

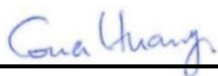
FCC SAR TEST REPORT

FCC ID : E2KFM350GL
Equipment : 5G Module
Brand Name : Fibocom
Model Name : FM350-GL
Applicant : Fibocom Wireless Inc.
1101,Tower A, Building 6, Shenzhen International, Innovation
Valley, Dashi 1st Rd, Nanshan, ShenZhen, China
Manufacturer : Fibocom Wireless Inc.
1101,Tower A, Building 6, Shenzhen International, Innovation
Valley, Dashi 1st Rd, Nanshan, ShenZhen, China
Standard : FCC 47 CFR Part 2 (2.1093)

The product was installed into Portable Computer (Brand Name DELL, Model Name: P178G, P178G001) during test.

The product was received on Jan. 18, 2023 and testing was started from May 19, 2023 and completed on May 19, 2023. 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



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History of this test report

Report No.	Version	Description	Issued Date
FA2O2008-01	01	Initial issue of report	Jun. 20, 2023

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) for **Fibocom Wireless Inc., 5G Module, FM350-GL**, are as follows.

Equipment Class	Frequency Band		Highest SAR Summary	Highest Simultaneous Transmission 1g SAR (W/kg)	
			Body		
			1g SAR (W/kg)		
Licensed	WCDMA	WCDMA II	1.18	1.55	
		WCDMA IV	1.11		
		WCDMA V	1.02		
	LTE	LTE Band 7	1.05		
		LTE Band 12 / 17	1.01		
		LTE Band 13	1.12		
		LTE Band 14	1.13		
		LTE Band 2 / 25	1.02		
		LTE Band 5 / 26	1.03		
		LTE Band 30	1.19		
		LTE Band 4 / 66	1.10		
		LTE Band 71	0.89		
		LTE Band 38 / 41	1.06		
		LTE Band 48	1.03		
		FR1	FR1 n2		1.04
			FR1 n5		0.88
	FR1 n7		1.15		
	FR1 n25		1.09		
	FR1 n30		0.97		
	FR1 n66		0.92		
	FR1 n71		0.79		
	FR1 n38 / n41		1.18		
	FR1 n48		0.93		
	FR1 n77 / n78	1.44			
Date of Testing:			2023/5/19		

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093) 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: Daisy Peng

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 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	5G Module
Brand Name	Fibocom
Model Name	FM350-GL
FCC ID	E2KFM350GL
Wireless Technology and Frequency Range	WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz 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 n25 : 1850 MHz ~ 1915 MHz 5G NR n30 : 2305 MHz ~ 2315 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77: 3700 MHz ~ 3980 MHz, 3450MHz ~ 3550MHz 5G NR n78: 3700 MHz ~ 3800 MHz, 3450MHz ~ 3550MHz
Mode	RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM
Remark: 1. Based on the original RF Exposure test report No.: FA2O2008 to enable 5G NR n48 .	

WWAN Antenna Information (LW)				
Main Antenna	Manufacturer	Wistron Corporation	Peak gain(dBi)	1.77
	Part number	0NNTR2	Type	PIFA
MIMO2 Antenna	Manufacturer	Wistron Corporation	Peak gain(dBi)	1.88
	Part number	0YH5FP	Type	PIFA
MIMO3 Antenna	Manufacturer	Wistron Corporation	Peak gain(dBi)	2.39
	Part number	0YH5FP	Type	PIFA
Aux Antenna	Manufacturer	Wistron Corporation	Peak gain(dBi)	1.43
	Part number	0NNTR2	Type	PIFA

Host Information	
Equipment Name	Portable Computer
Brand Name	DELL
Model Name	P178G
Integrated WLAN Module	Brand Name: Intel Model Name: AX211D2W
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8GHz Band: 5725 MHz ~ 5850 MHz WLAN 5.9 GHz Band: 5850 MHz ~ 5895 MHz WLAN 6GHz: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE
EUT Stage	Production Unit
Remark: 1. The Intel AX211D2W WLAN/BT module is also integrated into this host. The WLAN 2.4GHz/5GHz and Bluetooth SAR results are referenced from Intel SAR report, report number: 221017-03.TR01 (FCC ID: PD9AX211D2), WLAN 6GHz SAR refers new report No.: 221017-03.TR02 (FCC ID: PD9AX211D2), these result also using for Sim-Tx analysis.	

3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05								
FCC ID	E2KFM350GL							
Equipment Name	5G Module							
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz							
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 14: 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz LTE Band 30: 5MHz, 10MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 48: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 71: 5MHz, 10MHz, 15MHz, 20MHz							
uplink modulations used	QPSK / 16QAM / 64QAM / 256QAM							
LTE Voice / Data requirements	Data only							
LTE MPR permanently built-in by design	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3							
	Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})						MPR (dB)
		1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
	256 QAM	≥ 1						≤ 5
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)							
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.							
Power reduction applied to satisfy SAR compliance	Yes, Proximity Sensor.							

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)	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)	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)	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)	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)	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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506				
L	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5				
M	40620	2593	40620	2593	40620	2593	40620	2593				
H	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5				
M	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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	55265	3552.5	55290	3555	55315	3557.5	55340	3560				
L	55810	3607	55815	3607.5	55820	3608	55830	3609				
M	56170	3643	56165	3642.5	56160	3642	56150	3641				
H	56715	3697.5	56690	3695	56665	3692.5	56640	3690				
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)	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	E2KFM350GL							
Equipment Name	5G 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 n25: 1850 MHz ~ 1915 MHz 5G NR n30: 2305 MHz ~ 2315 MHz 5G NR n38: 2570 MHz ~ 2620 MHz 5G NR n41: 2496 MHz ~ 2690 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n71: 663 MHz ~ 698 MHz 5G NR n77: 3700 MHz ~ 3980 MHz, 3450MHz ~ 3550MHz 5G NR n78: 3700 MHz ~ 3800 MHz, 3450MHz ~ 3550MHz							
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 n25: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n30: 10MHz 5G NR n38: 10MHz, 15MHz, 20MHz 5G NR n41: 10MHz, 15MHz, 20MHz, 40MHz, 50MHz, 60MHz, 80MHz, 90MHz, 100MHz 5G NR n48: 10MHz, 15MHz, 20MHz, 30MHz, 40MHz 5G NR n66: 5MHz, 10MHz, 15MHz, 20MHz, 40MHz 5G NR n71: 5MHz, 10MHz, 15MHz, 20MHz 5G NR n77/78: 10MHz, 15MHz, 20MHz, 40MHz, 50MHz, 60MHz, 80MHz, 90MHz, 100MHz							
SCS	FDD/TDD: SCS15KHz, SCS30KHz							
uplink modulations used	DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM CP-OFDM QPSK / 16QAM / 64QAM / 256QAM							
A-MPR (Additional MPR) disabled for SAR Testing?	Yes							
LTE Anchor Bands for n2	LTE B5/12/13/14							
LTE Anchor Bands for n5	LTE B2/7/30/48/66							
LTE Anchor Bands for n41	LTE B2/41/66							
LTE Anchor Bands for n66	LTE B5/12/13/48							
LTE Anchor Bands for n71	LTE B2/66							
LTE Anchor Bands for n77	LTE B2/5/12/13/14/30/41/66							
LTE Anchor Bands for n78	LTE B2/5/7/38							
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 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 30																				
	Bandwidth 10MHz																			
	Ch. #								Freq. (MHz)											
M	462000								2310											
NR Band 38																				
	Bandwidth 10MHz				Bandwidth 15MHz				Bandwidth 20MHz											
	Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)									
L	515004		2575.02		515502		2577.51		516000		2580									
M	519000		2595		519000		2595		519000		2595									
H	522996		2614.98		522498		2612.49		522000		2610									
NR Band 41																				
	Bandwidth10MHz		Bandwidth15MHz		Bandwidth20MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth100MHz			
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	500202	2501.01	500700	2503.5	501204	2506.02	503202	2516.01	504204	2521.02	505200	2526	507204	2536.02	508200	2541	509202	2546.01		
M	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99		
H	537000	2685	536496	2682.48	535998	2679.99	534000	2670	532998	2664.99	531996	2659.98	529998	2649.99	528996	2644.98	528000	2640		
NR Band 48																				
	Bandwidth10MHz				Bandwidth 15MHz				Bandwidth20MHz				Bandwidth30MHz				Bandwidth 40MHz			
	Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)	
L	637000		3555		637168		3557.52		637334		3560.01		637668		3565.02		638000		3570	
M	641666		3624.99		641666		3624.99		641666		3624.99		641666		3624.99		641666		3624.99	
H	646332		3694.98		646166		3692.49		646000		3690		645666		3684.99		645332		3679.98	
NR Band 66																				
	Bandwidth 5MHz				Bandwidth 10MHz				Bandwidth 15MHz				Bandwidth 20MHz				Bandwidth 40MHz			
	Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)	
L	342500		1712.5		343000		1715		343500		1717.5		344000		1720		346000		1730	
M	349000		1745		349000		1745		349000		1745		349000		1745		349000		1745	
H	355500		1777.5		355000		1775		354500		1772.5		354000		1770		352000		1760	
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																				
	Bandwidth10MHz		Bandwidth15MHz		Bandwidth 20MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth100MHz			
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	647000	3705	647168	3707.52	647334	3710.01	648000	3720	648334	3725.01	648668	3730.02	649334	3740.01	649668	3745.02	650000	3750		
M	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840		
H	665000	3975	664832	3972.48	664666	3969.99	664000	3960	663666	3954.99	663332	3949.98	662666	3939.99	662332	3934.98	662000	3930		
NR Band 78																				
	Bandwidth10MHz		Bandwidth15MHz		Bandwidth 20MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth100MHz			
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	647000	3705	647168	3707.52	647334	3710.01	648000	3720	648334	3725.01	648668	3730.02	649334	3740.01	649668	3745.02				
M	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750		
H	653000	3795	652832	3792.48	652666	3789.99	652000	3780	651666	3774.99	651332	3769.98	650666	3759.99	650332	3754.98				
NR Band 77/78(3450MHz ~ 3550MHz)																				
	Bandwidth10MHz		Bandwidth15MHz		Bandwidth 20MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth100MHz			
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	630334	3455.01	630500	3457.5	630668	3460.02	631334	3470.01	631668	3475.02	632000	3480	632668	3490.02	633000	3495				
M	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98		
H	636332	3544.98	636166	3542.49	636000	3540	635332	3529.98	635000	3525	634666	3519.99	634000	3510	633666	3504.99				

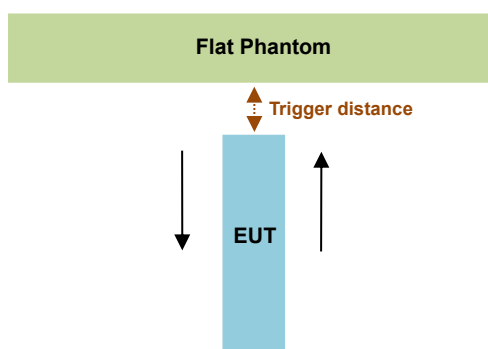
4. Proximity Sensor Triggering Test

<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)				
Antenna	Main		MIMO2	
Position	Bottom of Laptop		Bottom of Laptop	
Minimum	moving toward	moving away	moving toward	moving away
	20	20	12	15

<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 section 6.3, 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⁾
WCDMA Band II Main	8 dB
WCDMA Band IV Main	8.5 dB
WCDMA Band V Main	4 dB
LTE Band 7 Main	7.5 dB
LTE Band 7 MIMO2	4 dB
LTE Band 12 Main / 17 Main	1.5 dB
LTE Band 13 Main	2.5 dB
LTE Band 14 Main	2.5 dB
LTE Band 2 Main / 25 Main	7.5 dB
LTE Band 2 MIMO2 / 25 MIMO 2	2.5 dB
LTE Band 5 Main / 26 Main	3.5 dB
LTE Band 30 Main	5.5 dB
LTE Band 30 MIMO2	0.5 dB
LTE Band 38 Main / 41 Main	4.5 dB
LTE Band 41 MIMO2	2 dB
LTE Band 48 MIMO2	1.5 dB
LTE Band 4 Main / 66 Main	8 dB
LTE Band 4 MIMO2 / 66 MIMO2	2.5 dB
LTE Band 71 Main	0.5 dB
FR1 n2 Main / n25 Main	7.5 dB
FR1 n2 MIMO2 / n 25 MIMO2	2.5 dB
FR1 n5 Main	4 dB
FR1 n7 Main	6.5 dB
FR1 n30 Main	6.5 dB
FR1 n38 Main / n41 Main	5 dB
FR1 n41_HPUE Main	5 dB
FR1 n38 MIMO2 / n41 MIMO2	3.5 dB
FR1 n41_HPUE MIMO2	3.5 dB
FR1 n48_MIMO2	1 dB
FR1 n66 Main	2 dB
FR1 n66 MIMO 2	2 dB
FR1 n77 Main / n78 Main	9.5 dB
FR1 n77_HPUE Main / n78_HPUE Main	9.5 dB
FR1 n77 MIMO2 / n78 MIMO2	7.5 dB
FR1 n77_HPUE MIMO2 / n78_HPUE MIMO2	7.5 dB

Remark:

- ⁽¹⁾: Reduced maximum limit applied by activation of proximity.
- 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
- 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:

Main Antenna:

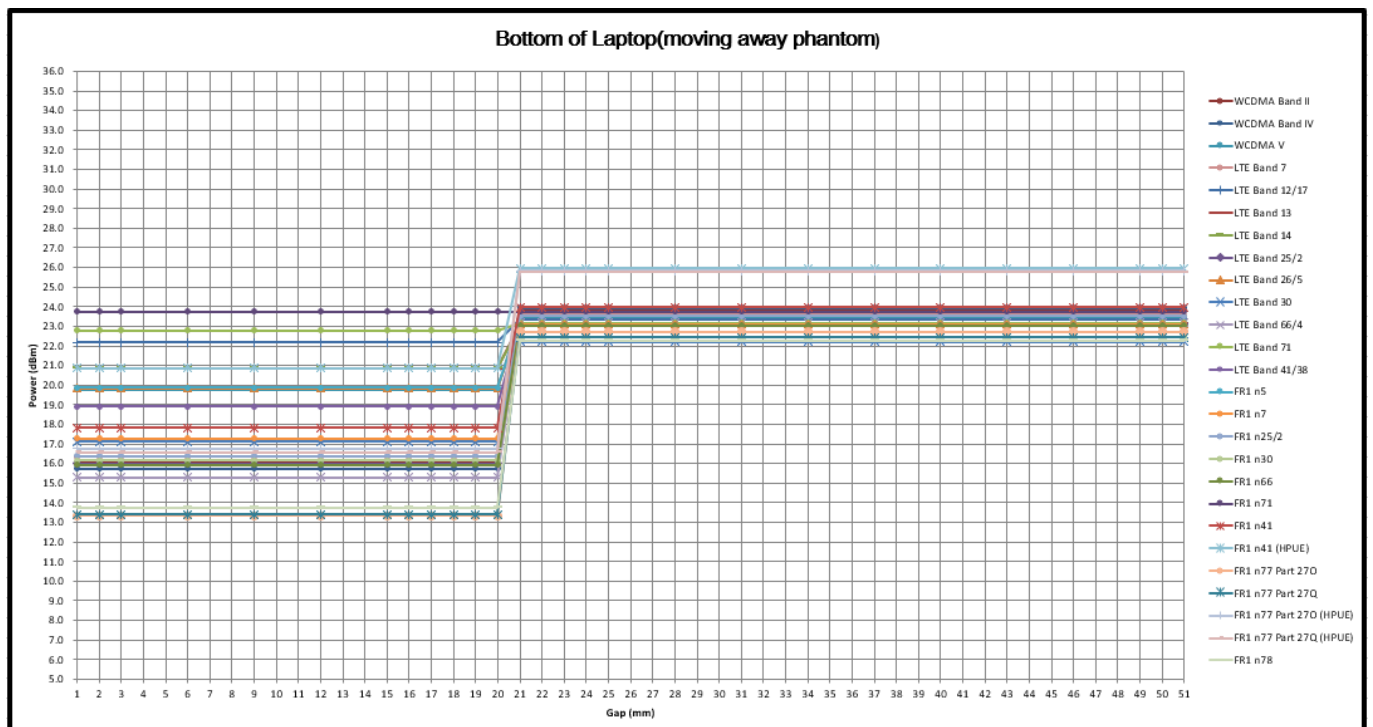
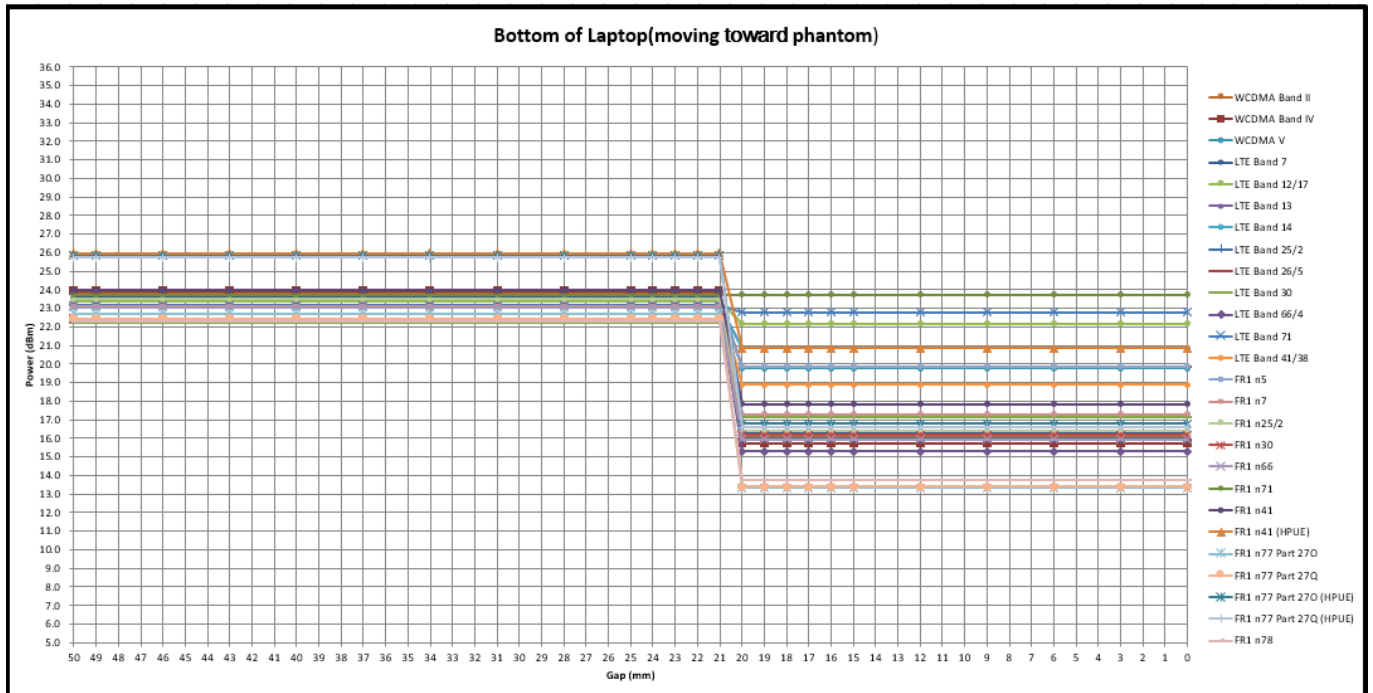
- Bottom of Laptop: [18 mm](#)

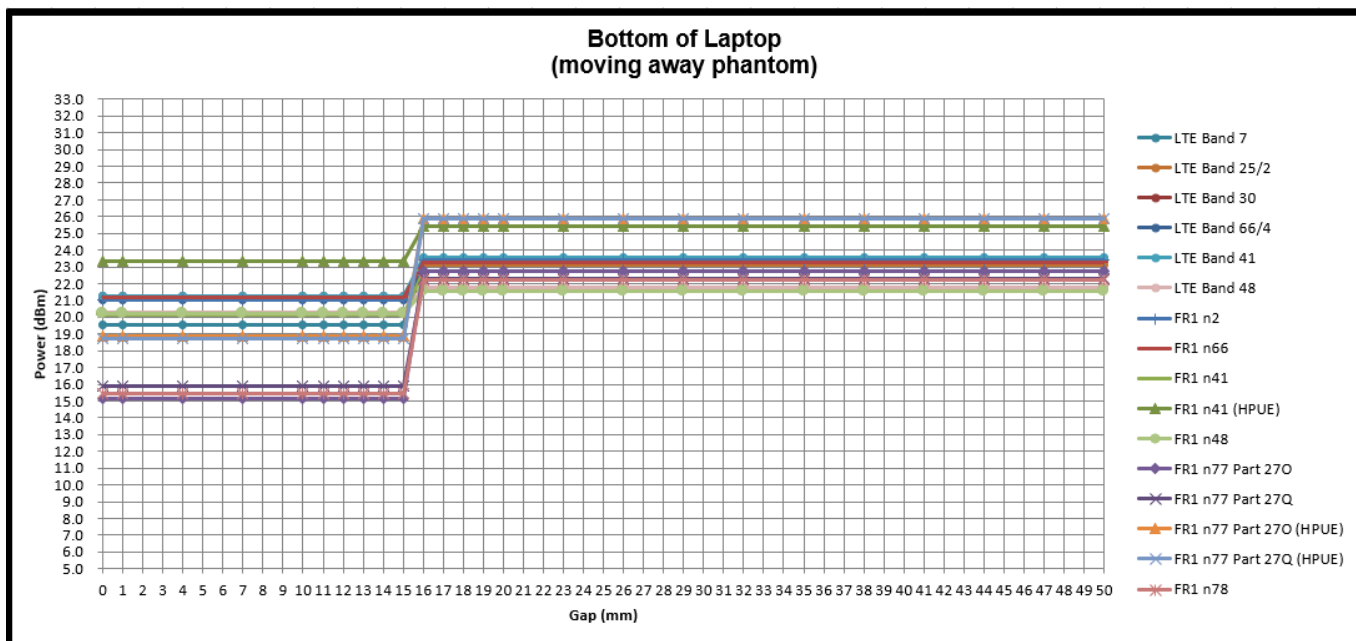
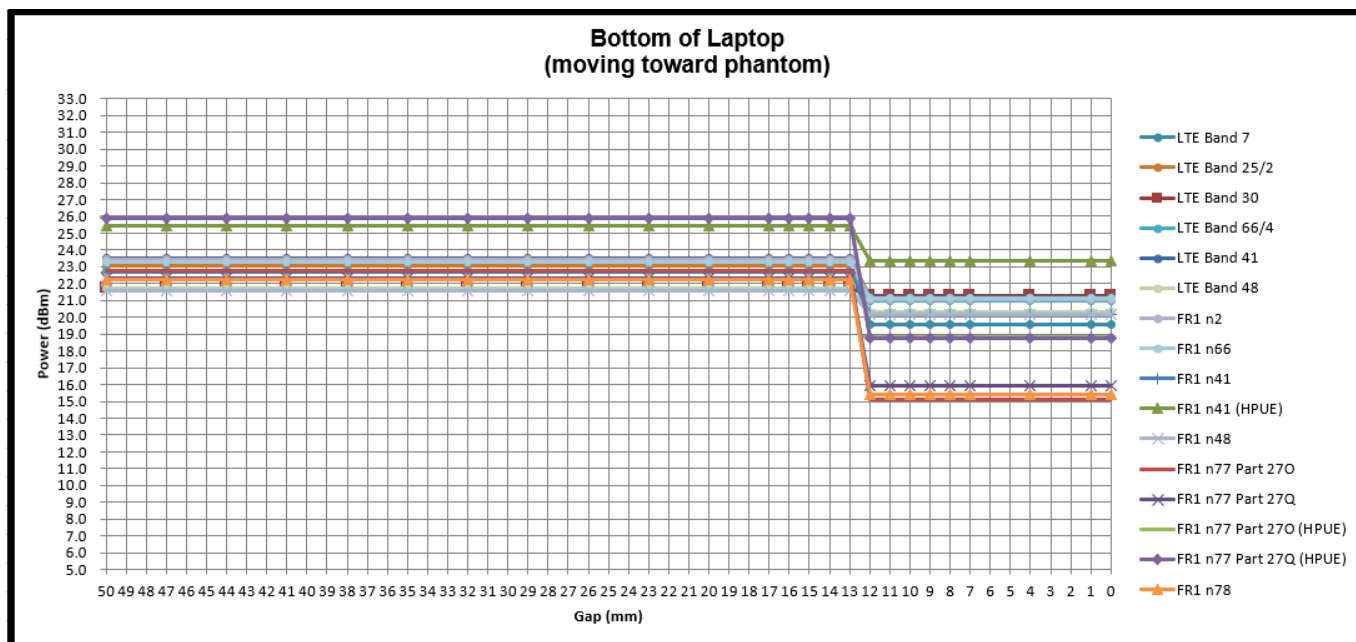
MIMO 2 Antenna:

- Bottom of Laptop: [11 mm](#)

Power Measurement during Sensor Trigger distance testing

<Main>



<MIMO2>


5. RF Exposure Limits

5.1 Uncontrolled Environment

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

5.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

6. Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

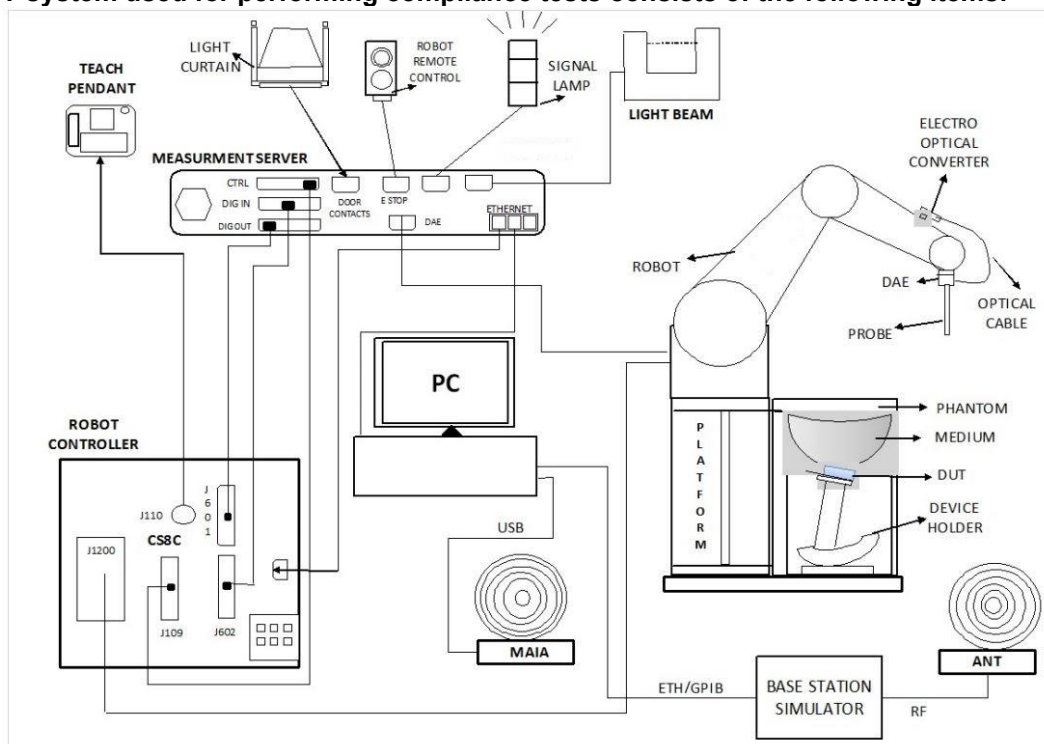
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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



- 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 μ W/g – >100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

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

7.3 Data Acquisition Electronics (DAE)

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

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



Fig 5.1 Photo of DAE

7.4 Phantom

<SAM Twin Phantom>

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

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

<ELI Phantom>

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

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

7.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

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



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

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

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



Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

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

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

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

8.1 Spatial Peak SAR Evaluation

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

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

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

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

8.2 Power Reference Measurement

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

8.3 Area Scan

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

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
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 $\leq$ 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 to 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 whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

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

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

8.5 Volume Scan Procedures

The volume scan is used to 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	3500MHz System Validation Kit ⁽²⁾	D3500V2	1014	Jan. 17, 2022	Jan. 15, 2024
SPEAG	3700MHz System Validation Kit	D3700V2	1006	Jun. 20, 2022	Jun. 19, 2023
SPEAG	Data Acquisition Electronics	DAE4	853	Jul. 20, 2022	Jul. 19, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	7439	Feb. 21, 2023	Feb. 20, 2024
Testo	Hygro meter	608-H1	45196600	Nov. 02, 2022	Nov. 01, 2023
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Oct. 12, 2022	Oct. 11, 2023
Keysight	ENA Network Analyzer	E5071C	MY46316648	Jul. 25, 2022	Jul. 24, 2023
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 28, 2022	Sep. 27, 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	ML2495A	1804003	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Power Sensor	MA2411B	1726150	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jul. 21, 2022	Jul. 20, 2023
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Jan. 10, 2023	Jan. 09, 2024
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 14, 2022	Oct. 13, 2023
Mini-Circuits	Power Amplifier	ZVE-8G+	479102029	Sep. 15, 2022	Sep. 14, 2023
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Warison	Directional Coupler	WCOU-10-50S-10	WR889BMC4B1	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

- 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.
- 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.

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

General Note:

1. The device support SCS 15KHz and 30KHz for NR FDD and TDD and have the same maximum power, in this report only select SCS 15KHz for NR FDD and SCS 30KHz for NR TDD power measurement, due to SCS 15KHz for FDD and SCS 30KHz for TDD have highest support bandwidth, and the NR SAR is < 1g SAR 1.45W/kg. Output power and SAR measurement for SCS30KHz for FDD and SCS15KHz for TDD shall be not necessary.
2. 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
3. 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. And only for TDD power class2 was performed using Factory Test Mode software to establish the connection and perform SAR with 50% transmission

<3GPP 38.101 MPR for EN-DC>

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

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

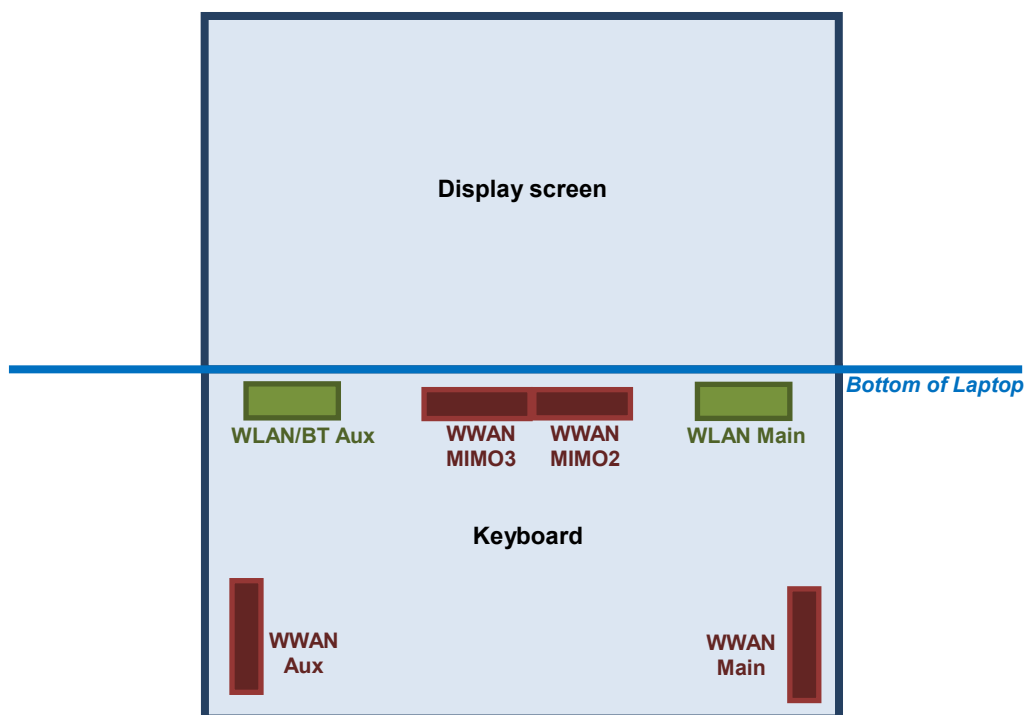
Table 6.2.2-2 Maximum power reduction (MPR) for power class 2

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	

<Default Power (MIMO2) FR1 n48>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				638000	641666	645332	Tune-up limit (dBm)
Frequency (MHz)				3570	3624.99	3679.98	
40	PI/2 BPSK	1	1	21.54	21.27	21.25	22.0
40	PI/2 BPSK	1	53	21.48	21.07	21.22	
40	PI/2 BPSK	1	104	21.04	21.08	21.06	
40	PI/2 BPSK	50	0	21.11	20.84	20.82	21.5
40	PI/2 BPSK	50	28	21.07	21.12	21.05	22.0
40	PI/2 BPSK	50	56	21.03	20.84	20.65	21.5
40	PI/2 BPSK	100	0	20.95	20.74	20.65	
40	QPSK	1	1	21.15	21.26	21.20	22.0
40	QPSK	1	53	21.37	21.07	21.19	
40	QPSK	1	104	21.10	21.08	21.09	
40	QPSK	50	0	21.44	21.19	21.05	22.0
40	QPSK	50	28	21.44	21.09	21.07	
40	QPSK	50	56	21.51	21.13	21.19	
40	QPSK	100	0	20.32	20.23	20.15	21.0
40	16QAM	1	1	20.04	19.97	19.84	21.0
40	64QAM	1	1	18.33	18.23	18.04	19.5
40	256QAM	1	1	16.65	16.64	16.59	17.5
Channel				637668	641666	645666	Tune-up limit (dBm)
Frequency (MHz)				3565.02	3624.99	3684.99	
30	PI/2 BPSK	1	1	21.42	21.25	21.17	22.0
Channel				637334	641666	646000	Tune-up limit (dBm)
Frequency (MHz)				3560.01	3624.99	3690	
20	PI/2 BPSK	1	1	21.50	21.07	21.20	22.0
Channel				637168	641666	646166	Tune-up limit (dBm)
Frequency (MHz)				3557.52	3624.99	3692.49	
15	PI/2 BPSK	1	1	21.37	21.24	21.17	22.0
Channel				637000	641666	646332	Tune-up limit (dBm)
Frequency (MHz)				3555	3624.99	3694.98	
10	PI/2 BPSK	1	1	21.40	21.20	21.05	22.0

<Reduced Power Mode(MIMO2)FR1 n48>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				638000	641666	645332	Tune-up limit (dBm)
Frequency (MHz)				3570	3624.99	3679.98	
40	PI/2 BPSK	1	1	20.20	20.15	20.14	21.0
40	PI/2 BPSK	1	53	20.19	20.07	20.02	
40	PI/2 BPSK	1	104	20.00	19.99	20.01	
40	PI/2 BPSK	50	0	20.06	20.01	20.11	21.0
40	PI/2 BPSK	50	28	20.15	19.99	19.98	21.0
40	PI/2 BPSK	50	56	20.11	20.11	20.12	21.0
40	PI/2 BPSK	100	0	20.03	20.15	19.96	
40	QPSK	1	1	20.04	19.99	19.96	21.0
40	QPSK	1	53	20.13	20.13	20.05	
40	QPSK	1	104	20.00	20.04	20.02	
40	QPSK	50	0	20.11	19.96	19.98	21.0
40	QPSK	50	28	20.00	20.08	20.03	
40	QPSK	50	56	20.05	20.11	20.07	
40	QPSK	100	0	20.06	19.96	20.10	21.0
40	16QAM	1	1	20.04	20.11	20.02	21.0
40	64QAM	1	1	19.03	19.09	18.99	20.0
40	256QAM	1	1	17.15	17.12	17.07	18.0
Channel				637668	641666	645666	Tune-up limit (dBm)
Frequency (MHz)				3565.02	3624.99	3684.99	
30	PI/2 BPSK	1	1	20.17	20.09	19.96	21.0
Channel				637334	641666	646000	Tune-up limit (dBm)
Frequency (MHz)				3560.01	3624.99	3690	
20	PI/2 BPSK	1	1	20.12	20.02	20.09	21.0
Channel				637168	641666	646166	Tune-up limit (dBm)
Frequency (MHz)				3557.52	3624.99	3692.49	
15	PI/2 BPSK	1	1	20.12	19.96	20.07	21.0
Channel				637000	641666	646332	Tune-up limit (dBm)
Frequency (MHz)				3555	3624.99	3694.98	
10	PI/2 BPSK	1	1	20.04	20.06	20.07	21.0

12. Antenna Location



The separation distance for antenna to edge :

Antenna	To Bottom of Laptop (mm)
WWAN Main Antenna	<5
WWAN Aux Antenna	<5
WWAN MIMO2 Antenna	<5
WWAN MIMO3 Antenna	<5
WLAN Main	<5
WLAN/BT Aux	<5

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
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 ≥ 0.8 W/kg.
4. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in sensor trigger distance was performed according to section 4. The test results just verification the sensor trigger distance to meet KDB 616217 requirement, when in normal usage will not operate at trigger distance, therefore, these results were not using performed Sim-Tx analysis.

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 $\frac{1}{2}$ dB higher than the same configuration in PI/2 BPSK, also reported SAR for the PI/2 BPSK configuration is less than 1.45 W/kg, QPSK/16QAM/64QAM/256QAM SAR testing are not required.
 - d. Smaller bandwidth output power for each RB allocation configuration for this device is not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device
 - e. 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.

**13.1 Body SAR****<5G NR SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Antenna Vendor	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 n48	40M	BPSK	1	1	Bottom of Laptop	0mm	MIMO 2	ON	638000	3570	Speed	20.20	21.00	1.202	-0.08	0.651	0.783
	FR1 n48	40M	BPSK	50	28	Bottom of Laptop	0mm	MIMO 2	ON	638000	3570	Speed	20.15	21.00	1.216	0.03	0.630	0.766
	FR1 n48	40M	BPSK	1	1	Bottom of Laptop	11mm	MIMO 2	OFF	638000	3570	Speed	21.54	22.00	1.112	0.08	0.236	0.262
	FR1 n48	40M	BPSK	50	28	Bottom of Laptop	11mm	MIMO 2	OFF	641666	3624.99	Speed	21.12	22.00	1.225	-0.1	0.207	0.253
01	FR1 n48	40M	BPSK	1	1	Bottom of Laptop	0mm	MIMO 2	ON	638000	3570	WNC	20.20	21.00	1.202	0	0.775	0.932
	FR1 n48	40M	BPSK	1	1	Bottom of Laptop	0mm	MIMO 2	ON	641666	3624.99	WNC	20.15	21.00	1.216	0.16	0.721	0.877
	FR1 n48	40M	BPSK	1	1	Bottom of Laptop	0mm	MIMO 2	ON	645332	3679.98	WNC	20.14	21.00	1.219	-0.02	0.714	0.870
	FR1 n48	40M	BPSK	50	28	Bottom of Laptop	0mm	MIMO 2	ON	638000	3570	WNC	20.15	21.00	1.216	-0.11	0.703	0.855
	FR1 n48	40M	BPSK	50	28	Bottom of Laptop	0mm	MIMO 2	ON	641666	3624.99	WNC	19.99	21.00	1.262	0.16	0.663	0.837
	FR1 n48	40M	BPSK	50	28	Bottom of Laptop	0mm	MIMO 2	ON	645332	3679.98	WNC	19.98	21.00	1.265	-0.09	0.658	0.832
	FR1 n48	40M	BPSK	100	0	Bottom of Laptop	0mm	MIMO 2	ON	641666	3624.99	WNC	20.15	21.00	1.216	0.01	0.695	0.845

14. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WWAN Main + WWAN MIMO 2 + 2.4GHz WLAN Main + 2.4GHz WLAN Aux	Yes
2.	WWAN Main + WWAN MIMO 2 + 2.4GHz WLAN Main + Bluetooth Aux	Yes
3.	WWAN Main + WWAN MIMO 2 + 5/6GHz WLAN Main + 5/6GHz WLAN Aux + Bluetooth Aux	Yes
4.	WWAN MIMO 3 + 2.4GHz WLAN Main + 2.4GHz WLAN Aux	Yes
5.	WWAN MIMO 3 + 2.4GHz WLAN Main + Bluetooth Aux	Yes
6.	WWAN MIMO 3 + 5/6GHz WLAN Main + 5/6GHz WLAN Aux + Bluetooth Aux	Yes
7.	WWAN Aux+ 2.4GHz WLAN Main + 2.4GHz WLAN Aux	Yes
8.	WWAN Aux + 2.4GHz WLAN Main + Bluetooth Aux	Yes
9.	WWAN Aux + 5/6GHz WLAN Main + 5/6GHz WLAN Aux + Bluetooth Aux	Yes

General Note:

1. The Intel AX211D2W WLAN/BT module is also integrated into this host. The WLAN 2.4GHz/5GHz and Bluetooth SAR results are referenced from Intel SAR report, report number: 221017-03.TR01 (FCC ID: PD9AX211D2), WLAN 6GHz SAR refers new report No.: 221017-03.TR02 (FCC ID: PD9AX211D2)
2. When the EN-DC is active only operating at WWAN main and MIMO2 antenna combination.
3. The worst case reported SAR for each configuration was used for SAR summation. Therefore, the following summations represent the absolute worst cases for simultaneous transmission.
4. The Scaled SAR summation is calculated based on the same configuration and test position.
5. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - i) Scalar SAR summation $< 1.6\text{W/kg}$.
 - ii) $\text{SPLSR} = (\text{SAR1} + \text{SAR2})^{1.5} / (\text{min. separation distance, mm})$, and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where $(x1, y1, z1)$ and $(x2, y2, z2)$ are the coordinates of the extrapolated peak SAR locations in the zoom scan.
 - iii) If $\text{SPLSR} \leq 0.04$, simultaneously transmission SAR measurement is not necessary.
 - iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR $< 1.6\text{W/kg}$.
 - v) The SPLSR calculated results please refer to section 14.2.



14.1 Body Exposure Conditions

Main & MIMO2

Exposure Position	1	2	3	4	5	6	7	1+2+3+7 Summed 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
	WWAN Main max	WWAN Mimo2 max	WLAN2.4GHz Main	WLAN2.4GHz Aux	WLAN5/6GHz Main	WLAN5/6GHz Aux	Bluetooth Aux					
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)					
Bottom of Laptop at 0mm	1.444	1.414	0.300	0.290	0.780	0.730	0.080	3.238	3.448	4.448	0.03	Case 1

MIMO3

Exposure Position	1	2	3	4	5	6	1+2+6 Summed 1g SAR (W/kg)	1+2+3 Summed 1g SAR (W/kg)	1+4+5+6 Summed 1g SAR (W/kg)	SPLSR	Case No
	WWAN Mimo3 MAX	WLAN2.4GHz Main	WLAN2.4GHz Aux	WLAN5/6GHz Main	WLAN5/6GHz Aux	Bluetooth Aux					
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)					
Bottom of Laptop at 0mm	0.349	0.300	0.290	0.780	0.730	0.080	0.729	0.939	1.939	0.03	Case 2

Aux

Exposure Position	1	2	3	4	5	6	1+2+6 Summed 1g SAR (W/kg)	1+2+3 Summed 1g SAR (W/kg)	1+4+5+6 Summed 1g SAR (W/kg)	SPLSR	Case No
	WWAN AUX Max	WLAN2.4GHz Main	WLAN2.4GHz Aux	WLAN5/6GHz Main	WLAN5/6GHz Aux	Bluetooth Aux					
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)					
Bottom of Laptop at 0mm	1.171	0.300	0.290	0.780	0.730	0.080	1.551	1.761	2.761	0.02	Case 3

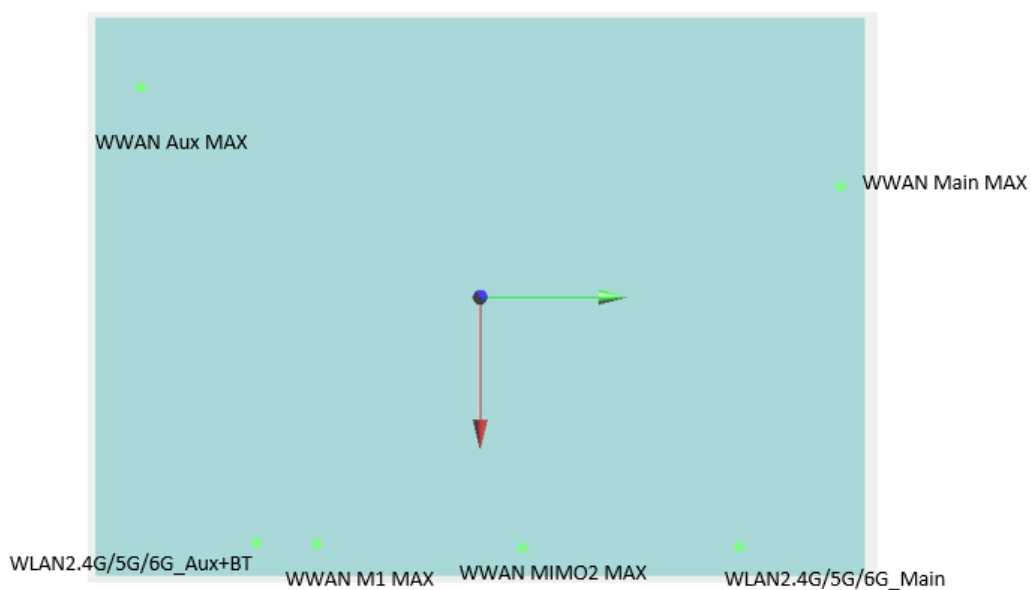
14.2 SPLSR Evaluation and Analysis

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. $SPLSR = (SAR_1 + SAR_2)^{1.5} / (\text{min. separation distance, mm})$. If $SPLSR \leq 0.04$, 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.

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 1	WWAN Main MAX	Bottom of Laptop	1.444	0mm	97.64	1.58	1.36	196.7	2.86	0.02	Not required
	WWAN MIMO2 MAX		1.414	0mm	-41.58	140.59	1.01				
	WWAN Main MAX	Bottom of Laptop	1.444	0mm	97.64	1.58	-177	110.1	1.74	0.02	Not required
	WLAN2.4GHz Main		0.3	0mm	86.8	111.1	-177				
	WWAN Main MAX	Bottom of Laptop	1.444	0mm	97.64	1.58	-177	100.1	1.73	0.02	Not required
	WLAN2.4GHz Aux		0.29	0mm	90.2	-98.2	-177				
	WWAN Main MAX	Bottom of Laptop	1.444	0mm	97.64	1.58	-177	110.1	2.22	0.03	Not required
	WLAN5/6GHz Main		0.78	0mm	86.8	111.1	-177				
	WWAN Main MAX	Bottom of Laptop	1.444	0mm	97.64	1.58	-177	100.1	2.17	0.03	Not required
	WLAN5/6GHz Aux		0.73	0mm	90.2	-98.2	-177				
	WWAN Main MAX	Bottom of Laptop	1.444	0mm	97.64	1.58	-177	100.1	1.61	0.02	Not required
	Bluetooth Aux		0.17	0mm	90.2	-98.2	-177				
	WWAN MIMO2 MAX	Bottom of Laptop	1.414	0mm	-41.58	140.59	-177	131.7	1.71	0.02	Not required
	WLAN2.4GHz Main		0.3	0mm	86.8	111.1	-177				
	WWAN MIMO2 MAX	Bottom of Laptop	1.414	0mm	-41.58	140.59	-177	272.7	1.70	0.01	Not required
	WLAN2.4GHz Aux		0.29	0mm	90.2	-98.2	-177				
	WWAN MIMO2 MAX	Bottom of Laptop	1.414	0mm	-41.58	140.59	-177	131.7	2.19	0.02	Not required
	WLAN5/6GHz Main		0.78	0mm	86.8	111.1	-177				
	WWAN MIMO2 MAX	Bottom of Laptop	1.414	0mm	-41.58	140.59	-177	272.7	2.14	0.01	Not required
	WLAN5/6GHz Aux		0.73	0mm	90.2	-98.2	-177				
	WWAN MIMO2 MAX	Bottom of Laptop	1.414	0mm	-41.58	140.59	-177	272.7	1.58	0.01	Not required
	Bluetooth Aux		0.17	0mm	90.2	-98.2	-177				
	WLAN2.4GHz Main	Bottom of Laptop	0.3	0mm	86.8	111.1	-177	209.3	0.59	0.00	Not required
	WLAN2.4GHz Aux		0.29	0mm	90.2	-98.2	-177				
	WLAN2.4GHz Main	Bottom of Laptop	0.3	0mm	86.8	111.1	-177	209.3	0.47	0.00	Not required
	Bluetooth Aux		0.17	0mm	90.2	-98.2	-177				
	WLAN5/6GHz Main	Bottom of Laptop	0.78	0mm	86.8	111.1	-177	209.3	1.51	0.01	Not required
	WLAN5/6GHz Aux+ BT		0.73	0mm	90.2	-98.2	-177				
Case 2	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WWAN Mimo3 MAX	Bottom of Laptop	0.384	0mm	92.84	-63.4	-177	174.6	1.16	0.01	Not required
	WLAN5/6GHz Main		0.78	0mm	86.8	111.1	-177				
	WWAN Mimo3 MAX	Bottom of Laptop	0.384	0mm	92.84	-63.4	-177	34.9	1.11	0.03	Not required
	WLAN5/6GHz Aux		0.73	0mm	90.2	-98.2	-177				
	WWAN Mimo3 MAX	Bottom of Laptop	0.384	0mm	92.84	-63.4	-177	34.9	0.55	0.01	Not required
	Bluetooth Aux		0.17	0mm	90.2	-98.2	-177				
	WLAN5/6GHz Main	Bottom of Laptop	0.78	0mm	86.8	111.1	-177	209.3	1.68	0.01	Not required
	WLAN5/6GHz Aux+BT		0.9	0mm	90.2	-98.2	-177				
Case 3	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WWAN Aux MAX	Bottom of Laptop	1.171	0mm	-79.16	-132.02	-177	294.4	1.47	0.01	Not required

	WLAN2.4GHz Main		0.3	0mm	86.8	111.1	-177				
	WWAN Aux MAX	Bottom of Laptop	1.171	0mm	-79.16	-132.02	-177	172.7	1.46	0.01	Not required
	WLAN2.4GHz Aux		0.29	0mm	90.2	-98.2	-177				
	WWAN Aux MAX	Bottom of Laptop	1.171	0mm	-79.16	-132.02	-177	294.4	1.95	0.01	Not required
	WLAN5/6GHz Main		0.78	0mm	86.8	111.1	-177				
	WWAN Aux MAX	Bottom of Laptop	1.171	0mm	-79.16	-132.02	-177	172.7	1.90	0.02	Not required
	WLAN5/6GHz Aux		0.73	0mm	90.2	-98.2	-177				
	WWAN Aux MAX	Bottom of Laptop	1.171	0mm	-79.16	-132.02	-177	172.7	1.34	0.01	Not required
	Bluetooth Aux		0.17	0mm	90.2	-98.2	-177				
	WLAN2.4GHz Main	Bottom of Laptop	0.3	0mm	86.8	111.1	-177	209.3	0.59	0.00	Not required
	WLAN2.4GHz Aux		0.29	0mm	90.2	-98.2	-177				
	WLAN2.4GHz Main	Bottom of Laptop	0.3	0mm	86.8	111.1	-177	209.3	0.47	0.00	Not required
	Bluetooth Aux		0.17	0mm	90.2	-98.2	-177				
	WLAN5/6GHz Main	Bottom of Laptop	0.78	0mm	86.8	111.1	-177	209.3	1.68	0.01	Not required
	WLAN5/6GHz Aux+BT		0.9	0mm	90.2	-98.2	-177				



Test Engineer : Jay Chien

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 $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. 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 D01 v03r01, "3G SAR MEAUREMENT PROCEDURES", Oct 2015
- [7] FCC KDB 941225 D05 v02r05, "SAR Evaluation Considerations for LTE Devices", Dec 2015
- [8] FCC KDB 941225 D05A v01r02, "Rel. 10 LTE SAR Test Guidance and KDB Inquiries", Oct 2015
- [9] FCC KDB 616217 D04 v01r02, "SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers", Oct 2015
- [10] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [11] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.