FCC SAR TEST REPORT

FCC ID	:	**2A8B72020RM502QAE**
Equipment	:	**5G Sub-6 GHz M.2 Module**
Brand Name	:	**Quectel**
Model Name	:	**RM502Q-AE**
Applicant	:	**Multinarity Ltd.** **112 Yigal Alon 3rd Floor,TEL AVIV, 6789150, Israel**
Standard	:	**FCC 47 CFR Part 2 (2.1093)**

The product was installed Notebook Computer (Brand Name: spacetop, Model Name: SPEA001) during test.

The product was received on Sep. 26, 2022 and testing was started from Oct. 15, 2022 and completed on Nov. 12, 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. Laboratory, the test report shall not be reproduced except in full.

Approved by: Cona Huang / Deputy Manager

Sporton International Inc. Wensan Laboratory
No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan

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History of this test report

Report No.	Version	Description	Issued Date
FA281815	01	Initial issue of report	Dec. 20, 2022

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) for Multinarity Ltd., 5G Sub-6 GHz M.2 Module, RM502Q-AE, are as follows.

Equipment Class	Frequency Band		Highest SAR Summary Body (Separation 0mm) 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	LTE	LTE Band 7	0.86	0.87
		LTE Band 12 / 17	0.71	
		LTE Band 13	0.82	
		LTE Band 14	0.87	
		LTE Band 2 / 25	0.81	
		LTE Band 5 / 26	0.72	
		LTE Band 30	0.81	
		LTE Band 4 / 66	0.81	
		LTE Band 71	0.86	
		LTE Band 38 / 41	0.82	
		LTE Band 48	0.86	
	FR1	FR1 n5	0.87	
		FR1 n7	0.81	
		FR1 n12	0.84	
		FR1 n2 / n25	0.84	
		FR1 n66	0.87	
		FR1 n71	0.84	
		FR1 n41	0.86	
		FR1 n77	0.87	
Date of Testing:			2022/10/15 ~ 2022/11/12	

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation and the FCC designation No. TW3786 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) 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 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

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	5G Sub-6 GHz M.2 Module
Brand Name	Quectel
Model Name	RM502Q-AE
FCC ID	2A8B72020RM502QAE
Integrated WWAN Module	Brand Name: Quectel Model Name: RM502Q-AE
Wireless Technology and Frequency Range	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n7 : 2500 MHz ~ 2570 MHz 5G NR n12 : 699 MHz ~ 716 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77: 3700 MHz ~ 3980 MHz
Mode	LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM

Host Information	
Equipment Name	Notebook Computer
Brand Name	spacetop
Model Name	SPEA001
HW Version	DVT(-SB)
SW Version	Android 10

WLAN Module Information	
Integrated WLAN Module	Brand Name: TurboX Model Name: C865C
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 Bluetooth: 2400 MHz ~ 2483.5 MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/HE20/HE40/HE80 Bluetooth BR/EDR/LE
Remark: 1. The TurboX C865C WLAN/BT module is also integrated into this host. The WLAN and Bluetooth SAR results are referenced from Sporton SAR report, report number: FA290812 (FCC ID: 2A8B7TURBOXC865C), and these SAR results are also used to perform simultaneous transmission analysis.	

3.2 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>2A8B72020RM502QAE</td></tr>
<tr><td>Equipment Name</td><td>5G Sub-6 GHz M.2 Module</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 2: 1850 MHz ~ 1910 MHz
LTE Band 4: 1710 MHz ~ 1755 MHz
LTE Band 5: 824 MHz ~ 849 MHz
LTE Band 7: 2500 MHz ~ 2570 MHz
LTE Band 12: 699 MHz ~ 716 MHz
LTE Band 13: 777 MHz ~ 787 MHz
LTE Band 14: 788 MHz ~ 798 MHz
LTE Band 17: 704 MHz ~ 716 MHz
LTE Band 25: 1850 MHz ~ 1915 MHz
LTE Band 26: 814 MHz ~ 849 MHz
LTE Band 30: 2305 MHz ~ 2315 MHz
LTE Band 38: 2570 MHz ~ 2620 MHz
LTE Band 41: 2496 MHz ~ 2690 MHz
LTE Band 48: 3550 MHz ~ 3700 MHz
LTE Band 66: 1710 MHz ~ 1780 MHz
LTE Band 71: 663 MHz ~ 698 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 13: 5MHz, 10MHz
LTE Band 14: 5MHz, 10MHz
LTE Band 17: 5MHz, 10MHz
LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz
LTE Band 30: 5MHz, 10MHz
LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 48: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 71: 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK / 16QAM / 64QAM / 256QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data only</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr>
</table>
</td></tr>
<tr><td>LTE A-MPR</td><td>In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>Yes, Proximity Sensor.</td></tr>
<tr><td>LTE Carrier Aggregation Combinations</td><td>The Intra-Band possible combinations and the detail power measurement please referred to section 11.</td></tr>
<tr><td>LTE Carrier Aggregation Additional Information</td><td>This device supports maximum of 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.</td></tr>
</table>

Transmission (H, M, L) channel numbers and frequencies in each LTE band												
LTE Band 2												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900
LTE Band 4												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745
LTE Band 5								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844
LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560
LTE Band 12								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711
LTE Band 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	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	27710	2310
M	27710	2310		
H	27735	2312.5		

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506
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

LTE Band 71								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	133147	665.5	133172	668	133197	670.5	133222	673
M	133297	680.5	133297	680.5	133297	680.5	133297	680.5
H	133447	695.5	133422	693	133397	690.5	133372	688

3.3 General 5G NR SAR Test and Reporting Considerations

5G NR Information	
FCC ID	2A8B72020RM502QAE
Equipment Name	5G Sub-6 GHz M.2 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 n25: 1850 MHz ~ 1915 MHz 5G NR n41: 2496 MHz ~ 2690 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n71: 663 MHz ~ 698 MHz 5G NR n77: 3700 MHz ~ 3980 MHz
Channel Bandwidth	5G NR n2: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n5: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n7: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n12: 5MHz, 10MHz, 15MHz 5G NR n25: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n41: 20MHz, 30MHz, 40MHz, 50MHz, 60MHz, 80MHz, 100MHz 5G NR n66: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n71: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n77: 100MHz
SCS	FDD: SCS15KHz, TDD: SCS30KHz
uplink modulations used	DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM CP-OFDM QPSK / 16QAM / 64QAM / 256QAM
A-MPR (Additional MPR) disabled for SAR Testing?	Yes
LTE Anchor Bands for n2	LTE B5/12/13
LTE Anchor Bands for n5	LTE B2/30/66
LTE Anchor Bands for n7	LTE B5/12
LTE Anchor Bands for n12	LTE B2
LTE Anchor Bands for n25	LTE B12
LTE Anchor Bands for n41	LTE B2/25/26/66
LTE Anchor Bands for n66	LTE B5/12/13/14/71
LTE Anchor Bands for n71	LTE B2/7/66

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 25								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	370500	1852.5	371000	1855	371500	1857.5	372000	1860
M	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5
H	382500	1912.5	382000	1910	381500	1907.5	381000	1905

NR Band 41														
	Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 80MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	501204	2506.02	502200	2511	503202	2516.01	504204	2521.02	505200	2526	507204	2536.02	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	534996	2674.98	534000	2670	532998	2664.99	531996	2659.98	529998	2649.99	528000	2640

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

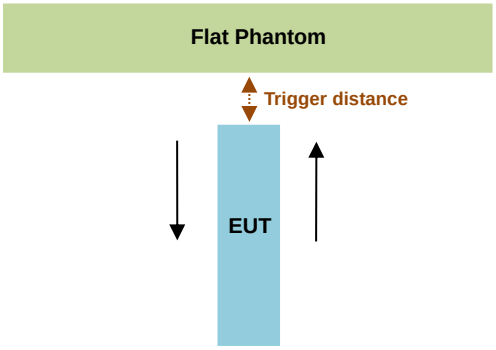
NR Band 71								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	133100	665.5	133600	668	13410	670.5	134600	673
M	136100	680.5	136100	680.5	136100	680.5	136100	680.5
H	139100	695.5	138600	693	13810	690.5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

NR Band 77		
	Bandwidth 100MHz	
	Ch. #	Freq. (MHz)
L	650000	3750
M	656000	3840
H	662000	3930

4. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:

For the device is fully integrated, touch sensing capacitive sensor. It uses a charge transfer capacitive acquisition method that is capable of near range proximity detection. In this device offers a state of the art capacitive sensing engine with an embedded sampling capacitor and voltage regulator allowing the overall solution cost to be reduced and improving system immunity in noisy environments.
Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed. The details are illustrated as following, and the shortest triggering distances were reported and used for SAR assessment.
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering distance than that for 1900MHz, and the tissue-equivalent medium for 1900MHz was used for formal proximity sensor triggering testing.



Proximity Sensor Trigger Distance (mm)		
Bottom of Laptop_ Ant 0		
Position	moving toward	moving away
Minimum	31	33

Proximity Sensor Trigger Distance (mm)		
Bottom of Laptop_ Ant 1		
Position	moving toward	moving away
Minimum	43	41

Proximity Sensor Trigger Distance (mm)		
Bottom of Laptop_ Ant 2		
Position	moving toward	moving away
Minimum	37	36

<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:

Since the antenna and sensor are collocated and all of the peak SAR location is overlapping with the sensor pad for this device, therefore, According to KDB 616217 section6.3, these procedures do not apply and are not required for this device. Due to the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor on this device.

Proximity sensor power reduction

Exposure Position / wireless mode	Bottom of Laptop(1)
LTE Band 7_Ant 0	5.5 dB
LTE Band 12 / 17_Ant 1	3.5 dB
LTE Band 13_Ant 1	3.5 dB
LTE Band 14_Ant 1	3.0 dB
LTE Band 2 / 25_Ant 0	5.0 dB
LTE Band 5 / 26_Ant 1	4.0 dB
LTE Band 30_Ant 0	5.0 dB
LTE Band 38 / 41_Ant 0	4.0 dB
LTE Band 38 / 41 HPUE _Ant 0	6.0 dB
LTE Band 48_Ant 2	2.0 dB
LTE Band 4 / 66_Ant 0	4.5 dB
LTE Band 71_Ant 1	2.5 dB
FR1 n5_Ant 1	3.0 dB
FR1 n7_Ant 0	4.5 dB
FR1 n12_Ant 1	2.0 dB
FR1 n2 / n25_Ant 0	4.5 dB
FR1 n41_Ant 0	4.0 dB
FR1 n41 HPUE _Ant 0	6.0 dB
FR1 n41_Ant 2	5.5 dB
FR1 n41 HPUE _Ant 2	7.5 dB
FR1 n66_Ant 0	3.0 dB
FR1 n71_Ant 1	4.0 dB
FR1 n77_Ant 2	6.0 dB
FR1 n77 HPUE _Ant 2	8.0 dB

Remark:

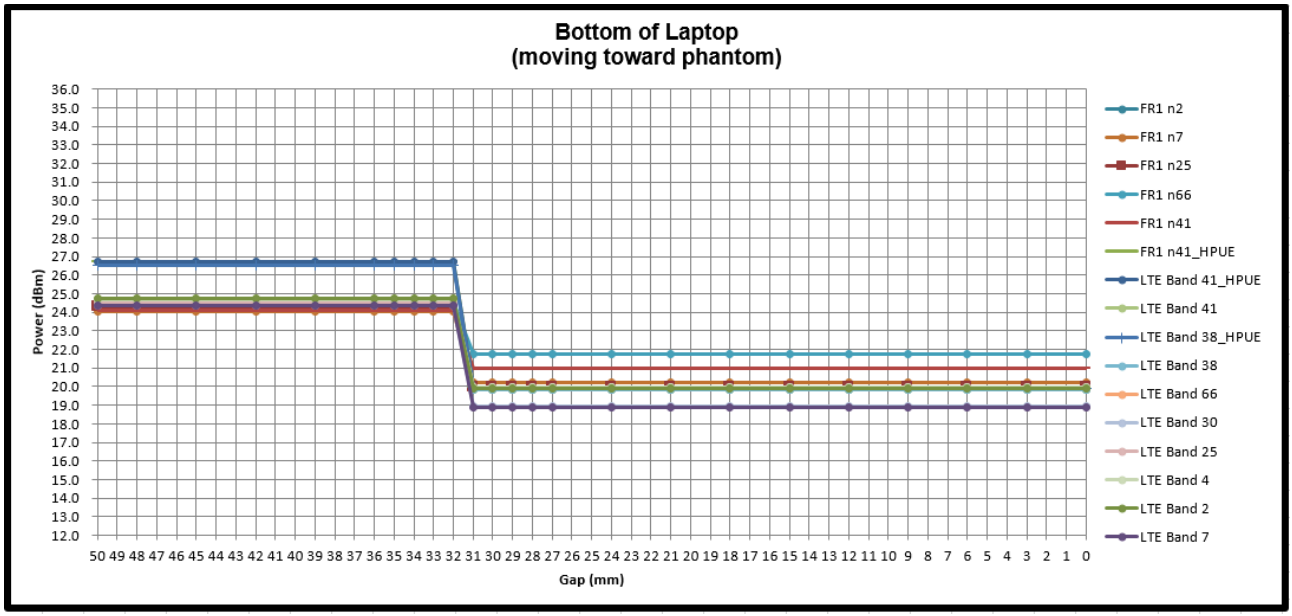
1. (1): Reduced maximum limit applied by activation of proximity sensor.
2. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown as below.
3. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
   Ant 0:
   - Bottom of Laptop: 30 mm

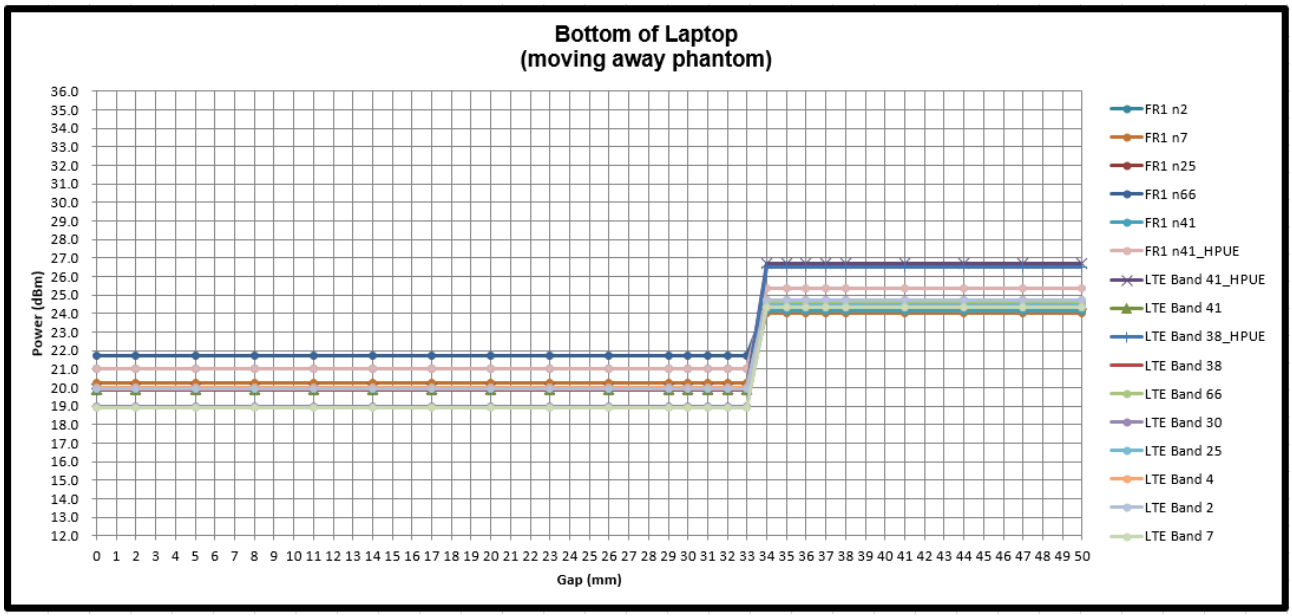
   Ant 1:
   - Bottom of Laptop: 40 mm

   Ant 2:
   - Bottom of Laptop: 35 mm

<Ant 0>

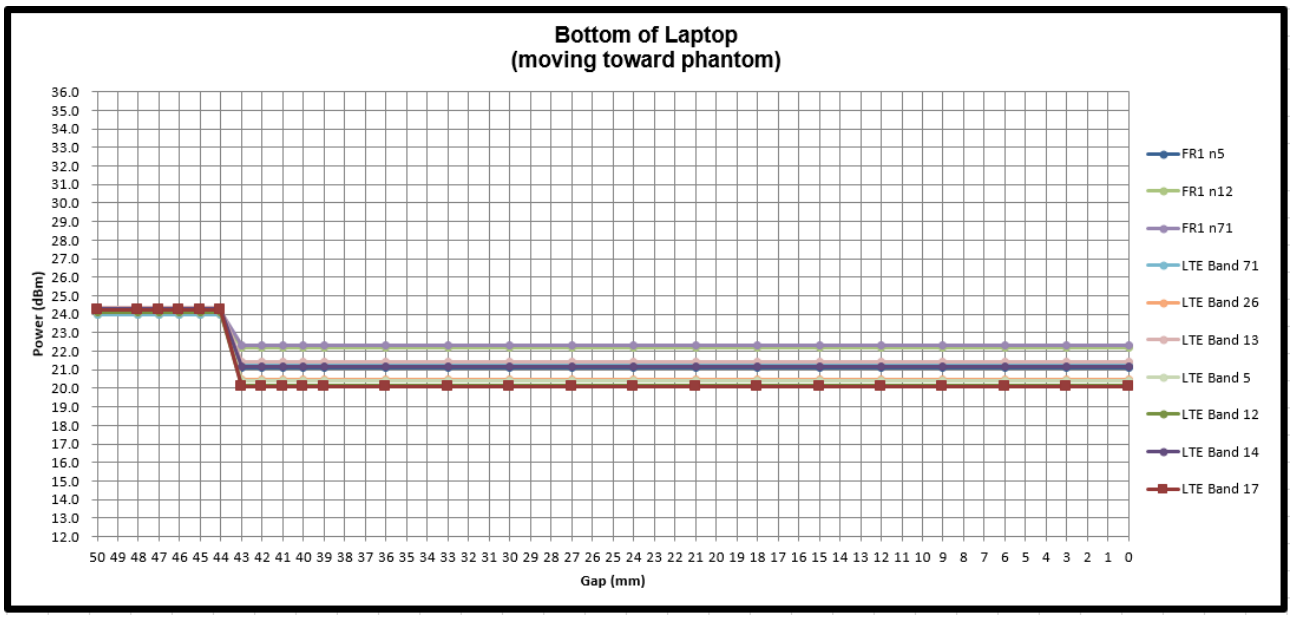
Power Measurement during Sensor Trigger distance testing

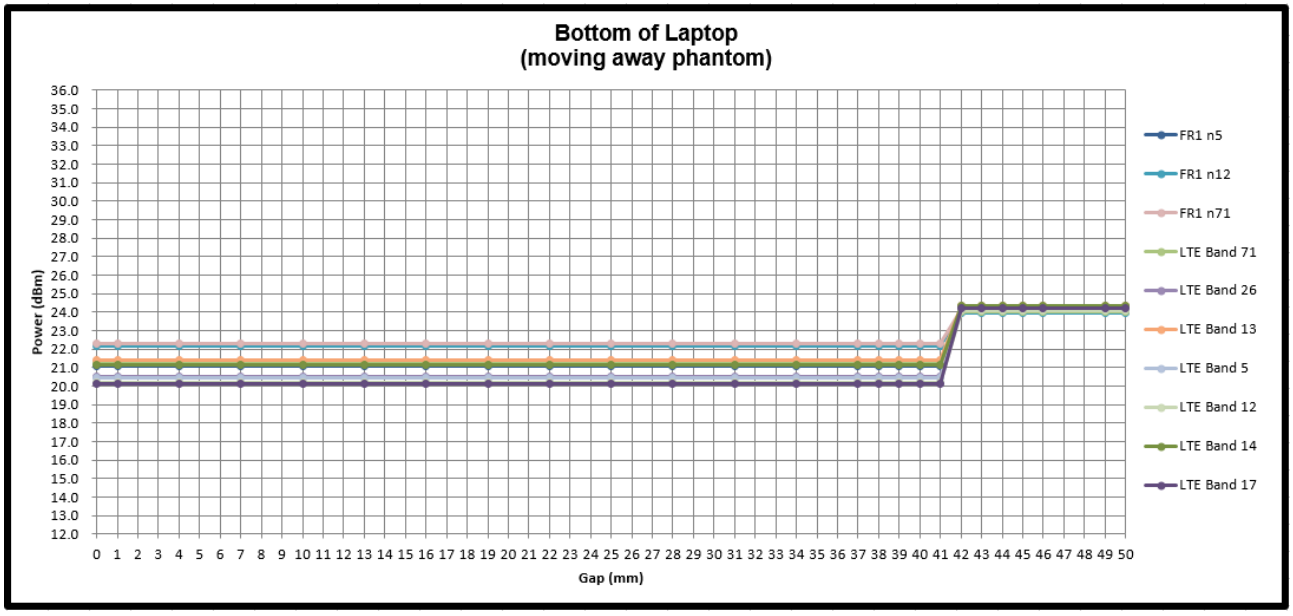




<Ant 1>

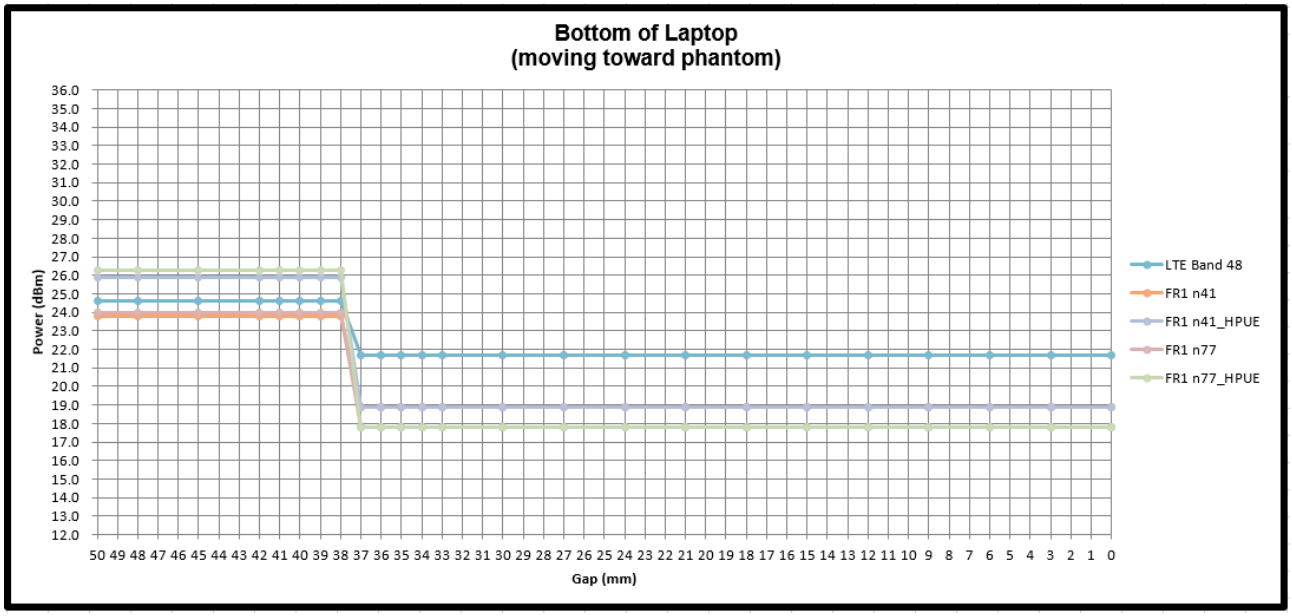
Power Measurement during Sensor Trigger distance testing

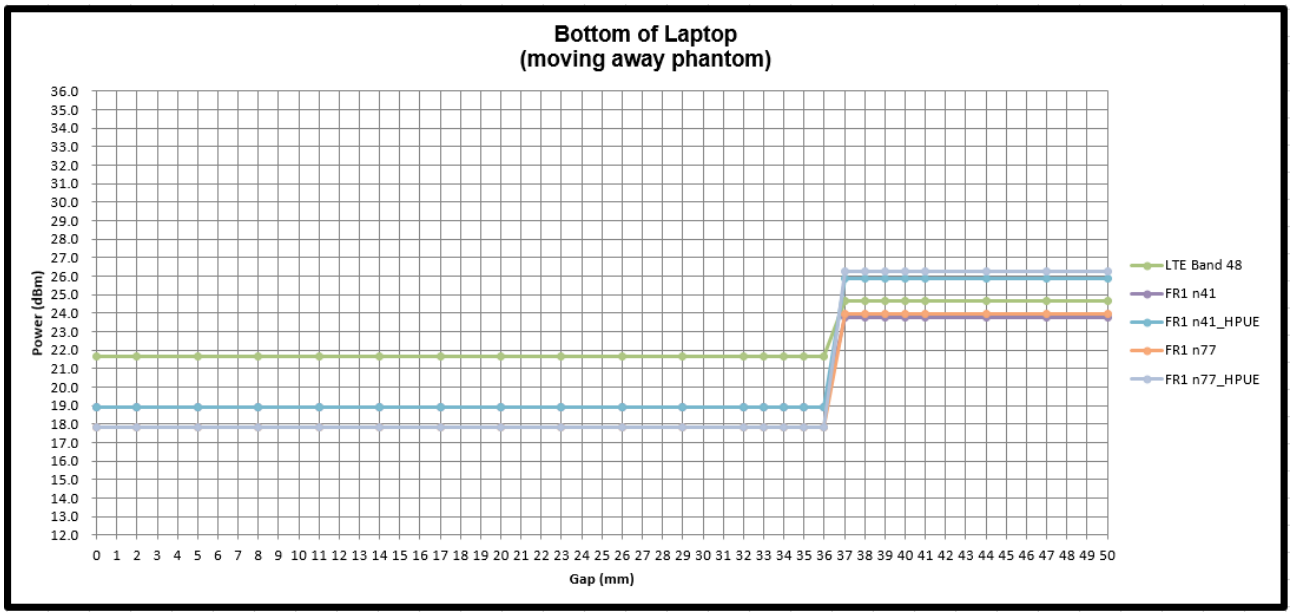




<Ant 2>

Power Measurement during Sensor Trigger distance testing





5. RF Exposure Limits

5.1 Uncontrolled Environment

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

5.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

6. Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

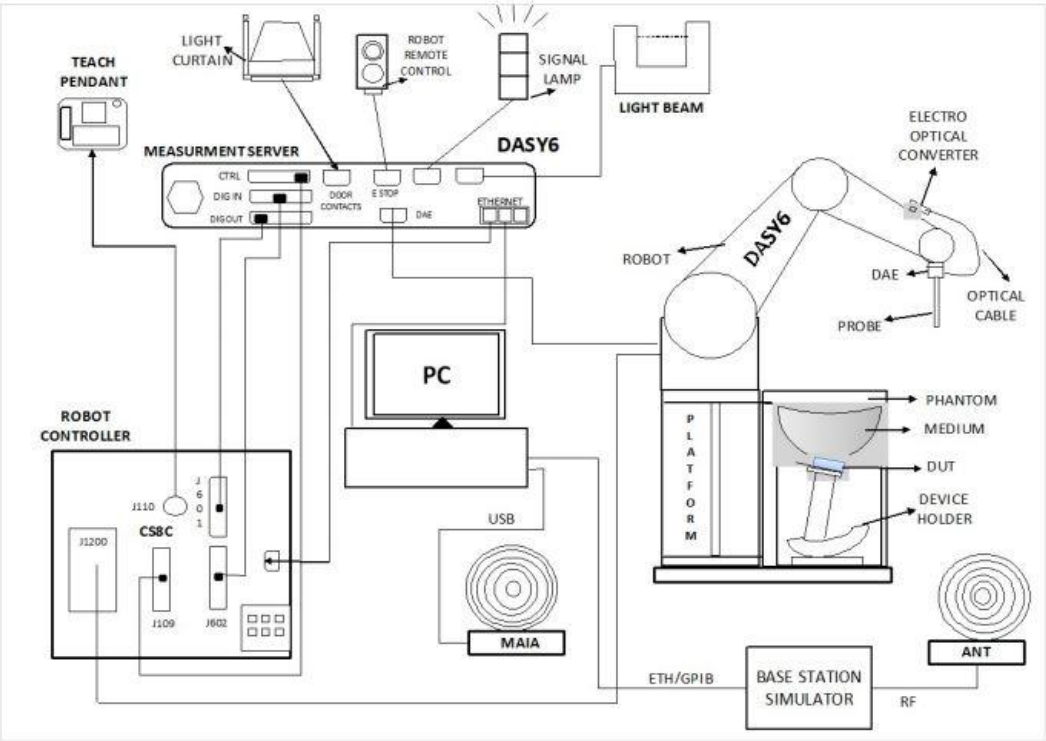
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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



- The DASY system in 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 DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 Test 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	SAR16-HY
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	SAR17-HY

7.2 E-Field Probe

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

<ES3DV3 Probe>

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

7.3 Data Acquisition Electronics (DAE)

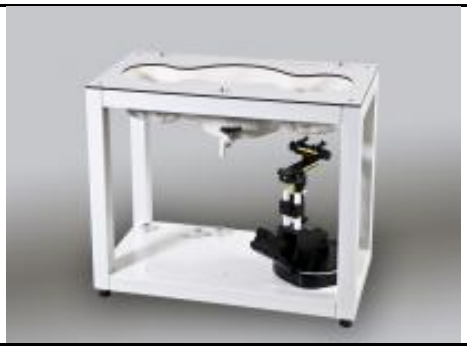
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

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

Fig 5.1 Photo of DAE

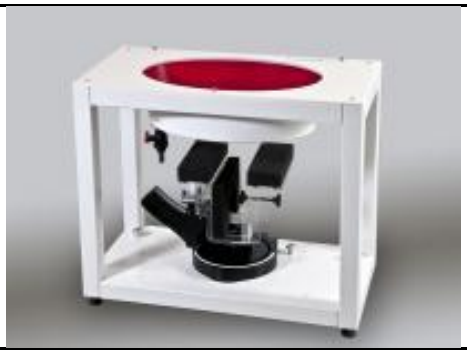
7.4 Phantom

<SAM Twin Phantom>

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

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

<ELI Phantom>

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

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

7.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

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

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

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

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

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

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

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

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

8.1 Spatial Peak SAR Evaluation

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

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

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

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values 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

8.2 Power Reference Measurement

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

8.3 Area Scan

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

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

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

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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit(2)	D750V3	1012	Aug. 18, 2021	Aug. 16, 2023
SPEAG	835MHz System Validation Kit(2)	D835V2	4d167	Nov. 25, 2019	Nov. 22, 2022
SPEAG	1750MHz System Validation Kit	D1750V2	1120	Mar. 25, 2022	Mar. 24, 2023
SPEAG	1750MHz System Validation Kit	D1750V2	1112	Jun. 22, 2022	Jun. 21, 2023
SPEAG	1900MHz System Validation Kit	D1900V2	5d093	Mar. 25, 2022	Mar. 24, 2023
SPEAG	1900MHz System Validation Kit	D1900V2	5d185	Jun. 17, 2022	Jun. 16, 2023
SPEAG	2300MHz System Validation Kit	D2300V2	1006	Jan. 18, 2022	Jan. 17, 2023
SPEAG	2600MHz System Validation Kit(2)	D2600V2	1008	Aug. 17, 2021	Aug. 15, 2023
SPEAG	3500MHz System Validation Kit	D3500V2	1014	Jan. 17, 2022	Jan. 16, 2023
SPEAG	3700MHz System Validation Kit(2)	D3700V2	1022	Jul. 14, 2021	Jul. 12, 2023
SPEAG	3900MHz System Validation Kit	D3900V2	1017	Apr. 22, 2022	Apr. 21, 2023
SPEAG	Data Acquisition Electronics	DAE4	853	Jul. 20, 2022	Jul. 19, 2023
SPEAG	Data Acquisition Electronics	DAE4	1399	Feb. 28, 2022	Feb. 27, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	7695	Nov. 19, 2021	Nov. 18, 2022
SPEAG	Dosimetric E-Field Probe	EX3DV4	7700	Jan. 11, 2022	Jan. 10, 2023
RCPTWN	Thermometer	HTC-1	TM685-1	Jun. 27, 2022	Jun. 26, 2023
RCPTWN	Thermometer	HTC-1	TM560-2	Mar. 15, 2022	Mar. 14, 2023
Anritsu	Radio Communication Analyzer	MT8821C	6201074414	Aug. 19, 2022	Aug. 18, 2023
Keysight	Wireless Communication Test Set	E5515C	MY50267236	Mar. 02, 2022	Mar. 01, 2023
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. 25, 2022	Jul. 24, 2023
SPEAG	Dielectric Probe Kit	DAK-3.5	1146	Jul. 25, 2022	Jul. 24, 2023
LINE SEIKI	Digital Thermometer	DTM3000-spezial	3252	Jul. 25, 2022	Jul. 24, 2023
Anritsu	Power Meter	ML2495A	1419002	Aug. 16, 2022	Aug. 15, 2023
Anritsu	Power Sensor	MA2411B	1911176	Aug. 16, 2022	Aug. 15, 2023
Anritsu	Power Meter	ML2496A	2119003	Jun. 22, 2022	Jun. 21, 2023
Anritsu	Power Sensor	MA2411B	1911334	Jun. 22, 2022	Jun. 21, 2023
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jul. 21, 2022	Jul. 20, 2023
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Jan. 12, 2022	Jan. 11, 2023
Mini-Circuits	Power Amplifier	ZHL-42W+	715701915	May. 12, 2022	May. 11, 2023
Mini-Circuits	Power Amplifier	ZVE-3W-183+	072602118	Mar. 09, 2022	Mar. 08, 2023
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

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

10. System Verification

10.1 Tissue 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
750	22.3	0.910	42.371	0.89	41.90	2.25	1.12	±5	2022/10/15
835	22.3	0.886	41.260	0.90	41.50	-1.56	-0.58	±5	2022/10/15
1750	22.5	1.361	40.178	1.37	40.10	-0.66	0.19	±5	2022/10/16
1750	22.8	1.368	40.664	1.37	40.10	-0.15	1.41	±5	2022/10/18
1900	22.5	1.437	38.630	1.40	40.00	2.64	-3.42	±5	2022/10/16
1900	22.8	1.413	39.248	1.40	40.00	0.93	-1.88	±5	2022/10/18
2300	22.6	1.639	39.362	1.67	39.50	-1.86	-0.35	±5	2022/10/17
2600	22.6	1.984	38.177	1.96	39.00	1.22	-2.11	±5	2022/10/17
2600	22.5	1.970	38.711	1.96	39.00	0.51	-0.74	±5	2022/11/12
3500	22.6	2.884	37.885	2.91	37.90	-0.89	-0.04	±5	2022/10/19
3700	22.6	3.091	37.684	3.12	37.70	-0.93	-0.04	±5	2022/10/19
3900	22.6	3.298	37.496	3.33	37.51	-0.96	-0.04	±5	2022/10/19

10.2 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 (%)
SAR14	2022/10/15	750	250	D750V3-1012	EX3DV4 - SN7695	DAE4 Sn853	2.240	8.560	8.96	4.67
SAR14	2022/10/15	835	250	D835V2-4d167	EX3DV4 - SN7695	DAE4 Sn853	2.480	9.550	9.92	3.87
SAR14	2022/10/16	1750	250	D1750V2-1120	EX3DV4 - SN7695	DAE4 Sn853	8.800	36.400	35.2	-3.30
SAR14	2022/10/18	1750	250	D1750V2-1112	EX3DV4 - SN7695	DAE4 Sn853	8.910	36.900	35.64	-3.41
SAR14	2022/10/16	1900	250	D1900V2-5d093	EX3DV4 - SN7695	DAE4 Sn853	10.100	39.900	40.4	1.25
SAR14	2022/10/18	1900	250	D1900V2-5d185	EX3DV4 - SN7695	DAE4 Sn853	9.380	39.000	37.52	-3.79
SAR14	2022/10/17	2300	250	D2300V2-1006	EX3DV4 - SN7695	DAE4 Sn853	11.800	48.300	47.2	-2.28
SAR14	2022/10/17	2600	250	D2600V2-1008	EX3DV4 - SN7695	DAE4 Sn853	14.100	58.000	56.4	-2.76
SAR13	2022/11/12	2600	50	D2600V2-1008	EX3DV4 - SN7700	DAE4 Sn1399	2.680	58.000	53.6	-7.59
SAR14	2022/10/19	3500	100	D3500V2-1014	EX3DV4 - SN7695	DAE4 Sn853	6.370	67.200	63.7	-5.21
SAR14	2022/10/19	3700	100	D3700V2-1022	EX3DV4 - SN7695	DAE4 Sn853	6.690	68.200	66.9	-1.91
SAR14	2022/10/19	3900	100	D3900V2-1017	EX3DV4 - SN7695	DAE4 Sn853	6.920	68.700	69.2	0.73

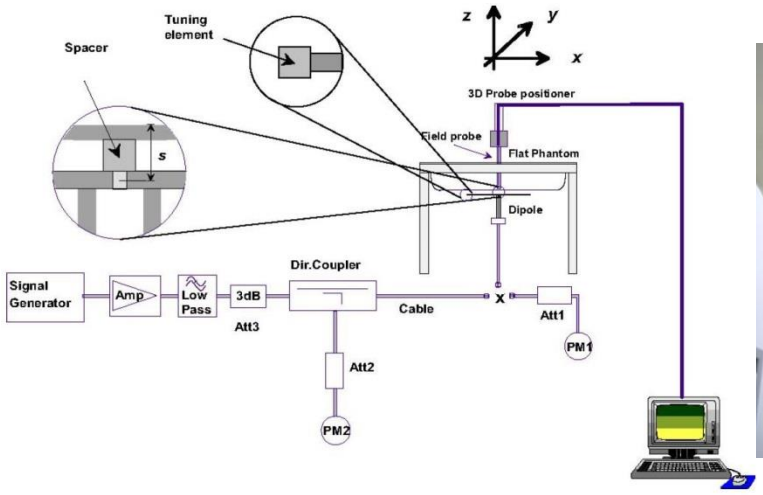


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. Measurement procedure for output power and SAR

Detail output power measurement data is in the appendix D.

<LTE 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.
8. For LTE B4/B5/B12/B17/B26/B38/B71 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE band 2/4/5/17/38 SAR test was covered by Band 25/66/26/12/41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

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

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

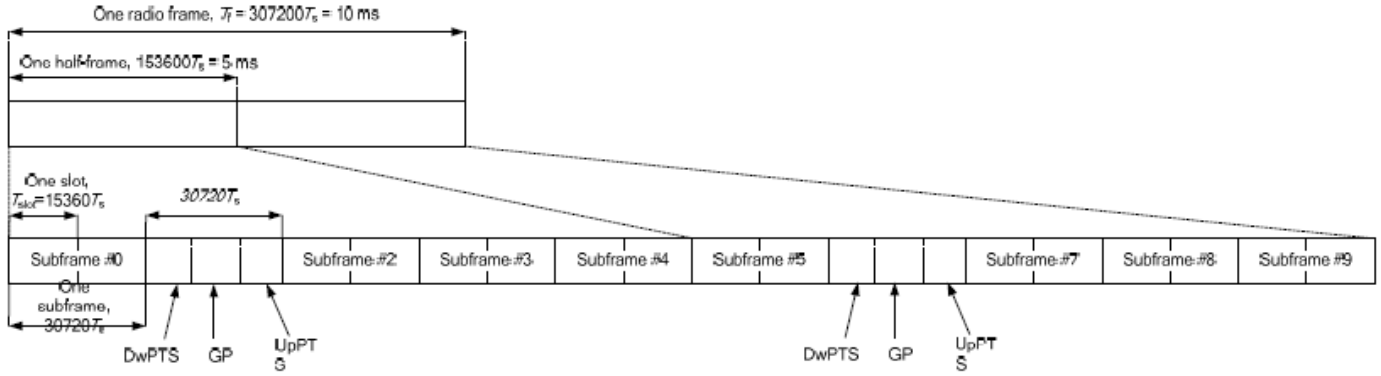


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

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

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

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

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

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

The highest duty factor is resulted from:

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.

vi. The device supports Power Class 3 uplink-downlink configurations 0 and 6, and Power Class 2 uplink-downlink configurations 1 to 5 operations for LTE Band 41.

vii. The highest available duty cycle for Power Class 2 operation is 43.3% using UL-DL configuration 1, for Power Class 3 operation is 63.3% using UL-DL configuration 0. Per FCC Guidance, all SAR tests were performed using Power Class 3. SAR with Power Class 2 at the available duty factor was additionally performed for the Power Class 3 configuration with the highest SAR among all exposure condition.

<5G NR 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.
3. Since the TDD PC3 and PC2 both support 100% transmission, therefore, the RF exposure is choose PC2 to be test, due to PC2 is highest power.

<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		

<LTE Uplink carrier aggregation>

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

<Intra-band>

General Note:

i. The device supports intra-band uplink carrier aggregation for LTE B2/B5/B7/B66/B38/B41 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. Additional SAR measurement for LTE UL CA with 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.

<Full power>

CA_2C										
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)
			RB Size	RB offset	RB Size	RB offset				
18700	18898	QPSK	1	0	0	0	1	0	24.88	25
18900	18702	QPSK	1	0	1	99	2	0	24.26	25
19100	18902	QPSK	1	0	1	99	2	0	24.71	25

CA_5B										
Combination 10MHz+10MHz (50RB+50RB)										
PCC Channel	SCC Channel	Modulation	PCC		SCC		Total RB Size	Target MPR Level (dB)	Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset				
20450	20549	QPSK	1	0	0	0	1	0	24.57	25
20475	20574	QPSK	1	49	1	0	2	0	24.97	25
20600	20501	QPSK	1	0	1	49	2	0	24.99	25

CA_7C										
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)
			RB Size	RB offset	RB Size	RB offset				
20850	21048	QPSK	1	0	0	0	1	0	23.54	25
21100	20902	QPSK	1	0	1	99	2	0	23.9	25
21350	21152	QPSK	1	0	1	99	2	0	24.2	25

CA_66C										
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)
			RB Size	RB offset	RB Size	RB offset				
132072	132270	QPSK	1	0	0	0	1	0	24.24	25
132322	132124	QPSK	1	0	1	99	2	0	24.32	25
132572	132374	QPSK	1	0	1	99	2	0	24.51	25

CA_38C										
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)
			RB Size	RB offset	RB Size	RB offset				
37850	38048	QPSK	1	0	0	0	1	0	24.23	25
37901	38099	QPSK	1	0	0	0	1	0	24.25	25
38150	37952	QPSK	1	0	1	99	2	0	24.18	25

CA_41C										
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)
			RB Size	RB offset	RB Size	RB offset				
39750	39948	QPSK	1	0	0	0	1	0	24.41	25
40185	39987	QPSK	1	0	1	99	2	0	24.89	25
40620	40422	QPSK	1	0	1	99	2	0	24.79	25
41055	40857	QPSK	1	0	1	99	2	0	24.96	25
41490	41292	QPSK	1	0	1	99	2	0	24.44	25

<Down Power>

CA_2C										
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)
			RB Size	RB offset	RB Size	RB offset				
18700	18898	QPSK	1	0	0	0	1	0	18.29	20
18900	18702	QPSK	1	0	1	99	2	0	18.97	20
19100	18902	QPSK	1	0	1	99	2	0	18.84	20

CA_5B										
Combination 10MHz+10MHz (50RB+50RB)										
PCC Channel	SCC Channel	Modulation	PCC		SCC		Total RB Size	Target MPR Level (dB)	Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset				
20450	20549	QPSK	1	0	0	0	1	0	19.68	21
20475	20574	QPSK	1	49	1	0	2	0	20.48	21
20600	20501	QPSK	1	0	1	49	2	0	20.46	21

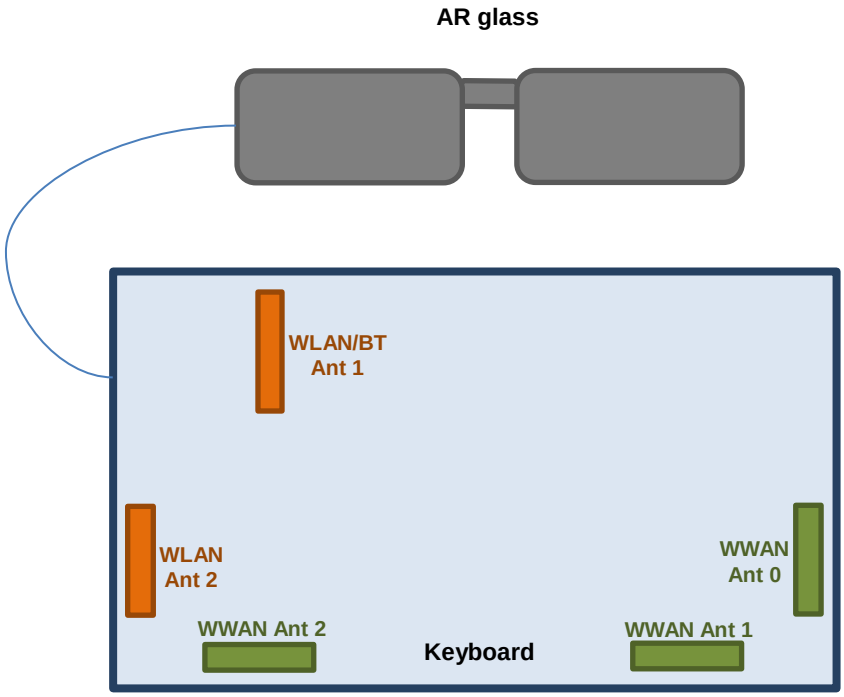
CA_7C										
Combination 20MHz+20MHz (100RB+100RB)										
PCC Channel	SCC Channel	Modulation	PCC		SCC		Total RB Size	Target MPR Level (dB)	Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset				
20850	21048	QPSK	1	0	0	0	1	0	18.06	19.5
21100	20902	QPSK	1	0	1	99	2	0	18.83	19.5
21350	21152	QPSK	1	0	1	99	2	0	18.63	19.5

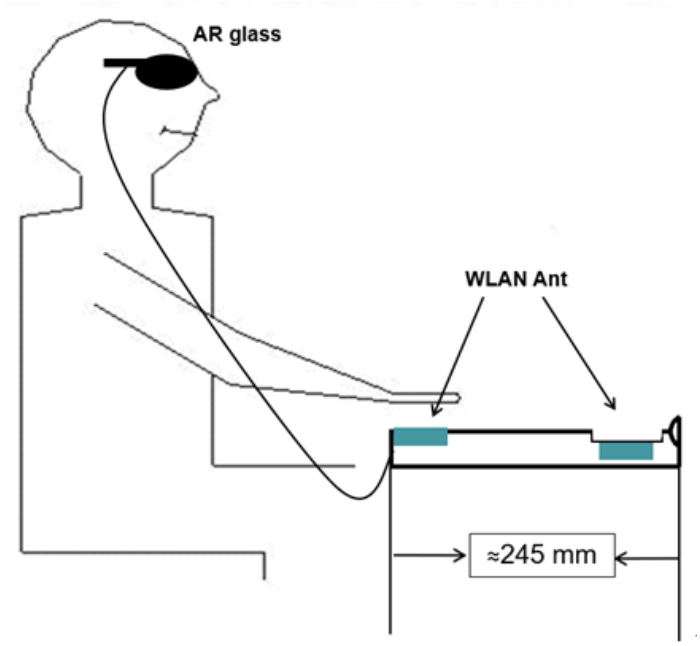
CA_66C										
Combination 20MHz+20MHz (100RB+100RB)										
PCC Channel	SCC Channel	Modulation	PCC		SCC		Total RB Size	Target MPR Level (dB)	Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset				
132072	132270	QPSK	1	0	0	0	1	0	19.26	20.5
132322	132124	QPSK	1	0	1	99	2	0	19.87	20.5
132572	132374	QPSK	1	0	1	99	2	0	19.93	20.5

CA_38C										
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)
			RB Size	RB offset	RB Size	RB offset				
37850	38048	QPSK	1	0	0	0	1	0	19.24	21
37901	38099	QPSK	1	0	0	0	1	0	19.19	21
38150	37952	QPSK	1	0	1	99	2	0	19.23	21

CA_41C										
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)
			RB Size	RB offset	RB Size	RB offset				
39750	39948	QPSK	1	0	0	0	1	0	19.1	21
40185	39987	QPSK	1	0	1	99	2	0	19.75	21
40620	40422	QPSK	1	0	1	99	2	0	19.68	21
41055	40857	QPSK	1	0	1	99	2	0	19.78	21
41490	41292	QPSK	1	0	1	99	2	0	19.41	21

12. Antenna Location





13. 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 WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   c. 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.

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.
6. For LTE B4/B5/B12/B17/B26/B38/B71 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
7. LTE band 2/4/5/17/38 SAR test was covered by Band 25/66/26/12/41; according to TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. The maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion.
   b. The channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

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/n71/n77, 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.
   g. Since the TDD PC3 and PC2 both support 100% transmission, therefore, the RF exposure is choose PC2 to be test, due to PC2 is highest power.

13.1 Body SAR

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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 7_Ant 0	20M	QPSK	1	99	Bottom of Laptop	0mm	ON	20850	2510	18.89	19.50	1.151	0	0.659	0.758
	LTE Band 7_Ant 0	20M	QPSK	50	50	Bottom of Laptop	0mm	ON	21350	2560	18.68	19.50	1.208	0.02	0.665	0.803
	LTE Band 7_Ant 0	20M	QPSK	50	50	Bottom of Laptop	0mm	ON	20850	2510	18.58	19.50	1.236	0.01	0.672	0.831
01	LTE Band 7_Ant 0	20M	QPSK	50	50	Bottom of Laptop	0mm	ON	21100	2535	18.59	19.50	1.233	0.04	0.701	0.864
	LTE Band 7_Ant 0	20M	QPSK	100	0	Bottom of Laptop	0mm	ON	21100	2535	18.56	19.50	1.242	0.1	0.672	0.834
	LTE Band 7_Ant 0	20M	QPSK	1	0	Bottom of Laptop	30mm	OFF	20850	2510	24.35	25.00	1.161	-0.18	0.153	0.178
	LTE Band 7_Ant 0	20M	QPSK	50	24	Bottom of Laptop	30mm	OFF	20850	2510	23.47	24.00	1.130	0.06	0.122	0.138
	LTE Band 7C_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	21100	2535	18.83	19.50	1.167	0.02	0.673	0.785
02	LTE Band 12_Ant 1	10M	QPSK	1	49	Bottom of Laptop	0mm	ON	23095	707.5	20.07	21.50	1.390	-0.19	0.514	0.714
	LTE Band 12_Ant 1	10M	QPSK	25	12	Bottom of Laptop	0mm	ON	23095	707.5	20.15	21.50	1.365	0.01	0.520	0.710
	LTE Band 12_Ant 1	10M	QPSK	1	49	Bottom of Laptop	40mm	OFF	23095	707.5	24.03	25.00	1.250	0.03	0.055	0.069
	LTE Band 12_Ant 1	10M	QPSK	25	25	Bottom of Laptop	40mm	OFF	23095	707.5	23.13	24.00	1.222	-0.15	0.041	0.050
	LTE Band 13_Ant 1	10M	QPSK	1	0	Bottom of Laptop	0mm	ON	23230	782	21.43	21.50	1.016	0.1	0.788	0.801
	LTE Band 13_Ant 1	10M	QPSK	25	25	Bottom of Laptop	0mm	ON	23230	782	21.30	21.50	1.047	-0.04	0.739	0.774
03	LTE Band 13_Ant 1	10M	QPSK	50	0	Bottom of Laptop	0mm	ON	23230	782	21.22	21.50	1.067	-0.02	0.768	0.819
	LTE Band 13_Ant 1	10M	QPSK	1	0	Bottom of Laptop	40mm	OFF	23230	782	24.34	25.00	1.164	0.02	0.061	0.071
	LTE Band 13_Ant 1	10M	QPSK	25	25	Bottom of Laptop	40mm	OFF	23230	782	23.46	24.00	1.132	0.09	0.048	0.054
	LTE Band 14_Ant 1	10M	QPSK	1	0	Bottom of Laptop	0mm	ON	23330	793	21.09	22.00	1.233	0	0.656	0.809
	LTE Band 14_Ant 1	10M	QPSK	25	12	Bottom of Laptop	0mm	ON	23330	793	21.16	22.00	1.213	0.02	0.640	0.777
04	LTE Band 14_Ant 1	10M	QPSK	50	0	Bottom of Laptop	0mm	ON	23330	793	21.15	22.00	1.216	-0.04	0.714	0.868
	LTE Band 14_Ant 1	10M	QPSK	1	0	Bottom of Laptop	40mm	OFF	23330	793	24.32	25.00	1.169	0.01	0.046	0.054
	LTE Band 14_Ant 1	10M	QPSK	25	12	Bottom of Laptop	40mm	OFF	23330	793	23.18	24.00	1.208	0.02	0.033	0.040

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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	LTE Band 25_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	26590	1905	19.87	20.00	1.030	-0.13	0.789	0.813
	LTE Band 25_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	26140	1860	19.83	20.00	1.040	-0.12	0.750	0.780
	LTE Band 25_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	26340	1880	19.84	20.00	1.038	0	0.741	0.769
	LTE Band 25_Ant 0	20M	QPSK	50	24	Bottom of Laptop	0mm	ON	26140	1860	19.99	20.00	1.002	0.18	0.755	0.757
	LTE Band 25_Ant 0	20M	QPSK	100	0	Bottom of Laptop	0mm	ON	26140	1860	19.97	20.00	1.007	-0.07	0.772	0.777
	LTE Band 25_Ant 0	20M	QPSK	1	0	Bottom of Laptop	30mm	OFF	26140	1860	24.46	25.00	1.132	0.04	0.201	0.228
	LTE Band 25_Ant 0	20M	QPSK	50	24	Bottom of Laptop	30mm	OFF	26140	1860	23.66	24.00	1.081	0.09	0.167	0.181
	LTE Band 2C_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	18900	1880	18.97	20.00	1.268	0.09	0.623	0.790
	LTE Band 26_Ant 1	15M	QPSK	1	0	Bottom of Laptop	0mm	ON	26865	831.5	20.38	21.00	1.153	0.06	0.582	0.671
06	LTE Band 26_Ant 1	15M	QPSK	36	20	Bottom of Laptop	0mm	ON	26865	831.5	20.21	21.00	1.199	0.01	0.599	0.719
	LTE Band 26_Ant 1	15M	QPSK	1	0	Bottom of Laptop	40mm	OFF	26865	831.5	23.95	25.00	1.274	0	0.020	0.025
	LTE Band 26_Ant 1	15M	QPSK	36	20	Bottom of Laptop	40mm	OFF	26865	831.5	23.12	24.00	1.225	0.08	0.016	0.020
	LTE Band 5B_Ant 1	10M	QPSK	1	0	Bottom of Laptop	0mm	ON	20475	831.5	20.48	21.00	1.127	0.04	0.598	0.674
	LTE Band 30_Ant 0	10M	QPSK	1	25	Bottom of Laptop	0mm	ON	27710	2310	18.98	20.00	1.265	0.04	0.579	0.732
07	LTE Band 30_Ant 0	10M	QPSK	25	25	Bottom of Laptop	0mm	ON	27710	2310	18.79	20.00	1.321	0.05	0.611	0.807
	LTE Band 30_Ant 0	10M	QPSK	50	0	Bottom of Laptop	0mm	ON	27710	2310	18.76	20.00	1.330	0.02	0.597	0.794
	LTE Band 30_Ant 0	10M	QPSK	1	0	Bottom of Laptop	30mm	OFF	27710	2310	24.34	25.00	1.164	0.08	0.191	0.222
	LTE Band 30_Ant 0	10M	QPSK	25	0	Bottom of Laptop	30mm	OFF	27710	2310	23.44	24.00	1.138	0.01	0.158	0.180
	LTE Band 66_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	132322	1745	19.99	20.50	1.125	0.02	0.684	0.769
	LTE Band 66_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	132072	1720	19.96	20.50	1.132	0.05	0.711	0.805
08	LTE Band 66_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	132572	1770	19.93	20.50	1.140	-0.03	0.708	0.807
	LTE Band 66_Ant 0	20M	QPSK	50	0	Bottom of Laptop	0mm	ON	132322	1745	19.71	20.50	1.199	0.01	0.647	0.776
	LTE Band 66_Ant 0	20M	QPSK	100	0	Bottom of Laptop	0mm	ON	132322	1745	19.70	20.50	1.202	-0.02	0.594	0.714
	LTE Band 66_Ant 0	20M	QPSK	1	0	Bottom of Laptop	30mm	OFF	132572	1770	24.50	25.00	1.122	0.06	0.078	0.088
	LTE Band 66_Ant 0	20M	QPSK	50	25	Bottom of Laptop	30mm	OFF	132072	1720	23.67	24.00	1.079	0.11	0.054	0.058
	LTE Band 66C_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	132572	1770	19.93	20.50	1.140	0.01	0.654	0.746
09	LTE Band 71_Ant 1	20M	QPSK	1	49	Bottom of Laptop	0mm	ON	133297	680.5	21.16	22.50	1.361	0.02	0.634	0.863
	LTE Band 71_Ant 1	20M	QPSK	50	24	Bottom of Laptop	0mm	ON	133297	680.5	21.26	22.50	1.330	0.06	0.648	0.862
	LTE Band 71_Ant 1	20M	QPSK	100	0	Bottom of Laptop	0mm	ON	133297	680.5	21.15	22.00	1.216	-0.09	0.649	0.789
	LTE Band 71_Ant 1	20M	QPSK	1	49	Bottom of Laptop	40mm	OFF	133297	680.5	23.91	25.00	1.285	0.01	0.018	0.023
	LTE Band 71_Ant 1	20M	QPSK	50	50	Bottom of Laptop	40mm	OFF	133297	680.5	23.06	24.00	1.242	0.08	0.013	0.016

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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)
	LTE Band 41_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	40620	2593	19.87	21.00	1.297	62.9	1.006	-0.18	0.474	0.619
10	LTE Band 41_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	39750	2506	19.52	21.00	1.406	62.9	1.006	-0.02	0.582	0.823
	LTE Band 41_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	40185	2549.5	19.66	21.00	1.361	62.9	1.006	-0.12	0.557	0.763
	LTE Band 41_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	41055	2636.5	19.71	21.00	1.346	62.9	1.006	0.1	0.464	0.628
	LTE Band 41_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	41490	2680	19.48	21.00	1.419	62.9	1.006	0.03	0.493	0.704
	LTE Band 41_Ant 0	20M	QPSK	50	24	Bottom of Laptop	0mm	ON	40620	2593	19.85	21.00	1.303	62.9	1.006	0.11	0.385	0.505
	LTE Band 41_Ant 0	20M	QPSK	100	0	Bottom of Laptop	0mm	ON	40620	2593	19.81	21.00	1.315	62.9	1.006	-0.18	0.383	0.507
	LTE Band 41_Ant 0	20M	QPSK	1	0	Bottom of Laptop	30mm	OFF	40620	2593	24.47	25.00	1.130	62.9	1.006	-0.18	0.049	0.056
	LTE Band 41_Ant 0	20M	QPSK	50	24	Bottom of Laptop	30mm	OFF	40620	2593	23.57	24.00	1.104	62.9	1.006	-0.02	0.037	0.041
	LTE Band 41_HPUE_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	40620	2593	19.96	21.00	1.271	42.9	1.009	0.11	0.407	0.522
	LTE Band 41C_Ant 0	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	41055	2636.5	19.78	21.00	1.324	62.9	1.006	0.03	0.545	0.726
	LTE Band 48_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	55830	3609	21.53	23.00	1.403	62.9	1.006	0.18	0.572	0.807
	LTE Band 48_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	56150	3641	21.52	23.00	1.406	62.9	1.006	-0.04	0.495	0.700
11	LTE Band 48_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	55340	3560	21.40	23.00	1.445	62.9	1.006	-0.11	0.594	0.864
	LTE Band 48_Ant 2	20M	QPSK	1	0	Bottom of Laptop	0mm	ON	56640	3690	21.49	23.00	1.416	62.9	1.006	-0.09	0.408	0.581
	LTE Band 48_Ant 2	20M	QPSK	50	0	Bottom of Laptop	0mm	ON	56150	3641	21.68	23.00	1.355	62.9	1.006	-0.18	0.486	0.663
	LTE Band 48_Ant 2	20M	QPSK	100	0	Bottom of Laptop	0mm	ON	56150	3641	21.63	23.00	1.371	62.9	1.006	0.04	0.544	0.750
	LTE Band 48_Ant 2	20M	QPSK	1	0	Bottom of Laptop	35mm	OFF	55830	3609	24.62	25.00	1.091	62.9	1.006	0.02	0.147	0.161
	LTE Band 48_Ant 2	20M	QPSK	50	0	Bottom of Laptop	35mm	OFF	55830	3609	23.71	24.00	1.069	62.9	1.006	0.03	0.121	0.130

<5G NR SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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)
	FR1 n5_Ant 1	20M	BPSK	1	1	Bottom of Laptop	0mm	ON	167300	836.5	21.07	22.00	1.239	-0.07	0.695	0.861
12	FR1 n5_Ant 1	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	167300	836.5	20.86	22.00	1.300	-0.11	0.668	0.869
	FR1 n5_Ant 1	20M	BPSK	100	0	Bottom of Laptop	0mm	ON	167300	836.5	20.89	22.00	1.291	-0.08	0.627	0.810
	FR1 n5_Ant 1	20M	BPSK	1	1	Bottom of Laptop	40mm	OFF	167300	836.5	23.90	25.00	1.288	0.07	0.013	0.017
	FR1 n5_Ant 1	20M	BPSK	50	28	Bottom of Laptop	40mm	OFF	167300	836.5	23.78	25.00	1.324	0.01	0.011	0.015
	FR1 n7_Ant 0	20M	BPSK	1	1	Bottom of Laptop	0mm	ON	507000	2535	20.06	20.50	1.107	0.13	0.726	0.803
13	FR1 n7_Ant 0	20M	BPSK	1	1	Bottom of Laptop	0mm	ON	502000	2510	19.95	20.50	1.135	-0.14	0.714	0.810
	FR1 n7_Ant 0	20M	BPSK	1	1	Bottom of Laptop	0mm	ON	512000	2560	20.01	20.50	1.119	-0.03	0.688	0.770
	FR1 n7_Ant 0	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	507000	2535	20.22	20.50	1.067	0.06	0.740	0.789
	FR1 n7_Ant 0	20M	BPSK	100	0	Bottom of Laptop	0mm	ON	507000	2535	20.11	20.50	1.094	-0.18	0.720	0.788
	FR1 n7_Ant 0	20M	BPSK	1	1	Bottom of Laptop	30mm	OFF	507000	2535	24.03	25.00	1.250	-0.02	0.070	0.088
	FR1 n7_Ant 0	20M	BPSK	50	28	Bottom of Laptop	30mm	OFF	507000	2535	23.94	25.00	1.276	0.07	0.064	0.082
	FR1 n12_Ant 1	15M	BPSK	1	1	Bottom of Laptop	0mm	ON	141500	707.5	22.17	23.00	1.211	0.13	0.653	0.791
14	FR1 n12_Ant 1	15M	BPSK	36	22	Bottom of Laptop	0mm	ON	141500	707.5	21.96	23.00	1.271	-0.05	0.659	0.837
	FR1 n12_Ant 1	15M	BPSK	75	0	Bottom of Laptop	0mm	ON	141500	707.5	21.94	23.00	1.276	0.19	0.639	0.816
	FR1 n12_Ant 1	15M	BPSK	1	1	Bottom of Laptop	40mm	OFF	141500	707.5	23.93	25.00	1.279	0.01	0.009	0.012
	FR1 n12_Ant 1	15M	BPSK	36	22	Bottom of Laptop	40mm	OFF	141500	707.5	23.78	25.00	1.324	0.02	0.007	0.009
	FR1 n25_Ant 0	20M	BPSK	1	1	Bottom of Laptop	0mm	ON	376500	1882.5	19.97	20.50	1.130	0.05	0.687	0.776
	FR1 n25_Ant 0	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	376500	1882.5	19.74	20.50	1.191	-0.13	0.675	0.804
	FR1 n25_Ant 0	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	372000	1860	19.73	20.50	1.194	0.19	0.698	0.833
15	FR1 n25_Ant 0	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	381000	1905	19.68	20.50	1.208	-0.02	0.699	0.844
	FR1 n25_Ant 0	20M	BPSK	100	0	Bottom of Laptop	0mm	ON	376500	1882.5	19.69	20.50	1.205	-0.17	0.664	0.800
	FR1 n25_Ant 0	20M	BPSK	1	53	Bottom of Laptop	30mm	OFF	376500	1882.5	24.31	25.00	1.172	0.04	0.155	0.182
	FR1 n25_Ant 0	20M	BPSK	50	28	Bottom of Laptop	30mm	OFF	376500	1882.5	24.30	25.00	1.175	-0.09	0.147	0.173

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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)
	FR1 n41_HPUE_Ant 0	100M	BPSK	1	271	Bottom of Laptop	0mm	ON	518598	2592.99	21.00	21.00	1.000	-0.13	0.762	0.762
16	FR1 n41_HPUE_Ant 0	100M	BPSK	135	69	Bottom of Laptop	0mm	ON	518598	2592.99	20.91	21.00	1.021	-0.07	0.837	0.855
	FR1 n41_HPUE_Ant 0	100M	BPSK	270	0	Bottom of Laptop	0mm	ON	518598	2592.99	20.90	21.00	1.023	-0.14	0.812	0.831
	FR1 n41_HPUE_Ant 0	100M	BPSK	1	1	Bottom of Laptop	30mm	OFF	518598	2592.99	25.36	27.00	1.459	0.03	0.033	0.048
	FR1 n41_HPUE_Ant 0	100M	BPSK	135	69	Bottom of Laptop	30mm	OFF	518598	2592.99	25.27	27.00	1.489	0.09	0.027	0.040
	FR1 n41_HPUE_Ant 2	100M	BPSK	1	1	Bottom of Laptop	0mm	ON	518598	2592.99	18.89	19.50	1.151	0.09	0.687	0.791
	FR1 n41_HPUE_Ant 2	100M	BPSK	135	69	Bottom of Laptop	0mm	ON	518598	2592.99	18.70	19.50	1.202	0.01	0.708	0.851
	FR1 n41_HPUE_Ant 2	100M	BPSK	270	0	Bottom of Laptop	0mm	ON	518598	2592.99	18.73	19.50	1.194	-0.05	0.709	0.847
	FR1 n41_HPUE_Ant 2	100M	BPSK	1	137	Bottom of Laptop	35mm	OFF	518598	2592.99	25.88	27.00	1.294	0.02	0.006	0.008
	FR1 n41_HPUE_Ant 2	100M	BPSK	135	69	Bottom of Laptop	35mm	OFF	518598	2592.99	25.58	27.00	1.387	0.01	0.005	0.007
	FR1 n66_Ant 0	20M	BPSK	1	1	Bottom of Laptop	0mm	ON	354000	1770	21.55	22.00	1.109	0.18	0.579	0.642
	FR1 n66_Ant 0	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	354000	1770	21.74	22.00	1.062	0.04	0.759	0.806
	FR1 n66_Ant 0	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	344000	1720	21.48	22.00	1.127	0.11	0.601	0.677
17	FR1 n66_Ant 0	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	349000	1745	21.52	22.00	1.117	-0.1	0.778	0.869
	FR1 n66_Ant 0	20M	BPSK	100	0	Bottom of Laptop	0mm	ON	349000	1745	21.50	22.00	1.122	-0.01	0.330	0.370
	FR1 n66_Ant 0	20M	BPSK	1	1	Bottom of Laptop	30mm	OFF	344000	1720	24.55	25.00	1.109	0.05	0.111	0.123
	FR1 n66_Ant 0	20M	BPSK	50	28	Bottom of Laptop	30mm	OFF	344000	1720	24.52	25.00	1.117	0.07	0.107	0.120
18	FR1 n71_Ant 1	20M	BPSK	1	1	Bottom of Laptop	0mm	ON	136100	680.5	22.12	23.00	1.225	-0.07	0.688	0.843
	FR1 n71_Ant 1	20M	BPSK	50	28	Bottom of Laptop	0mm	ON	136100	680.5	22.09	23.00	1.233	0.15	0.639	0.788
	FR1 n71_Ant 1	20M	BPSK	100	0	Bottom of Laptop	0mm	ON	136100	680.5	21.95	23.00	1.274	0.09	0.652	0.830
	FR1 n71_Ant 1	20M	BPSK	1	1	Bottom of Laptop	40mm	OFF	136100	680.5	23.95	25.00	1.274	0.06	0.022	0.028
	FR1 n71_Ant 1	20M	BPSK	50	28	Bottom of Laptop	40mm	OFF	136100	680.5	23.92	25.00	1.282	0.04	0.019	0.024
	FR1 n77_HPUE_Ant 2	100M	BPSK	1	137	Bottom of Laptop	0mm	ON	656000	3840	17.80	19.00	1.318	-0.15	0.639	0.842
19	FR1 n77_HPUE_Ant 2	100M	BPSK	135	69	Bottom of Laptop	0mm	ON	656000	3840	17.79	19.00	1.321	-0.12	0.657	0.868
	FR1 n77_HPUE_Ant 2	100M	BPSK	270	0	Bottom of Laptop	0mm	ON	656000	3840	17.60	19.00	1.380	0	0.593	0.819
	FR1 n77_HPUE_Ant 2	100M	BPSK	1	1	Bottom of Laptop	35mm	OFF	656000	3840	26.27	27.00	1.183	0.08	0.054	0.064
	FR1 n77_HPUE_Ant 2	100M	BPSK	135	69	Bottom of Laptop	35mm	OFF	656000	3840	26.16	27.00	1.213	0.12	0.051	0.062

13.2 Repeated SAR Measurement

No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	FR1 n41_HPUE_Ant 0	100M	BPSK	135	69	Bottom of Laptop	0mm	ON	518598	2592.99	20.91	21.00	1.021	-0.07	0.837	-	0.855
2nd	FR1 n41_HPUE_Ant 0	100M	BPSK	135	69	Bottom of Laptop	0mm	ON	518598	2592.99	20.91	21.00	1.021	0.11	0.787	1.06	0.803

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

13.3 LTE Band 41 Power Class 2 and Power Class 3 Linearity

This device support Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operation is 43.3% using UL-DL configuration 1. Per FCC Guidance based on the device behavior, all SAR tests were performed using Power Class 3. Power Class 2 is tested using the highest SAR test configuration in Power Class 3 for each LTE configuration and exposure condition combination, according to the highest time averaged power for all applicable uplink-downlink configurations in Power Class 2. When the reported SAR vs. output power is linearly scaled with < 10% discrepancy between power classes and all reported SAR are < 1.4 W/kg, Separate SAR testing for Power Class 2 is not required
Use PC3 power level and SAR to estimated PC2 SAR linearly, and check if the deviation from the measured PC2 SAR is <10%

Ant 0	LTE Band 41 (Power Class 3)	LTE Band 41 (Power Class 2)
Maximum Tune up Power (dBm)	21	21
Reported 1g SAR (W/kg)	0.823	0.522
Duty Cycle	63.30%	43.30%
Frame Averaged (mW)	79.69	54.51
Linearity SAR(W/kg)	0.56	
% deviation from expected linearity		-7.28%

14. Simultaneous Transmission Analysis

	NO.	Simultaneous Transmission Configurations	Body
Standalone		DBS	
	1.	LTE/NR + WLAN2.4GHz Ant 1 + WLAN2.4GHz Ant 2 + WLAN5GHz Ant 1 + WLAN5GHz Ant 2	Yes
		Non-DBS	
	2.	LTE/NR + WLAN2.4GHz Ant 1 + WLAN2.4GHz Ant 2	Yes
	3.	LTE/NR + WLAN5GHz Ant 1 + WLAN5GHz Ant 2 + Bluetooth Ant 1	Yes

	NO.	Simultaneous Transmission Configurations	Body
EN-DC		DBS	
	1.	LTE + FR1 + WLAN2.4GHz Ant 1 + WLAN2.4GHz Ant 2 + WLAN5GHz Ant 1 + WLAN5GHz Ant 2	Yes
		Non-DBS	
	2.	LTE + FR1 + WLAN2.4GHz Ant 1 + WLAN2.4GHz Ant 2	Yes
	3.	LTE + FR1 + WLAN5GHz Ant 1 + WLAN5GHz Ant 2 + Bluetooth Ant 1	Yes

General Note:

1. The worst case WLAN reported SAR for each configuration was used for SAR summation. Therefore, the following summations represent the absolute worst cases for simultaneous transmission with WLAN.
2. WLAN RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode. Therefore SPLSR calculation was choose worst case with SAR test results of each antenna in SISO mode perform evaluation.
3. The Scaled SAR summation is calculated based on the same configuration and test position.
4. 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.
   v) The SPLSR calculated results please refer to section 14.2.

14.1 Body Exposure Conditions

Standalone

<DBS>

Exposure Position	WWAN Ant	0 Maximum WWAN 1g SAR (W/kg)	1 WLAN2.4GHz Ant 1 1g SAR (W/kg)	2 WLAN2.4GHz Ant 2 1g SAR (W/kg)	3 WLAN5GHz Ant 1 1g SAR (W/kg)	4 WLAN5GHz Ant 2 1g SAR (W/kg)	0+1+2+3+4 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	Ant 0	0.869	0.758	0.386	0.790	0.360	3.163	0.02	Case 1
Bottom of Laptop at 0mm	Ant 1	0.869	0.758	0.386	0.790	0.360	3.163	0.02	Case 2
Bottom of Laptop at 0mm	Ant 2	0.868	0.758	0.386	0.790	0.360	3.162	0.04	Case 3

<Non-DBS>

Exposure Position	WWAN Ant	0 Maximum WWAN 1g SAR (W/kg)	1 WLAN2.4GHz Ant 1 1g SAR (W/kg)	2 WLAN2.4GHz Ant 2 1g SAR (W/kg)	3 WLAN5GHz Ant 1 1g SAR (W/kg)	4 WLAN5GHz Ant 2 1g SAR (W/kg)	5 Bluetooth Ant 1 1g SAR (W/kg)	0+1+2 Summed 1g SAR (W/kg)	0+3+4+5 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	Ant 0	0.869	0.758	0.386	0.790	0.360	0.214	2.013	2.233	0.01	Case 4
Bottom of Laptop at 0mm	Ant 1	0.869	0.758	0.386	0.790	0.360	0.214	2.013	2.233	0.01	Case 5
Bottom of Laptop at 0mm	Ant 2	0.868	0.758	0.386	0.790	0.360	0.214	2.012	2.232	0.03	Case 6

EN-DC

<DBS>

Exposure Position	1 Maximum LTE Ant 0 1g SAR (W/kg)	2 Maximum FR1 Ant 1 1g SAR (W/kg)	3 WLAN2.4GHz Ant 1 1g SAR (W/kg)	4 WLAN2.4GHz Ant 2 1g SAR (W/kg)	5 WLAN5GHz Ant 1 1g SAR (W/kg)	6 WLAN5GHz Ant 2 1g SAR (W/kg)	1+2+3+4+5+6 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	0.864	0.869	0.758	0.386	0.790	0.360	4.027	0.04	Case 7

Exposure Position	1 Maximum LTE Ant 1 1g SAR (W/kg)	2 Maximum FR1 Ant 0 1g SAR (W/kg)	3 WLAN2.4GHz Ant 1 1g SAR (W/kg)	4 WLAN2.4GHz Ant 2 1g SAR (W/kg)	5 WLAN5GHz Ant 1 1g SAR (W/kg)	6 WLAN5GHz Ant 2 1g SAR (W/kg)	1+2+3+4+5+6 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	0.868	0.869	0.758	0.386	0.790	0.360	4.031	0.04	Case 8

Exposure Position	1 Maximum LTE Ant 0 1g SAR (W/kg)	2 Maximum FR1 Ant 2 1g SAR (W/kg)	3 WLAN2.4GHz Ant 1 1g SAR (W/kg)	4 WLAN2.4GHz Ant 2 1g SAR (W/kg)	5 WLAN5GHz Ant 1 1g SAR (W/kg)	6 WLAN5GHz Ant 2 1g SAR (W/kg)	1+2+3+4+5+6 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	0.813	0.851	0.758	0.386	0.790	0.360	3.958	0.03	Case 9

Exposure Position	1 Maximum LTE Ant 1 1g SAR (W/kg)	2 Maximum FR1 Ant 2 1g SAR (W/kg)	3 WLAN2.4GHz Ant 1 1g SAR (W/kg)	4 WLAN2.4GHz Ant 2 1g SAR (W/kg)	5 WLAN5GHz Ant 1 1g SAR (W/kg)	6 WLAN5GHz Ant 2 1g SAR (W/kg)	1+2+3+4+5+6 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	0.719	0.851	0.758	0.386	0.790	0.360	3.864	0.03	Case 10

<Non-DBS>

Exposure Position	1 Maximum LTE Ant 0 1g SAR (W/kg)	2 Maximum FR1 Ant 1 1g SAR (W/kg)	3 WLAN2.4GHz Ant 1 1g SAR (W/kg)	4 WLAN2.4GHz Ant 2 1g SAR (W/kg)	5 WLAN5GHz Ant 1 1g SAR (W/kg)	6 WLAN5GHz Ant 2 1g SAR (W/kg)	7 Bluetooth Ant 1 1g SAR (W/kg)	1+2+3+4 Summed 1g SAR (W/kg)	1+2+5+6+7 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	0.864	0.869	0.758	0.386	0.790	0.360	0.214	2.877	3.097	0.04	Case 11

Exposure Position	1 Maximum LTE Ant 1 1g SAR (W/kg)	2 Maximum FR1 Ant 0 1g SAR (W/kg)	3 WLAN2.4GHz Ant 1 1g SAR (W/kg)	4 WLAN2.4GHz Ant 2 1g SAR (W/kg)	5 WLAN5GHz Ant 1 1g SAR (W/kg)	6 WLAN5GHz Ant 2 1g SAR (W/kg)	7 Bluetooth Ant 1 1g SAR (W/kg)	1+2+3+4 Summed 1g SAR (W/kg)	1+2+5+6+7 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	0.868	0.869	0.758	0.386	0.790	0.360	0.214	2.881	3.101	0.04	Case 12

Exposure Position	1 Maximum LTE Ant 0 1g SAR (W/kg)	2 Maximum FR1 Ant 2 1g SAR (W/kg)	3 WLAN2.4GHz Ant 1 1g SAR (W/kg)	4 WLAN2.4GHz Ant 2 1g SAR (W/kg)	5 WLAN5GHz Ant 1 1g SAR (W/kg)	6 WLAN5GHz Ant 2 1g SAR (W/kg)	7 Bluetooth Ant 1 1g SAR (W/kg)	1+2+3+4 Summed 1g SAR (W/kg)	1+2+5+6+7 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	0.813	0.851	0.758	0.386	0.790	0.360	0.214	2.808	3.028	0.02	Case 13

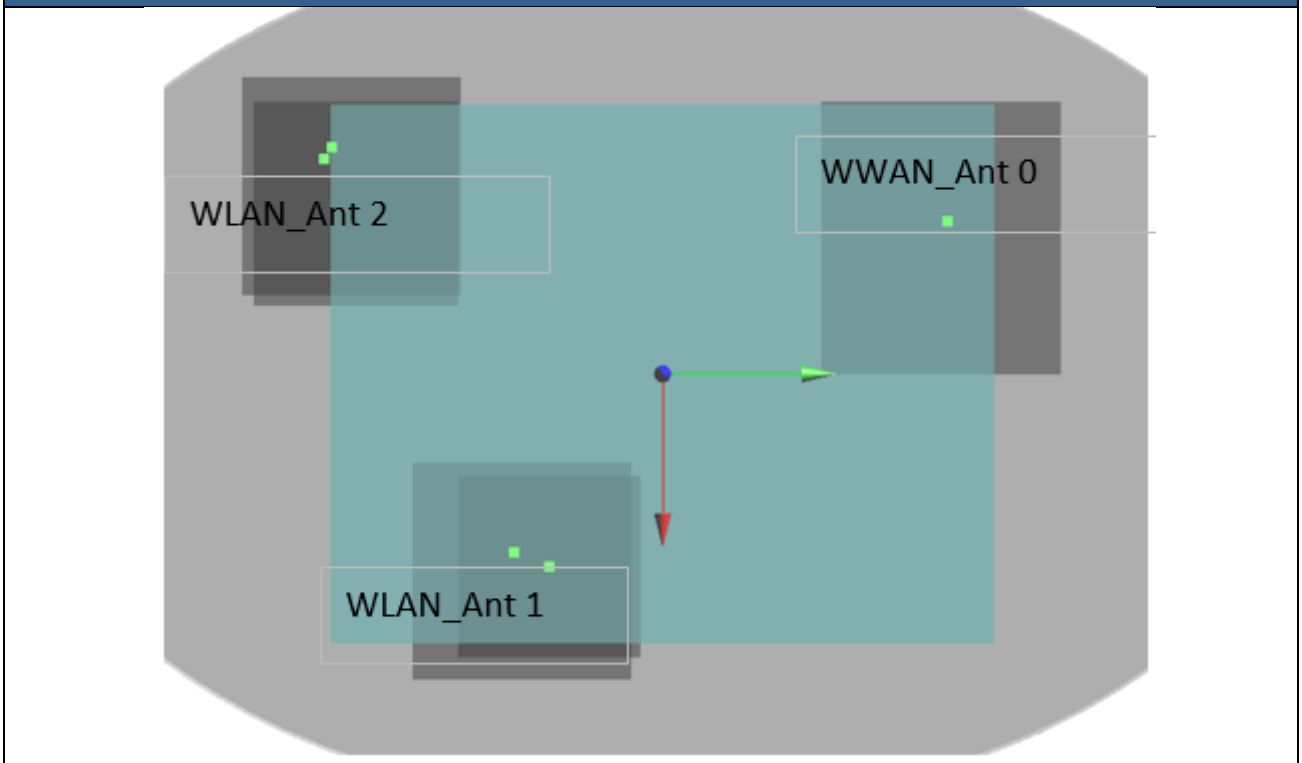
Exposure Position	1 Maximum LTE Ant 1 1g SAR (W/kg)	2 Maximum FR1 Ant 2 1g SAR (W/kg)	3 WLAN2.4GHz Ant 1 1g SAR (W/kg)	4 WLAN2.4GHz Ant 2 1g SAR (W/kg)	5 WLAN5GHz Ant 1 1g SAR (W/kg)	6 WLAN5GHz Ant 2 1g SAR (W/kg)	7 Bluetooth Ant 1 1g SAR (W/kg)	1+2+3+4 Summed 1g SAR (W/kg)	1+2+5+6+7 Summed 1g SAR (W/kg)	SPLSR	Case No
Bottom of Laptop at 0mm	0.719	0.851	0.758	0.386	0.790	0.360	0.214	2.714	2.934	0.02	Case 14

14.2 SPLSR Evaluation and Analysis

General Note:

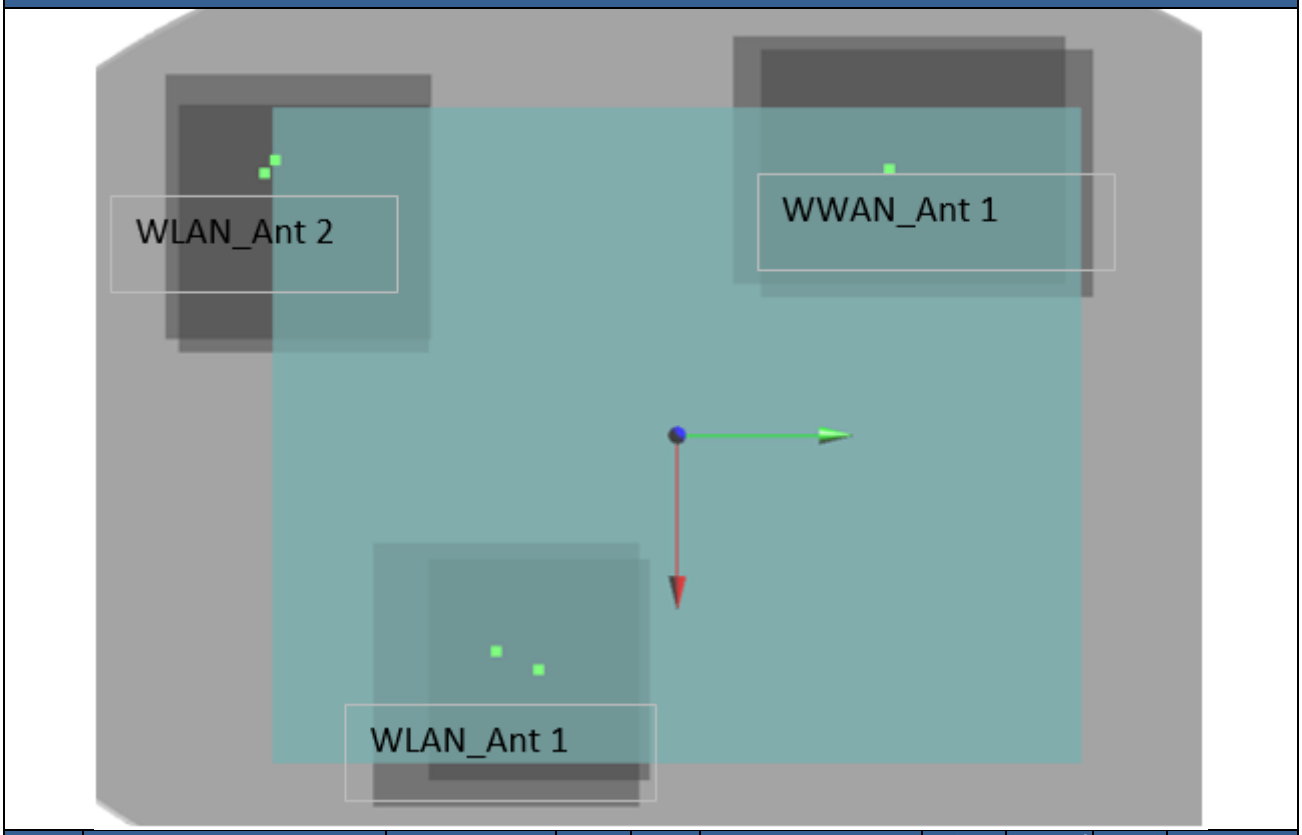
1. Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneously transmitting antenna. When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration. Therefore, the adjacent transmit antennas will be summed first, and then the SPLSR calculation will be evaluated with the farther transmitted antennas.
2. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary
3. The detail hotspot point for each transmitter in each exposure condition are showing as below figure and the minimum 3D distance for each sum combination is used for SPLSR analysis.

Bottom of laptop hotspot point



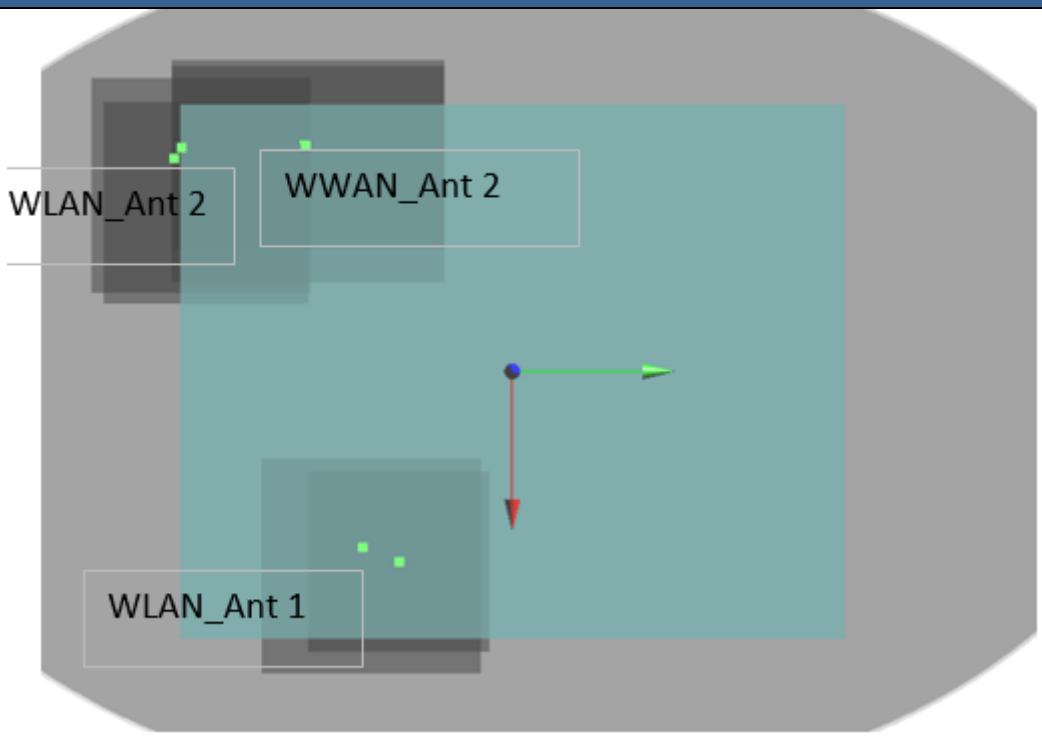
	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
Case 1	FR1 n66_Ant 0	Bottom of Laptop	0.869	0mm	-65.9	123.9	0.12	229.1	2.42	0.02	Not required
	WLAN2.4G Ant 1+WLAN5G Ant 1		1.548	0mm	84.2	-49.2	0.94				
	FR1 n66_Ant 0	Bottom of Laptop	0.869	0mm	-65.9	123.9	0.12	270.3	1.62	0.01	Not required
	WLAN2.4G Ant 2+WLAN5G Ant 2		0.746	0mm	-98.8	-144.4	-0.09				
	WLAN2.4G Ant 1+WLAN5G Ant 1	Bottom of Laptop	1.548	0mm	84.2	-49.2	0.94	206.3	2.29	0.02	Not required
	WLAN2.4G Ant 2+WLAN5G Ant 2		0.746	0mm	-98.8	-144.4	-0.09				

Bottom of laptop hotspot point



	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
Case 2	FR1 n5_Ant 1	Bottom of Laptop	0.869	0mm	-96.5	74.9	-0.38	219.2	2.42	0.02	Not required
	WLAN2.4G Ant 1+WLAN5G Ant 1		1.548	0mm	84.2	-49.2	0.94				
	FR1 n5_Ant 1	Bottom of Laptop	0.869	0mm	-96.5	74.9	-0.38	219.3	1.62	0.01	Not required
	WLAN2.4G Ant 2+WLAN5G Ant 2		0.746	0mm	-98.8	-144.4	-0.09				
	WLAN2.4G Ant 1+WLAN5G Ant 1	Bottom of Laptop	1.548	0mm	84.2	-49.2	0.94	206.3	2.29	0.02	Not required
	WLAN2.4G Ant 2+WLAN5G Ant 2		0.746	0mm	-98.8	-144.4	-0.09				

Bottom of laptop hotspot point



	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
Case 3	FR1 n77_Ant 2	Bottom of Laptop	0.868	0mm	-102.6	-90.6	1.39	191.3	2.42	0.02	Not required
	WLAN2.4G Ant 1+WLAN5G Ant 1		1.548	0mm	84.2	-49.2	0.94				
	FR1 n77_Ant 2	Bottom of Laptop	0.868	0mm	-102.6	-90.6	1.39	54.0	1.61	0.04	Not required
	WLAN2.4G Ant 2+WLAN5G Ant 2		0.746	0mm	-98.8	-144.4	-0.09				
	WLAN2.4G Ant 1+WLAN5G Ant 1	Bottom of Laptop	1.548	0mm	84.2	-49.2	0.94	206.3	2.29	0.02	Not required
	WLAN2.4G Ant 2+WLAN5G Ant 2		0.746	0mm	-98.8	-144.4	-0.09				

Test Engineer：Chris Yang, Jeff Tsao, Shane Song, Henry Chou and Randy Lin

15. Uncertainty Assessment

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

16. 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 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

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

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

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

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

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