18.00			18.00				
		12	2467		15.00			15.00				
		13	2472		12.00			12.00				
		1	2412		18.50			18.50			20.00	
		6	2437		20.50			20.50			23.50	
	802.11n-HT20 MCS0	11	2462		18.00			18.00			20.00	
2.4GHz WLAN		12	2467		15.00			15.00			14.50	
		13	2472		12.00			12.00			11.50	
		3	2422		15.00			16.00			18.50	
		6	2437		17.50			17.50			18.50	
	802.11n-HT40 MCS0	9	2452	No Required	15.50	No Required	No Required	17.00	No Required		17.50	
		10	2457		12.50			12.50			14.50	
		11	2462		10.00			11.00		No Required	11.50	No Required
		1	2412		18.50			18.50			19.50	
		6	2437		20.50			20.50			23.50	
	802.11ax-HE20 MCS0	11	2462		18.00			18.00			18.50	
		12	2467		15.00			15.00			14.50	
		13	2472		12.00			12.00			10.00	
		3	2422		15.00			16.00			18.50	
		6	2437		17.50			17.50			18.50	
	802.11ax-HE40 MCS0	9	2452		15.50			17.00			17.50	
		10	2457		12.50			12.50			14.50	
		11	2462		10.00			11.00			11.50	

<5GHz WLAN>

5.2GHz WLAN				Ant 1			Ant 2			Ant 1+2		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	No Required	19.50	No Required	No Required	19.50	No Required			
		40	5200		20.50			20.50				
		44	5220		20.50			20.50				
		48	5240		20.50			20.50				
	802.11n-HT20 MCS0	36	5180		19.50			19.50		No Required	21.00	No Required
		40	5200		20.50			20.50			21.00	
		44	5220		20.50			20.50			21.00	
		48	5240		20.50			20.50			21.50	
	802.11n-HT40 MCS0	38	5190		18.00			18.00			18.50	
		46	5230		21.00			21.00			23.50	
	802.11ac-VHT20 MCS0	36	5180		19.50			19.50			21.00	
		40	5200		20.50			20.50			21.00	
		44	5220		20.50			20.50			21.00	
		48	5240		20.50			20.50			21.50	
	802.11ac-VHT40 MCS0	38	5190		18.00			18.00			18.50	
		46	5230		21.00			21.00			23.50	
	802.11ac-VHT80 MCS0	42	5210		17.00			17.00			18.00	
	802.11ax-HE20 MCS0	36	5180		19.50			19.50			21.00	
		40	5200		20.50			20.50			21.00	
		44	5220		20.50			20.50			21.00	
		48	5240		20.50			20.50			21.50	
	802.11ax-HE40 MCS0	38	5190		18.00			18.00			18.50	
		46	5230		21.00			21.00			23.50	
	802.11ax-HE80 MCS0	42	5210		17.00			17.00			18.00	

5.3GHz WLAN				Ant 1			Ant 2			Ant 1+2		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	No Required	20.50	No Required	No Required	20.50	No Required			
		56	5280		20.50			20.50				
		60	5300		20.00			20.00				
		64	5320		20.00			20.00				
	802.11n-HT20 MCS0	52	5260		20.50			20.50		No Required	21.50	No Required
		56	5280		20.50			20.50			21.50	
		60	5300		20.00			20.00			21.50	
		64	5320		20.00			20.00			21.50	
	802.11n-HT40 MCS0	54	5270	20.90	21.00	98.80	20.00	21.00	98.80		23.50	
		62	5310	18.00	18.00		18.00	18.00			19.00	
	802.11ac-VHT20 MCS0	52	5260	No Required	20.50	No Required	No Required	20.50	No Required		21.50	
		56	5280		20.50			20.50			21.50	
		60	5300		20.00			20.00			21.50	
		64	5320		20.00			20.00			21.50	
	802.11ac-VHT40 MCS0	54	5270		21.00			21.00			23.50	
		62	5310		18.00			18.00			19.00	
	802.11ac-VHT80 MCS0	58	5290		18.00			18.00			19.00	
	802.11ac-VHT160 MCS0	50	5250		14.50			14.50			15.50	
	802.11ax-HE20 MCS0	52	5260		20.50			20.50			21.50	
		56	5280		20.50			20.50			21.50	
		60	5300		20.00			20.00			21.00	
		64	5320		20.00			20.00			21.00	
	802.11ax-HE40 MCS0	54	5270		21.00			21.00			23.50	
		62	5310		18.00			18.00			19.00	
	802.11ax-HE80 MCS0	58	5290		18.00			18.00			18.50	
	802.11ax-HE160 MCS0	50	5250		14.50			14.50			16.00	

5.5GHz WLAN				Ant 1			Ant 2			Ant 1+2		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	No Required	20.50	No Required	No Required	20.50	No Required			
		116	5580		20.50			20.50				
		124	5620		20.50			20.50				
		132	5660		20.50			20.50				
		144	5720		20.50			20.50				
	802.11n-HT20 MCS0	100	5500		20.50			20.50		No Required	21.50	No Required
		116	5580		20.50			20.50			21.50	
		124	5620		20.50			20.50			21.50	
		132	5660		20.50			20.50			21.50	
		144	5720		20.50			20.50			21.50	
	802.11n-HT40 MCS0	102	5510	19.40	19.50	98.80	19.40	19.50	98.80		21.00	
		110	5550	20.20	20.50		20.30	20.50			21.00	
		126	5630	20.20	20.50		20.10	20.50			22.50	
		134	5670	20.20	20.50		20.30	20.50			22.50	
		142	5710	20.20	20.50		20.30	20.50			22.50	
	802.11ac-VHT20 MCS0	100	5500	No Required	20.50	No Required	No Required	20.50	No Required		21.50	
		116	5580		20.50			20.50			21.50	
		124	5620		20.50			20.50			21.50	
		132	5660		20.50			20.50			21.50	
		144	5720		20.50			20.50			21.50	
	802.11ac-VHT40 MCS0	102	5510		19.50			19.50			21.00	
		110	5550		20.50			20.50			21.00	
		126	5630		20.50			20.50			22.50	
		134	5670		20.50			20.50			22.50	
		142	5710		20.50			20.50			22.50	
	802.11ac-VHT80 MCS0	106	5530		17.50			17.50			15.50	
		122	5610		18.50			15.50			23.00	
		138	5690		18.50			15.50			23.00	
	802.11ac-VHT160 MCS0	114	5570		16.50			15.50			17.50	
	802.11ax-HE20 MCS0	100	5500		20.50			20.50			21.50	
		116	5580		20.50			20.50			21.50	
		124	5620		20.50			20.50			21.50	
		132	5660		20.50			20.50			21.50	
		144	5720		20.50			20.50			21.50	
	802.11ax-HE40 MCS0	102	5510		19.50			19.50			21.00	
		110	5550		20.50			20.50			21.00	
		126	5630		20.50			20.50			22.50	
		134	5670		20.50			20.50			22.50	
		142	5710		20.50			20.50			22.50	
	802.11ax-HE80 MCS0	106	5530		18.00			18.00			15.50	
		122	5610		19.50			18.00			23.00	
		138	5690		19.50			18.00			23.00	
	802.11ax-HE160 MCS0	114	5570		16.00			16.00			17.50	

5.8GHz WLAN				Ant 1			Ant 2			Ant 1+2		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	No Required	20.50	No Required	No Required	20.50	No Required			
		157	5785		20.50			20.50				
		165	5825		20.50			20.50				
	802.11n-HT20 MCS0	149	5745		20.50			20.50		No Required	23.50	No Required
		157	5785		20.50			20.50			23.50	
		165	5825		20.50			20.50			23.50	
	802.11n-HT40 MCS0	151	5755	21.00	21.00	98.80	20.90	21.00	98.80		24.00	
		159	5795	21.00	21.00		20.90	21.00			24.00	
	802.11ac-VHT20 MCS0	149	5745	No Required	20.50	No Required	No Required	20.50	No Required		23.50	
		157	5785		20.50			20.50			23.50	
		165	5825		20.50			20.50			23.50	
	802.11ac-VHT40 MCS0	151	5755		21.00			21.00			24.00	
		159	5795		21.00			21.00			24.00	
	802.11ac-VHT80 MCS0	155	5775		20.50			20.50			22.50	
	802.11ax-HE20 MCS0	149	5745		20.50			20.50			23.50	
		157	5785		20.50			20.50			23.50	
		165	5825		20.50			20.50			23.50	
	802.11ax-HE40 MCS0	151	5755		21.00			21.00			24.00	
		159	5795		21.00			21.00			24.00	
	802.11ax-HE80 MCS0	155	5775		20.50			20.50			22.50	

<u><6GHz WLAN></u>

WiFi 6E				Ant 1			Ant 2			Ant 1+2		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
WiFi 6E	802.11ax-HE20 MCS0	1	5955	No Required	4.50	No Required	No Required	4.50	No Required	No Required	4.50	No Required
		57	6235		4.50			4.50			4.50	
		113	6515		4.50			4.50			4.50	
		173	6815		4.50			4.50			4.50	
		233	7115		0.50			0.50			0.50	
	802.11ax-HE40 MCS0	3	5965		7.50			7.50			7.50	
		59	6245		7.50			7.50			7.50	
		107	6485		7.50			7.50			7.50	
		171	6805		7.50			7.50			7.50	
		227	7085		7.50			7.50			7.50	
	802.11ax-HE80 MCS0	7	5985		9.50			9.50			9.50	
		71	6305		9.50			9.50			9.50	
		119	6545		10.00			10.00			10.00	
		167	6785		10.00			10.00			10.00	
		215	7025		12.50			12.50			12.50	
	802.11ax-HE160 MCS0	15	6025	12.40	12.50	98.00	12.20	12.50	98.00		12.50	
		47	6185	12.30	12.50		12.20	12.50			12.50	
		111	6505	13.00	13.00		12.90	13.00			13.00	
		175	6825	11.70	12.00		11.90	12.00			12.00	
		207	6985	12.20	12.50		12.30	12.50			12.50	

<2.4GHz Bluetooth>

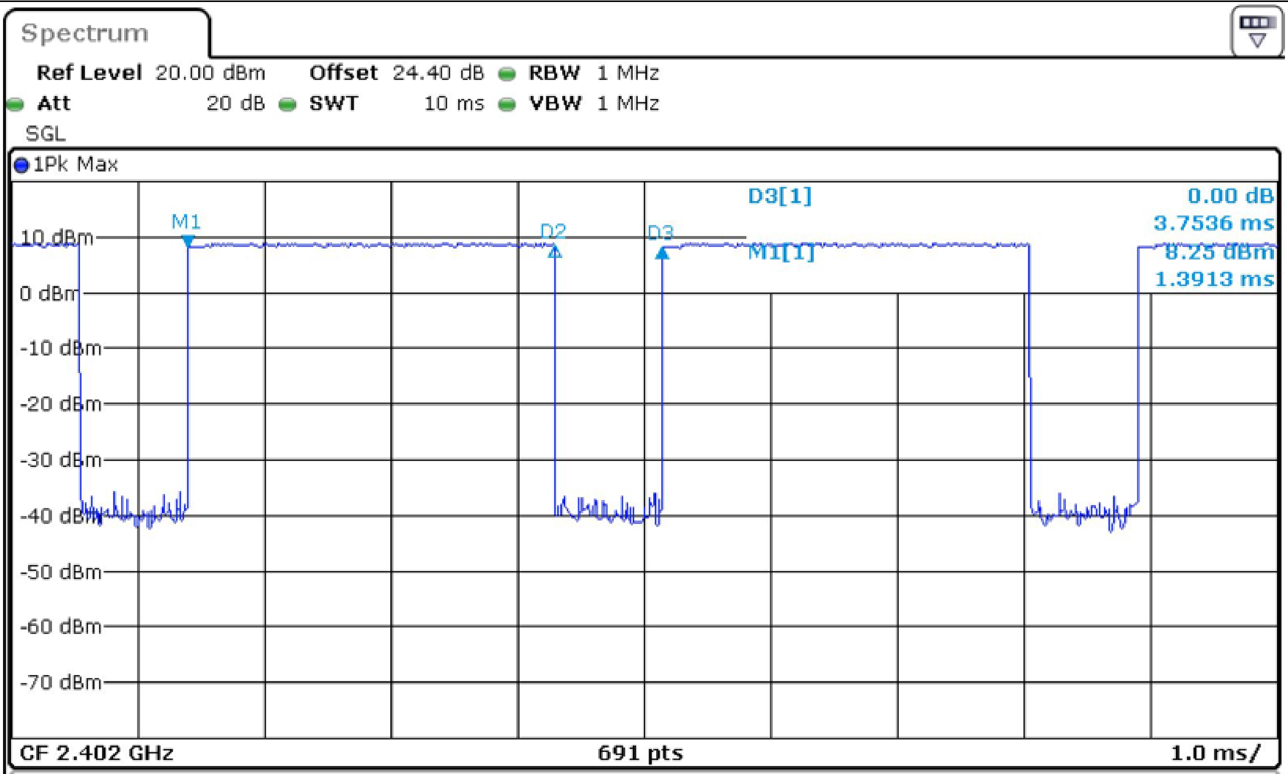
Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	9.70	Not Required	Not Required
	CH 39	2441	9.80		
	CH 78	2480	9.90		
Tune-up Limit			10.50	10.50	10.50

Mode	Channel	Frequency (MHz)	Average power (dBm)	
			1Mbps	2Mbps
LE	CH 00	2402	Not Required	Not Required
	CH 19	2440		
	CH 39	2480		
Tune-up Limit			9.00	9.00

General Note:

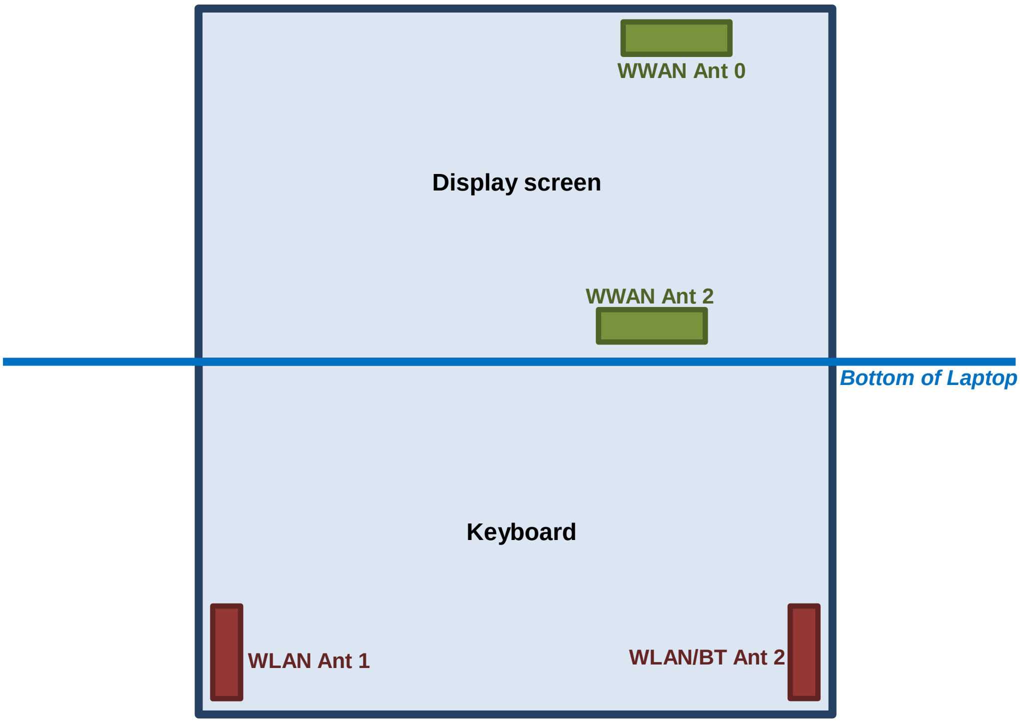
1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps due to its highest average power and duty cycle is 77.22% considered in SAR testing, and the duty cycle would be scaled to theoretical 83.3% in reported SAR calculation.

BT Duty cycle



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.3913 ms	8.25 dBm		
D2	M1	1	2.8986 ms	0.19 dB		
D3	M1	1	3.7536 ms	-0.00 dB		

13. Antenna Location



The separation distance for antenna to edge :

Antenna	To Bottom of Laptop (mm)
WWAN Antenna 0	279.86
WWAN Antenna 2	29.44
WLAN Antenna 1	6.24
WLAN/BT Antenna 2	6.24

<SAR test exclusion table>

General Note:

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

<Ant 0>

Exposure Position	Wireless Interface	WCDMA Band V	WCDMA Band IV	WCDMA Band II	LTE Band 12 / n12	LTE Band 13	LTE Band 14	LTE Band 17	LTE Band 5 / n5	LTE Band 26	LTE Band 4	LTE Band 66 / n66	LTE Band 2 / n2	LTE Band 25	LTE Band 30	LTE Band 7	LTE Band 38	LTE Band 41
	Calculated Frequency (MHz)	846	1750	1907	715	784	795	713	848	848	1754	1779	1909	1914	2312	2567	2617	2687
	Maximum power (dBm)	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.0	24.0	24.0	24.0	23.0	24.0	24.0	27.0
	Maximum rated power(mW)	281.84	281.84	281.84	281.84	281.84	281.84	281.84	281.84	281.84	251.19	251.19	251.19	251.19	199.53	251.19	251.19	501.19
Bottom of Laptop	Separation distance(mm)	268.86																
	exclusion threshold	1397.0	2302.0	2297.0	1221.0	1313.0	1328.0	1218.0	1400.0	1400.0	2302.0	2301.0	2297.0	2297.0	2287.0	2282.0	2281.0	2280.0
	Testing required?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

<Ant 2>

Exposure Position	Wireless Interface	LTE Band 66 / n66	LTE Band 2 / n2	LTE Band 7 / n7	FR1 Band n41	LTE Band 48
	Calculated Frequency (MHz)	1779	1909	2567	2687	3697
	Maximum power (dBm)	24.0	24.0	24.0	24.0	22.0
	Maximum rated power(mW)	251.19	251.19	251.19	251.19	158.49
Bottom of Laptop	Separation distance(mm)	24.8				
	exclusion threshold	13.5	14.0	16.3	16.6	12.3
	Testing required?	Yes	Yes	Yes	Yes	Yes

14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
    a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
    b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
    c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
    d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
    e. 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 Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
    - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
    - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
    - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

UMTS 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 (HSUPA, HSDPA, DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

LTE Note:

1. 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.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. 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.
4. Per KDB 941225 D05v02r05, 16QAM 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 SAR testing is not required.
5. 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.

5G NR Note:

1. Referencing the procedure in KDB 941225, the test procedures are outlined as below:
   a. To start SAR test for the largest channel bandwidth for PI/2 BPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. Also do SAR test for 50% RB allocation for PI/2 BPSK SAR testing using 1RB PI/2 BPSK allocation procedure
   b. For PI/2 BPSK with 100% RB allocation, SAR test 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.
   c. For higher modulation QPSK/16QAM/64QAM/256QAM, according to tune-up document the power level is not ½ dB higher than the same configuration in PI/2 BPSK, also reported SAR for the PI/2 BPSK configuration is less than 1.45 W/kg, QPSK/16QAM/64QAM/256QAM SAR testing are not required.
   d. Smaller bandwidth output power for each RB allocation configuration for this device 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, smaller bandwidth SAR testing is not required for this device
   e. For 5G FR1 n5/n12/n41, the maximum channel bandwidth does not support three non-overlapping channels in the frequency band, the middle channel of the group of overlapping channels were selected for testing.
   f. Due to test setup limitations, SAR testing for NR was performed using Factory Test Mode software to establish the connection and perform SAR with 100% transmission.

WLAN Note:

1. The Intel AX211D2W (FCC ID: PD9AX211D2) WLAN/BT module is also integrated into DELL P115F host. In this report additional WLAN/BT SAR just evaluated Sim-Tx analysis with WWAN transmitter
2. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
3. Per KDB 248227 D01v02r02, WLAN5.2GHz SAR testing is not required when the WLAN5.3GHz band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for WLAN5.2GHz band.
4. 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.
5. 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.
6. For WLAN SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
7. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
8. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

14.1 WWAN SAR

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Antenna Vendor	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	WNC	18900	1880	22.66	24.00	1.361	-0.13	0.029	0.039
01	LTE Band 2_Ant 2	20M	QPSK	50	0	Bottom of Laptop	0mm	WNC	18900	1880	21.74	23.00	1.337	-0.17	0.034	0.045
	LTE Band 2_Ant 2	20M	QPSK	50	0	Bottom of Laptop	0mm	HB	18900	1880	21.74	23.00	1.337	0.06	0.023	0.031
	LTE Band 7_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	WNC	21100	2535	22.56	24.00	1.393	-0.06	0.022	0.031
02	LTE Band 7_Ant 2	20M	QPSK	50	0	Bottom of Laptop	0mm	WNC	21100	2535	21.88	23.00	1.294	0.14	0.046	0.060
	LTE Band 7_Ant 2	20M	QPSK	50	0	Bottom of Laptop	0mm	HB	21100	2535	21.88	23.00	1.294	0.09	0.034	0.044
03	LTE Band 66_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	WNC	132572	1770	23.51	24.00	1.119	-0.1	0.062	0.069
	LTE Band 66_Ant 2	20M	QPSK	50	0	Bottom of Laptop	0mm	WNC	132322	1745	22.59	23.00	1.099	-0.06	0.047	0.052
	LTE Band 66_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	HB	132572	1770	23.51	24.00	1.119	0.06	0.055	0.062

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Antenna Vendor	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
04	LTE Band 48_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	WNC	55340	3560	20.80	22.00	1.318	62.9	1.006	-0.15	0.022	0.029
	LTE Band 48_Ant 2	20M	QPSK	50	0	Bottom of Laptop	0mm	WNC	55340	3560	19.93	21.00	1.279	62.9	1.006	0.01	0.014	0.018
	LTE Band 48C_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	WNC	55340	3560	20.26	22.00	1.493	62.9	1.006	0.03	0.015	0.023
	LTE Band 48_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	HB	55340	3560	20.80	22.00	1.318	62.9	1.006	0.04	0.016	0.021

<5G NR SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Antenna Vendor	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
05	FR1 n2_Ant 2	20M	BPSK	1	1	Bottom of Laptop	0mm	WNC	376000	1880	23.07	24.00	1.239	-0.04	0.022	0.027
	FR1 n2_Ant 2	20M	BPSK	50	0	Bottom of Laptop	0mm	WNC	376000	1880	22.99	24.00	1.262	-0.1	0.019	0.024
	FR1 n2_Ant 2	20M	BPSK	1	1	Bottom of Laptop	0mm	HB	376000	1880	23.07	24.00	1.239	0.01	0.014	0.017
06	FR1 n7_Ant 2	20M	BPSK	1	1	Bottom of Laptop	0mm	WNC	507000	2535	23.58	24.00	1.102	-0.03	0.033	0.036
	FR1 n7_Ant 2	20M	BPSK	50	0	Bottom of Laptop	0mm	WNC	507000	2535	23.21	24.00	1.199	-0.04	0.029	0.035
	FR1 n7_Ant 2	20M	BPSK	50	0	Bottom of Laptop	0mm	HB	507000	2535	23.21	24.00	1.199	0.09	0.029	0.035
07	FR1 n41_Ant 2	100M	BPSK	1	1	Bottom of Laptop	0mm	WNC	518598	2592.99	23.16	24.00	1.213	-0.19	0.036	0.044
	FR1 n41_Ant 2	100M	BPSK	135	0	Bottom of Laptop	0mm	WNC	518598	2592.99	23.07	24.00	1.239	0.06	0.035	0.043
	FR1 n41_Ant 2	100M	BPSK	135	0	Bottom of Laptop	0mm	HB	518598	2592.99	23.07	24.00	1.239	0.07	0.031	0.038
08	FR1 n66_Ant 2	20M	BPSK	1	1	Bottom of Laptop	0mm	WNC	354000	1770	23.26	24.00	1.186	0.17	0.041	0.049
	FR1 n66_Ant 2	20M	BPSK	50	0	Bottom of Laptop	0mm	WNC	354000	1770	23.17	24.00	1.211	0.05	0.029	0.035
	FR1 n66_Ant 2	20M	BPSK	1	1	Bottom of Laptop	0mm	HB	354000	1770	23.26	24.00	1.186	0.06	0.036	0.043

14.2 WLAN/BT SAR

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna Vendor	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
09	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	WNC	Ant 1	1	2412	20.50	20.50	1.000	99.5	1.005	-0.11	0.393	0.395
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	WNC	Ant 1	6	2437	20.40	20.50	1.023	99.5	1.005	0.04	0.377	0.388
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	WNC	Ant 1	11	2462	20.40	20.50	1.023	99.5	1.005	-0.17	0.315	0.324
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	HB	Ant 1	1	2412	20.50	20.50	1.000	99.5	1.005	0.11	0.367	0.369
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	WNC	Ant 2	6	2437	20.40	20.50	1.023	97.8	1.022	0.04	0.256	0.268
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	WNC	Ant 2	1	2412	20.30	20.50	1.047	97.8	1.022	-0.11	0.236	0.253
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	WNC	Ant 2	11	2462	20.40	20.50	1.023	97.8	1.022	-0.13	0.266	0.278
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	HB	Ant 2	11	2462	20.40	20.50	1.023	97.8	1.022	-0.06	0.259	0.271
10	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	54	5270	20.90	21.00	1.023	98.8	1.012	0.02	0.053	0.055
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	62	5310	18.00	18.00	1.000	98.8	1.012	0.12	0.018	0.018
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	HB	Ant 1	54	5270	20.90	21.00	1.023	98.8	1.012	-0.05	0.044	0.046
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	54	5270	20.00	21.00	1.259	98.8	1.012	0.05	0.009	0.011
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	62	5310	18.00	18.00	1.000	98.8	1.012	0.19	0.004	0.004
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	HB	Ant 2	54	5270	20.00	21.00	1.259	98.8	1.012	0.17	0.008	0.010
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	110	5550	20.20	20.50	1.072	98.8	1.012	0.02	0.027	0.029
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	102	5510	19.40	19.50	1.023	98.8	1.012	-0.13	0.028	0.029
11	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	126	5630	20.20	20.50	1.072	98.8	1.012	0.05	0.030	0.033
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	134	5670	20.20	20.50	1.072	98.8	1.012	0.02	0.024	0.026
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	142	5710	20.20	20.50	1.072	98.8	1.012	0.07	0.025	0.027
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	HB	Ant 1	126	5630	20.20	20.50	1.072	98.8	1.012	-0.03	0.027	0.029
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	110	5550	20.30	20.50	1.047	98.8	1.012	-0.16	0.007	0.007
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	102	5510	19.40	19.50	1.023	98.8	1.012	-0.1	0.006	0.006
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	126	5630	20.10	20.50	1.096	98.8	1.012	0	0.005	0.006
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	134	5670	20.30	20.50	1.047	98.8	1.012	0.18	0.006	0.006
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	142	5710	20.30	20.50	1.047	98.8	1.012	0.16	0.003	0.003
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	HB	Ant 2	110	5550	20.30	20.50	1.047	98.8	1.012	-0.07	0.006	0.006
12	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	151	5755	21.00	21.00	1.000	98.8	1.012	-0.13	0.045	0.046
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	159	5795	21.00	21.00	1.000	98.8	1.012	-0.01	0.037	0.037
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	HB	Ant 1	151	5755	21.00	21.00	1.000	98.8	1.012	0.08	0.042	0.043
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	151	5755	20.90	21.00	1.023	98.8	1.012	-0.17	0.020	0.021
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	159	5795	20.90	21.00	1.023	98.8	1.012	0.03	0.015	0.016
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	HB	Ant 2	151	5755	20.90	21.00	1.023	98.8	1.012	0.16	0.019	0.020
13	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	111	6505	13.00	13.00	1.000	98	1.020	0.01	0.007	0.007
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	15	6025	12.40	12.50	1.023	98	1.020	0.1	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	47	6185	12.30	12.50	1.047	98	1.020	0.01	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	175	6825	11.70	12.00	1.072	98	1.020	-0.09	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 1	207	6985	12.20	12.50	1.072	98	1.020	-0.15	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	HB	Ant 1	111	6505	13.00	13.00	1.000	98	1.020	0.06	0.003	0.003
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	111	6505	12.90	13.00	1.023	98	1.020	0.01	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	15	6025	12.20	12.50	1.072	98	1.020	0.07	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	47	6185	12.20	12.50	1.072	98	1.020	-0.02	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	175	6825	11.90	12.00	1.023	98	1.020	-0.12	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	WNC	Ant 2	207	6985	12.30	12.50	1.047	98	1.020	0.19	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom of Laptop	0mm	HB	Ant 2	111	6505	12.90	13.00	1.023	98	1.020	0.19	0.001	0.001

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna Vendor	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Bluetooth	1Mbps	Bottom of Laptop	0mm	WNC	Ant 2	78	2480	9.90	10.50	1.148	77.22	1.079	-0.11	0.008	0.010
	Bluetooth	1Mbps	Bottom of Laptop	0mm	WNC	Ant 2	0	2402	9.70	10.50	1.202	77.22	1.079	-0.02	0.012	0.016
14	Bluetooth	1Mbps	Bottom of Laptop	0mm	WNC	Ant 2	39	2441	9.80	10.50	1.175	77.22	1.079	-0.05	0.016	0.020
	Bluetooth	1Mbps	Bottom of Laptop	0mm	HB	Ant 2	39	2441	9.80	10.50	1.175	77.22	1.079	-0.17	0.011	0.014

15. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WWAN Ant 0 + WWAN Ant 2 + WLAN2.4GHz Ant 1 + WLAN2.4GHz Ant 2	Yes
2.	WWAN Ant 0 + WWAN Ant 2 + WLAN2.4GHz Ant 1 + Bluetooth Ant 2	Yes
3.	WWAN Ant 0 + WWAN Ant 2 + WLAN5G/6GHz Ant 1 + WLAN5G/6GHz Ant 2 + Bluetooth Ant 2	Yes

General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. According to KDB 447498 D01v06, an estimated 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the separation distances is > 50 mm is used for Sim-Tx analysis.
3. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.

15.1 Body Exposure Conditions

Exposure Position	1	2	3	4	5	6	7	1+2+3+4 Summed 1g SAR (W/kg)	1+2+3+7 Summed 1g SAR (W/kg)	1+2+5+6+7 Summed 1g SAR (W/kg)
	Maximum WWAN_Ant 0	Maximum WWAN_Ant 2	WLAN2.4GHz Ant 1	WLAN2.4GHz Ant 2	WLAN5G/6GHz Ant 1	WLAN5G/6GHz Ant 2	Bluetooth Ant 2			
	Estimated 1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)			
Bottom of Laptop at 0mm	0.400	0.069	0.395	0.278	0.055	0.021	0.020	**1.142**	**0.884**	**0.565**

Test Engineer：Bob Cheng, Dennis Hsieh and Luke Lee

16. Uncertainty Assessment

Declaration of Conformity:
The test results with all measurement uncertainty excluded is 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.

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor(a)	$1/k^{(b)}$	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity
(b) κ is the coverage factor

Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty.

Applicable for SAR Measurements:

Uncertainty Budget (4 MHz - 10 GHz range)							
Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	18.60	N	2	1	1	9.3	9.3
Axial Isotropy	4.70	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.60	R	1.732	0.7	0.7	3.9	3.9
Linearity	4.70	R	1.732	1	1	2.7	2.7
Modulation Response	4.68	R	1.732	1	1	2.7	2.7
System Detection Limits	1.00	R	1.732	1	1	0.6	0.6
Boundary Effects	2.00	R	1.732	1	1	1.2	1.2
Readout Electronics	0.30	N	1	1	1	0.3	0.3
Response Time	0.00	R	1.732	1	1	0.0	0.0
Integration Time	2.60	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.00	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.00	R	1.732	1	1	1.7	1.7
Probe Positioner	0.40	R	1.732	1	1	0.2	0.2
Probe Positioning	6.70	R	1.732	1	1	3.9	3.9
Post-processing	4.00	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Holder	3.60	N	1	1	1	3.6	3.6
Test sample Positioning	3.03	N	1	1	1	3.0	3.0
Power Scaling	0.00	R	1.732	1	1	0.0	0.0
Power Drift	5.00	R	1.732	1	1	2.9	2.9
Phantom and Setup							
Phantom Uncertainty	7.60	R	1.732	1	1	4.4	4.4
SAR correction	0.00	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.03	N	1	0.78	0.77	0.0	0.0
Liquid Conductivity (target)	5.00	R	1.732	0.78	0.77	2.3	2.2
Liquid Conductivity (mea.)	2.50	R	1.732	0.78	0.77	1.1	1.1
Temp. unc. - Conductivity	3.68	R	1.732	0.78	0.77	1.7	1.6
Liquid Permittivity Repeatability	0.02	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.00	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.50	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.84	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						14.5%	14.2%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						29.0%	28.4%

17. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[8] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

[9] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[10] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[11] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

[12] IEC/IEEE 62209-1528:2020, “Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)”, Oct. 2020