

FCC SAR TEST REPORT

FCC ID : ACJ9TGWW24A
Equipment : Radio Module
Brand Name : Panasonic
Model Name : WW24A
Applicant : Panasonic Corporation of North America
Two Riverfront Plaza, Newark, New Jersey, 07102-5490, USA
Standard : FCC 47 CFR Part 2 (2.1093)

The product was installed into Laptop (Brand Name: Panasonic, Model Name: FZ-56(mk1)) during test.

The product was received on Oct. 31, 2025 and testing was started from Nov. 07, 2025 and completed on Nov. 09, 2025. 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
FA5O2912	01	Initial issue of report	Feb. 13, 2026

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) for **Panasonic Corporation of North America, Radio Module, WW24A**, are as follows.

Frequency Band		Highest SAR Summary		Highest Simultaneous Transmission 1g SAR (W/kg)
		Body (Separation 0mm)		
		1g SAR (W/kg)		
LTE	LTE Band 48	0.04		1.40
FR1	FR1 n41	0.01		
	FR1 n48	0.04		
	FR1 n77	0.20		
Date of Testing:		2025/11/05 ~ 2025/11/09		

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: 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	Radio Module
Brand Name	Panasonic
Model Name	WW24A
FCC	ACJ9TGW24A
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 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 n13: 777 MHz ~ 787 MHz 5G NR n14 : 788 MHz ~ 798 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n26 : 814 MHz ~ 849 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n70 : 1695 MHz ~ 1710 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77: 3700 MHz ~ 3980 MHz, 3450 MHz ~ 3550 MHz
Mode	RMC 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ (16QAM uplink) LTE: QPSK, 16QAM, 64QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM

Host Information	
Equipment Name	Laptop
Brand Name	Panasonic
Model Name	FZ-56(mk1)
Integrated WLAN Module	Brand Name: Intel Model Name: BE201D2W
Integrated RFID Module 1	Brand Name: Panasonic Model Name: RI24A
Integrated RFID Module 2	Brand Name: Panasonic Model Name: RI23B
Wireless Technology and Frequency Range	WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz WLAN 5.9 GHz Band: 5850 MHz ~ 5895 MHz WLAN 6GHz Band: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz RFID: 13.56 MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax/be HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160/EHT20/EHT40/EHT80/EHT160/EHT320 Bluetooth BR/EDR/LE RFID: ASK
EUT Stage	Identical Prototype
Remark: - The Intel BE201D2W WLAN/Bluetooth module is also integrated into this host. The WLAN/Bluetooth power and SAR testing data can be found in the Sporton SAR Test Report, Report No.: FA5O2913-01(ACJ9TGWL24A), and these results are used for simultaneous transmission analysis. - The RFID module is integrated into this host, the RFID test report is referenced from Sporton FCC SAR report, report no.: FA5O2913-02 (FCC ID: ACJ9TGRI24A) for Model: RI24A / FA5O2913-03 (FCC ID: ACJ9TGRI23B) for Model: RI23B; the SAR result is used to do simultaneous transmission analysis.	

3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05									
FCC ID		ACJ9TGW24A							
Equipment Name		Radio 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 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 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							
LTE Voice / Data requirements		Data only							
LTE MPR permanently built-in by design		Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3							
		Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})					MPR (dB)	
			1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz		20 MHz
		QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
		16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
		16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
		64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
		64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
		256 QAM	≥ 1					≤ 5	
LTE A-MPR		In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)							
Spectrum plots for RB configuration		A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.							
LTE Carrier Aggregation Combinations		Inter-Band and Intra-Band possible combinations and the detail power measurement please referred to section 11.							
LTE Carrier Aggregation Additional Information		Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.							

Transmission (H, M, L) channel numbers and frequencies in each LTE band												
LTE Band 2												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900
LTE Band 4												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745
LTE Band 5												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	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		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	26765	821.5
M	26865	831.5	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	26965	841.5
LTE Band 41												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz		Bandwidth 20 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	39750	2506	39750	2506
L	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5	40185	2549.5	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593	40620	2593	40620	2593
H	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5	41055	2636.5	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680	41490	2680	41490	2680
LTE Band 48												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz		Bandwidth 20 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	55340	3560	55340	3560
L	55810	3607	55815	3607.5	55820	3608	55830	3609	55830	3609	55830	3609
M	56170	3643	56165	3642.5	56160	3642	56150	3641	56150	3641	56150	3641
H	56715	3697.5	56690	3695	56665	3692.5	56640	3690	56640	3690	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		Bandwidth 20 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	133222	673	133222	673
M	133297	680.5	133297	680.5	133297	680.5	133297	680.5	133297	680.5	133297	680.5
H	133447	695.5	133422	693	133397	690.5	133372	688	133372	688	133372	688

3.3 General 5G NR SAR Test and Reporting Considerations

5G NR Information								
FCC ID	ACJ9TGW24A							
Equipment Name	Radio 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 n13: 777 MHz ~ 787 MHz							
	5G NR n14 : 788 MHz ~ 798 MHz							
	5G NR n25: 1850 MHz ~ 1915 MHz							
	5G NR n26: 814 MHz ~ 849 MHz							
	5G NR n41: 2496 MHz ~ 2690 MHz							
	5G NR n48: 3550 MHz ~ 3700 MHz							
	5G NR n66: 1710 MHz ~ 1780 MHz							
	5G NR n70 : 1695 MHz ~ 1710 MHz							
	5G NR n71: 663 MHz ~ 698 MHz							
	5G NR n77: 3700 MHz ~ 3980 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, 25 MHz, 30MHz, 40MHz							
	5G NR n12: 5MHz, 10MHz, 15MHz							
	5G NR n13: 5MHz, 10MHz							
	5G NR n14: 5MHz, 10MHz							
	5G NR n25: 5MHz, 10MHz, 15MHz, 20MHz, 25 MHz 30MHz, 40MHz							
	5G NR n26: 5MHz, 10MHz, 15MHz, 20MHz							
	5G NR n41: 10MHz, 15MHz, 20MHz, 30MHz, 40MHz, 50MHz, 60MHz, 80MHz, 90MHz, 100MHz							
	5G NR n48: 10MHz, 15MHz, 20MHz, 30MHz, 40MHz							
	5G NR n66: 5MHz, 10MHz, 15MHz, 20MHz, 25 MHz, 30MHz, 40MHz							
	5G NR n70: 5MHz, 10MHz, 15MHz							
	5G NR n71: 5MHz, 10MHz, 15MHz, 20MHz							
	5G NR n77: 10MHz, 15MHz, 20MHz, 30MHz, 40MHz, 50MHz, 60MHz, 70MHz, 80MHz, 90MHz, 100MHz							
SCS	FDD: SCS15KHz, TDD: SCS30KHz							
uplink modulations used	DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM CP-OFDM QPSK / 16QAM / 64QAM / 256QAM							
A-MPR (Additional MPR) disabled for SAR Testing?	Yes							
LTE Anchor Bands for n2	LTE B5/12/13/14/71							
LTE Anchor Bands for n5	LTE B2/4/7/66							
LTE Anchor Bands for n7	LTE B5/12/13/71							
LTE Anchor Bands for n12	LTE B2/7/66							
LTE Anchor Bands for n14	LTE B2/66							
LTE Anchor Bands for n25	LTE B5/12/13/26/71							
LTE Anchor Bands for n26	LTE B7							
LTE Anchor Bands for n41	LTE B5/12/26/71							
LTE Anchor Bands for n48	LTE B2/5/13/66							
LTE Anchor Bands for n66	LTE B5/12/13/14/71							
LTE Anchor Bands for n71	LTE B2/7/66							
LTE Anchor Bands for n77	LTE B2/5/7/12/13/14/25/41/66/71							
NR Band 2								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	370500	1852.5	371000	1855	371500	1857.5	372000	1860
M	376000	1880	376000	1880	376000	1880	376000	1880
H	381500	1907.5	381000	1905	380500	1902.5	380000	1900
NR Band 5								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	165300	826.5	165800	829	166300	831.5	166800	834
M	167300	836.5	167300	836.5	167300	836.5	167300	836.5
H	169300	846.5	168800	844	168300	841.5	167800	839

NR Band 7																				
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz							
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)						
L	500500	2502.5	501000	2505	501500	2507.5	502000	2510	502500	2512.5	503000	2515	504000	2520						
M	507000	2535	507000	2535	507000	2535	507000	2535	507000	2535	507000	2535	507000	2535						
H	513500	2567.5	513000	2565	512500	2562.5	512000	2560	511500	2557.5	511000	2555	510000	2550						
NR Band 12																				
	Bandwidth 5MHz				Bandwidth 10MHz				Bandwidth 15MHz											
	Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)									
L	140300		701.5		140800		704		141300		706.5									
M	141500		707.5		141500		707.5		141500		707.5									
H	142700		713.5		142200		711		141700		708.5									
NR Band 13																				
	Bandwidth 5MHz						Bandwidth 10MHz													
	Ch. #			Freq. (MHz)			Ch. #			Freq. (MHz)										
L	155900			779.5			156400			782										
M	156400			782																
H	156900			784.5																
NR Band 14																				
	Bandwidth 5MHz						Bandwidth 10MHz													
	Ch. #			Freq. (MHz)			Ch. #			Freq. (MHz)										
L	158100			790.5			158600			793										
M	158600			793																
H	159100			795.5																
NR Band 25																				
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz							
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)						
L	370500	1852.5	371000	1855	371500	1857.5	372000	1860	372500	1862.5	373000	1865	374000	1870						
M	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5						
H	382500	1912.5	382000	1910	381500	1907.5	381000	1905	380500	1902.5	380000	1900	379000	1895						
NR Band 26																				
	Bandwidth 5MHz				Bandwidth 10MHz				Bandwidth 15MHz				Bandwidth 20MHz							
	Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)					
L	163300		816.5		163800		819		164300		821.5		164800		824					
M	166300		831.5		166300		831.5		166300		831.5		166300		831.5					
H	169300		846.5		168800		844		168300		841.5		167800		839					
NR Band 41																				
	Bandwidth10MHz		Bandwidth15MHz		Bandwidth20MHz		Bandwidth30MHz		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)	Ch. #	Freq. (MHz)
L	500202	2501.01	500700	2503.5	501204	2506.02	502200	2511	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	518598	2592.99
H	537000	2685	536496	2682.48	535998	2679.99	534996	2674.98	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 25MHz		Bandwidth 30MHz		Bandwidth 40MHz									
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)								
L	342500	1712.5	343000	1715	343500	1717.5	344000	1720	344500	1722.5	345000	1725	346000	1730								
M	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745								
H	355500	1777.5	355000	1775	354500	1772.5	354000	1770	353500	1767.5	353000	1765	352000	1760								
NR Band 70																						
	Bandwidth 5MHz				Bandwidth 10MHz				Bandwidth 15MHz													
	Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #			Freq. (MHz)										
L	339500		1697.5		340000		1700		340500			1702.5										
M	340500		1702.5		340500		1702.5															
H	341500		1707.5		341000		1705															
NR Band 71																						
	Bandwidth 5MHz			Bandwidth 10MHz				Bandwidth 15MHz				Bandwidth 20MHz										
	Ch. #		Freq. (MHz)	Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)		Ch. #		Freq. (MHz)								
L	133100		665.5	133600		668		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		Bandwidth30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	647000	3705	647168	3707.52	647334	3710.01	647668	3715.02	648000	3720	648334	3725.01	648668	3730.02	649000	3735	649334	3740.01	649668	3745.02	650000	3750
M	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840
H	665000	3975	664832	3972.48	664666	3969.99	664332	3964.98	664000	3960	663666	3954.99	663332	3949.98	663000	3945	662666	3939.99	662332	3934.98	662000	3930
NR Band 77(3450MHz ~ 3550MHz)																						
	Bandwidth10MHz		Bandwidth15MHz		Bandwidth 20MHz		Bandwidth30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	630334	3455.01	630500	3457.5	630668	3460.02	631000	3465	631334	3470.01	631668	3475.02	632000	3480	632334	3485.01	632668	3490.02	633000	3495		
M	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98	633332	3499.98
H	636332	3544.98	636166	3542.49	636000	3540	635666	3534.99	635332	3529.98	635000	3525	634666	3519.99	634332	3514.98	634000	3510	633666	3504.99		

4. RF Exposure Limits

4.1 Uncontrolled Environment

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

4.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

4.3 RF Exposure limit for above 6GHz

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Peak Spatially Averaged Power Density was evaluated over a circular area of 4cm² per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

5. Specific Absorption Rate (SAR)

5.1 Introduction

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

5.2 SAR Definition

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

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

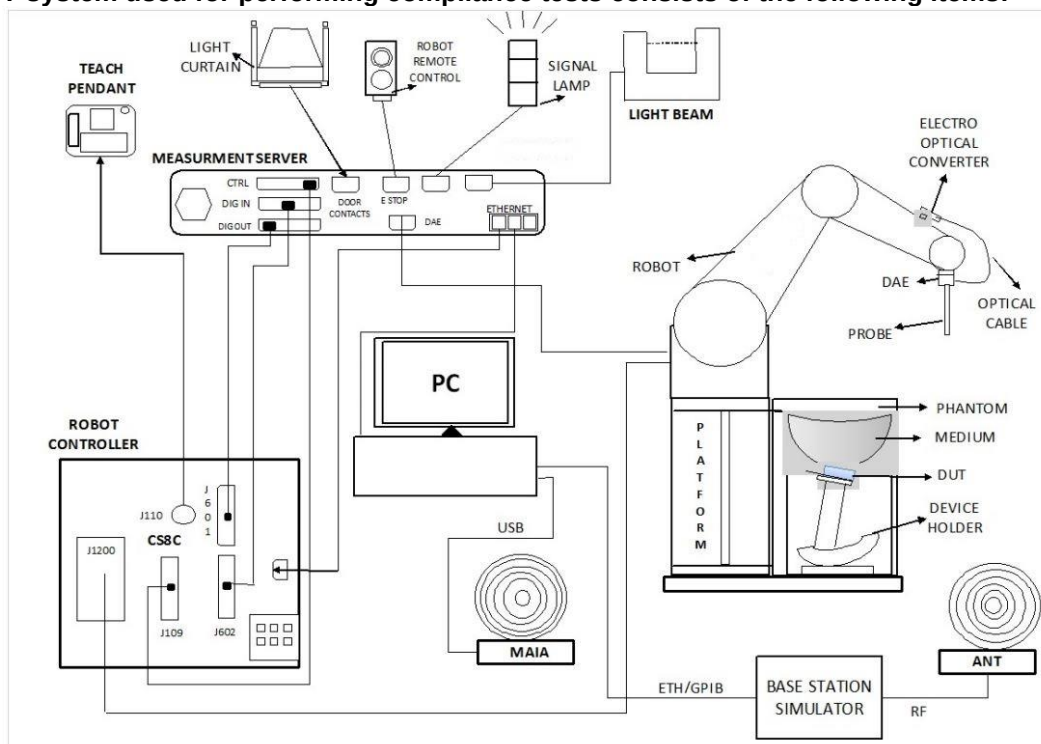
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

6. 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.

6.1 Test Site Location

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

Laboratory	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	SAR18-HY	SAR21-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY	SAR16-HY	SAR19-HY	SAR22-HY
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	SAR17-HY	SAR20-HY	

6.2 E-Field Probe

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

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	4 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	4 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	

6.3 Data Acquisition Electronics (DAE)

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

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

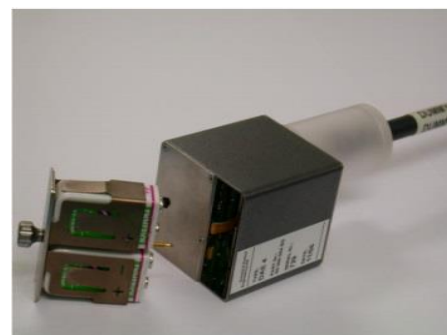


Fig 5.1 Photo of DAE

6.4 Phantom

<SAM Twin Phantom>

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

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

<ELI Phantom>

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

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

6.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

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



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

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

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



Mounting Device for Laptops

7. Measurement Procedures

The measurement procedures are as follows:

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

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

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

7.1 Spatial Peak SAR Evaluation

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

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

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

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

7.2 Power Reference Measurement

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

7.3 Area Scan

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

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

	≤ 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.	

7.4 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.				

7.5 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.

7.6 Power Drift Monitoring

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

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Last Cal.	Due Date
SPEAG	2600MHz System Validation Kit ⁽²⁾	D2600V2	1008	Aug. 15, 2024	Aug. 13, 2026
SPEAG	3500MHz System Validation Kit	D3500V2	1014	Jan. 15, 2025	Jan. 14, 2026
SPEAG	3700MHz System Validation Kit	D3700V2	1006	Jun. 12, 2025	Jun. 11, 2026
SPEAG	3900MHz System Validation Kit ⁽²⁾	D3900V2	1092	May. 15, 2023	May. 12, 2026
SPEAG	Data Acquisition Electronics	DAE4	1424	Dec. 19, 2024	Dec. 18, 2025
SPEAG	Data Acquisition Electronics	DAE4	376	May. 06, 2025	May. 05, 2026
SPEAG	Dosimetric E-Field Probe	EX3DV4	3728	Mar. 19, 2025	Mar. 18, 2026
SPEAG	Dosimetric E-Field Probe	EX3DV4	7813	May. 21, 2025	May. 20, 2026
SPEAG	Dielectric Probe Kit	DAK-3.5	1270	May. 19, 2025	May. 18, 2026
Testo	Hygro meter	608-H1	45256904	Dec. 06, 2024	Dec. 05, 2025
Testo	Hygro meter	608-H1	45142597	Jan. 09, 2025	Jan. 08, 2026
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Nov. 12, 2024	Nov. 11, 2025
Keysight	5G Wireless Test Platform	E7515B	MY59321595	Jun. 20, 2025	Jun. 19, 2026
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Sep. 24, 2025	Sep. 23, 2026
Keysight	ENA Network Analyzer	E5071C	MY46104758	Oct. 14, 2025	Oct. 13, 2026
LINE SEIKI	Digital Thermometer	DTM3000-spezial	3902	Feb. 19, 2025	Feb. 18, 2026
Anritsu	Power Meter	ML2496A	2119003	Jul. 14, 2025	Jul. 13, 2026
R&S	Power Sensor	NRP8S	109687	Sep. 22, 2025	Sep. 21, 2026
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Sep. 09, 2025	Sep. 08, 2026
Mini-Circuits	Power Amplifier	ZVE-8G+	D120604	Oct. 17, 2025	Oct. 16, 2026
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:

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

9. System Verification

9.1 Tissue Verification

The tissue dielectric parameters of tissue-equivalent media used for SAR measurements must be characterized within a temperature range of 18°C to 25°C, 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°C to 25°C and within $\pm 2^\circ\text{C}$ 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

The SPEAG Dasy Measurement system implement a SAR error compensation algorithm as documented in IEEE Std 1528-2013 to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, according to KDB 865664 D01 and IEC/IEEE 62209-1528, the tolerance for “Delta (σ)” and “Delta (ϵ_r)” can be relaxed to $\pm 10\%$

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
2600	22.7	1.96	39.1	1.96	39	0	0.26	± 10.0	2025/11/7
3500	22.8	2.73	37.5	2.91	37.9	-6.19	-1.06	± 10.0	2025/11/8
3500	22.9	2.72	37.6	2.91	37.9	-6.53	-0.79	± 10.0	2025/11/9
3700	22.8	2.91	37.2	3.12	37.7	-6.73	-1.33	± 10.0	2025/11/8
3700	22.9	2.9	37.3	3.12	37.7	-7.05	-1.06	± 10.0	2025/11/9
3900	22.9	3.07	37	3.33	37.51	-7.81	-1.36	± 10.0	2025/11/9

9.2 System Performance Check Results

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

Test Site	Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
SAR19	2025/11/7	2600	50.12	D2600V2 - 1008	EX3DV4 - SN3728	DAE4 Sn376	2.65	55.7	52.874	-5.07
SAR19	2025/11/8	3500	50.12	D3500V2 - 1014	EX3DV4 - SN3728	DAE4 Sn376	3.03	65.7	60.456	-7.98
SAR19	2025/11/9	3500	100	D3500V2 - 1014	EX3DV4 - SN7813	DAE4 Sn1424	6.68	65.7	66.8	1.67
SAR19	2025/11/8	3700	50.12	D3700V2 - 1006	EX3DV4 - SN3728	DAE4 Sn376	3.21	69.9	64.048	-8.37
SAR19	2025/11/9	3700	100	D3700V2 - 1006	EX3DV4 - SN7813	DAE4 Sn1424	7.01	69.9	70.1	0.29
SAR19	2025/11/9	3900	100	D3900V2 - 1092	EX3DV4 - SN7813	DAE4 Sn1424	6.62	67	66.2	-1.19

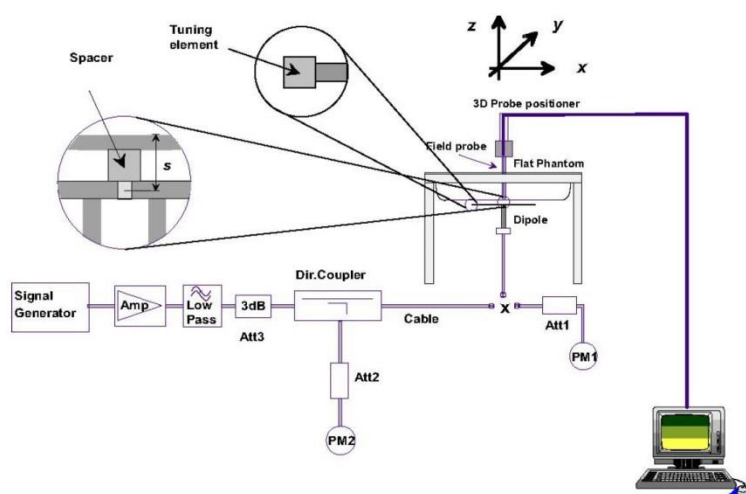


Fig 8.3.1 System Performance Check Setup



Fig 8.3.2 Setup Photo

10. LTE Output Power (Unit: dBm)

<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.

- 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
- “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
- Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Base station simulator was used for LTE output power measurements and SAR testing.

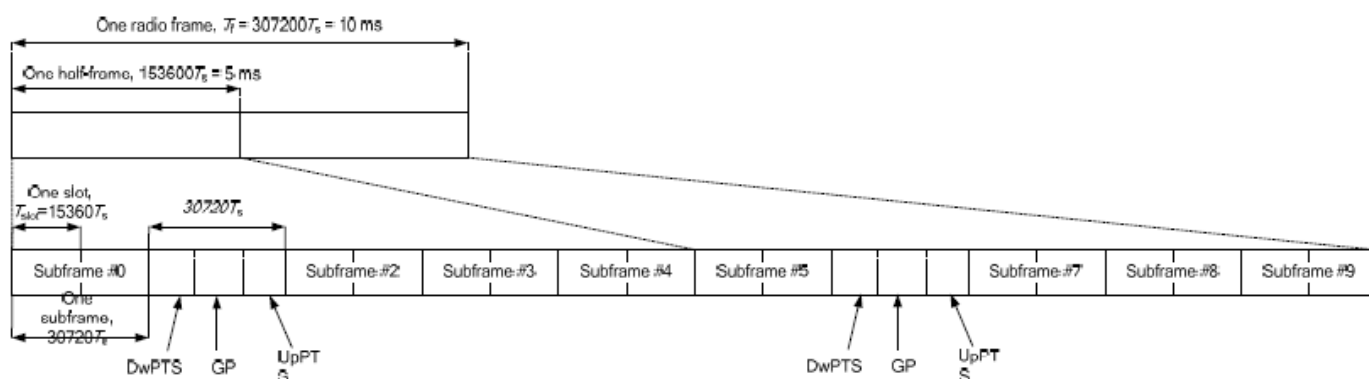


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

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	$26336 \cdot T_s$			$7680 \cdot T_s$		
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
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 subframes, 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.



【LTE Band 48_FCC_Part 96
(3550~3700MHz)_3rd】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				55340	55830	55990	56150	56640	
Frequency (MHz)				3560	3609	3625	3641	3690	
20	QPSK	1	0	17.22	17.24	17.25	17.24	17.16	19.00
20	QPSK	1	49	17.13	17.25	17.30	17.22	17.16	19.00
20	QPSK	1	99	17.23	17.26	17.35	17.31	17.24	19.00
20	QPSK	50	0	16.17	16.24	16.33	16.20	16.14	18.00
20	QPSK	50	24	16.20	16.17	16.27	16.18	16.16	18.00
20	QPSK	50	50	16.18	16.16	16.25	16.15	16.15	18.00
20	QPSK	100	0	16.11	16.15	16.26	16.22	16.04	18.00
20	16QAM	1	0	16.38	16.42	16.53	16.38	16.40	18.00
20	16QAM	1	49	16.37	16.36	16.52	16.44	16.35	18.00
20	16QAM	1	99	16.49	16.54	16.56	16.41	16.33	18.00
20	16QAM	50	0	15.31	15.21	15.36	15.29	15.23	17.00
20	16QAM	50	24	15.17	15.26	15.29	15.24	15.08	17.00
20	16QAM	50	50	15.23	15.29	15.31	15.24	15.12	17.00
20	16QAM	100	0	15.06	15.13	15.22	15.07	15.03	17.00
20	64QAM	1	0	15.17	15.28	15.30	15.24	15.17	17.00
20	64QAM	1	49	15.19	15.19	15.29	15.26	15.16	17.00
20	64QAM	1	99	15.12	15.22	15.29	15.25	15.19	17.00
20	64QAM	50	0	14.31	14.33	14.39	14.25	14.30	16.00
20	64QAM	50	24	14.22	14.21	14.30	14.16	14.14	16.00
20	64QAM	50	50	14.24	14.24	14.29	14.15	14.09	16.00
20	64QAM	100	0	14.13	14.17	14.24	14.15	14.04	16.00
Channel				55315	55820	55990	56160	56665	Tune-up limit (dBm)
Frequency (MHz)				3557.5	3608	3625	3642	3692.5	
15	QPSK	1	0	17.10	17.16	17.16	17.21	17.15	19.00
15	QPSK	1	37	17.05	17.19	17.23	17.18	17.07	19.00
15	QPSK	1	74	17.15	17.22	17.26	17.27	17.14	19.00
15	QPSK	36	0	16.05	16.17	16.20	16.12	16.06	18.00
15	QPSK	36	20	16.05	16.06	16.19	16.12	16.10	18.00
15	QPSK	36	39	16.06	16.07	16.14	16.07	16.11	18.00
15	QPSK	75	0	16.57	16.51	16.69	16.70	16.46	18.00
15	16QAM	1	0	16.31	16.34	16.38	16.30	16.38	18.00
15	16QAM	1	37	16.30	16.24	16.37	16.43	16.30	18.00
15	16QAM	1	74	16.43	16.45	16.42	16.30	16.30	18.00
15	16QAM	36	0	15.71	15.61	15.85	15.77	15.62	17.00
15	16QAM	36	20	15.63	15.72	15.73	15.68	15.55	17.00
15	16QAM	36	39	15.63	15.78	15.72	15.61	15.59	17.00
15	16QAM	75	0	15.48	15.61	15.63	15.50	15.38	17.00
15	64QAM	1	0	15.66	15.66	15.69	15.62	15.60	17.00
15	64QAM	1	37	15.62	15.61	15.65	15.70	15.54	17.00
15	64QAM	1	74	15.60	15.66	15.73	15.68	15.60	17.00
15	64QAM	36	0	14.66	14.75	14.82	14.71	14.70	16.00
15	64QAM	36	20	14.59	14.57	14.73	14.57	14.62	16.00
15	64QAM	36	39	14.69	14.62	14.65	14.59	14.44	16.00
15	64QAM	75	0	14.04	14.15	14.22	14.02	14.00	16.00
Channel				55290	55815	55990	56165	56690	Tune-up limit (dBm)
Frequency (MHz)				3555	3607.5	3625	3642.5	3695	
10	QPSK	1	0	17.20	17.12	17.18	17.11	17.06	19.00
10	QPSK	1	25	17.02	17.17	17.28	17.11	17.14	19.00
10	QPSK	1	49	17.15	17.22	17.22	17.29	17.12	19.00
10	QPSK	25	0	16.59	16.67	16.71	16.59	16.49	18.00
10	QPSK	25	12	16.68	16.64	16.62	16.59	16.61	18.00
10	QPSK	25	25	16.62	16.60	16.64	16.63	16.53	18.00
10	QPSK	50	0	16.49	16.57	16.71	16.63	16.42	18.00
10	16QAM	1	0	16.31	16.31	16.41	16.25	16.31	18.00
10	16QAM	1	25	16.26	16.30	16.38	16.35	16.25	18.00
10	16QAM	1	49	16.39	16.49	16.49	16.27	16.27	18.00
10	16QAM	25	0	15.73	15.68	15.74	15.75	15.72	17.00
10	16QAM	25	12	15.62	15.74	15.74	15.71	15.52	17.00
10	16QAM	25	25	15.70	15.64	15.73	15.67	15.58	17.00
10	16QAM	50	0	15.54	15.59	15.59	15.50	15.44	17.00
10	64QAM	1	0	15.64	15.75	15.65	15.71	15.53	17.00
10	64QAM	1	25	15.54	15.63	15.71	15.62	15.54	17.00
10	64QAM	1	49	15.51	15.59	15.64	15.74	15.66	17.00
10	64QAM	25	0	14.77	14.72	14.79	14.73	14.76	16.00
10	64QAM	25	12	14.66	14.61	14.70	14.59	14.59	16.00
10	64QAM	25	25	14.60	14.67	14.67	14.54	14.56	16.00
10	64QAM	50	0	14.53	14.62	14.68	14.52	14.40	16.00



FCC SAR TEST REPORT

Report No. : FA5O2912

Channel				55265	55810	55990	56170	56715	Tune-up limit (dBm)
Frequency (MHz)				3552.5	3607	3625	3643	3697.5	
5	QPSK	1	0	17.12	17.16	17.17	17.14	17.09	19.00
5	QPSK	1	12	17.12	17.24	17.25	17.15	17.01	19.00
5	QPSK	1	24	17.12	17.12	17.29	17.17	17.16	19.00
5	QPSK	12	0	16.05	16.16	16.30	16.09	16.13	18.00
5	QPSK	12	7	16.06	16.13	16.17	16.13	16.12	18.00
5	QPSK	12	13	16.12	16.03	16.13	16.04	16.14	18.00
5	QPSK	25	0	16.55	16.62	16.69	16.59	16.43	18.00
5	16QAM	1	0	16.35	16.38	16.42	16.28	16.36	18.00
5	16QAM	1	12	16.27	16.26	16.48	16.34	16.28	18.00
5	16QAM	1	24	16.48	16.48	16.48	16.29	16.23	18.00
5	16QAM	12	0	15.68	15.68	15.73	15.72	15.62	17.00
5	16QAM	12	7	15.60	15.67	15.70	15.67	15.56	17.00
5	16QAM	12	13	15.67	15.73	15.66	15.60	15.48	17.00
5	16QAM	25	0	15.43	15.61	15.70	15.43	15.45	17.00
5	64QAM	1	0	15.65	15.64	15.72	15.71	15.58	17.00
5	64QAM	1	12	15.59	15.63	15.77	15.66	15.55	17.00
5	64QAM	1	24	15.53	15.60	15.67	15.62	15.67	17.00
5	64QAM	12	0	14.73	14.77	14.86	14.68	14.68	16.00
5	64QAM	12	7	14.63	14.58	14.72	14.55	14.58	16.00
5	64QAM	12	13	14.68	14.72	14.68	14.57	14.46	16.00
5	64QAM	25	0	14.54	14.64	14.65	14.60	14.39	16.00

【LTE Band 48_FCC_Part 96
(3550~3700MHz)_4th】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				55340	55830	55990	56150	56640	
Frequency (MHz)				3560	3609	3625	3641	3690	
20	QPSK	1	0	17.24	17.33	17.39	17.40	17.45	19.00
20	QPSK	1	49	17.81	17.51	17.32	17.32	17.96	19.00
20	QPSK	1	99	17.60	17.27	17.15	17.21	17.12	19.00
20	QPSK	50	0	16.32	16.41	16.47	16.39	16.51	18.00
20	QPSK	50	24	16.36	16.46	16.43	16.48	16.37	18.00
20	QPSK	50	50	16.30	16.39	16.44	16.42	16.23	18.00
20	QPSK	100	0	16.29	16.47	16.33	16.40	16.30	18.00
20	16QAM	1	0	16.16	16.30	16.38	16.37	16.43	18.00
20	16QAM	1	49	16.34	16.46	16.23	16.47	16.27	18.00
20	16QAM	1	99	16.05	16.58	16.19	16.07	16.15	18.00
20	16QAM	50	0	15.28	15.41	15.41	15.62	15.38	17.00
20	16QAM	50	24	15.34	15.48	15.31	15.47	15.29	17.00
20	16QAM	50	50	15.30	15.43	15.42	15.35	15.21	17.00
20	16QAM	100	0	15.26	15.51	15.35	15.45	15.31	17.00
20	64QAM	1	0	15.50	15.60	15.17	15.75	15.33	17.00
20	64QAM	1	49	15.47	15.66	15.07	15.17	15.09	17.00
20	64QAM	1	99	15.03	15.04	15.17	15.11	15.07	17.00
20	64QAM	50	0	14.32	14.37	14.48	14.57	14.28	16.00
20	64QAM	50	24	14.36	14.56	14.45	14.53	14.35	16.00
20	64QAM	50	50	14.33	14.43	14.47	14.39	14.23	16.00
20	64QAM	100	0	14.28	14.44	14.36	14.50	14.22	16.00
Channel				55315	55820	55990	56160	56665	Tune-up limit (dBm)
Frequency (MHz)				3557.5	3608	3625	3642	3692.5	
15	QPSK	1	0	17.32	17.27	17.41	17.41	17.35	19.00
15	QPSK	1	37	17.16	17.38	17.27	17.26	17.39	19.00
15	QPSK	1	74	17.25	17.26	17.43	17.38	17.07	19.00
15	QPSK	36	0	16.34	16.41	16.43	16.50	16.43	18.00
15	QPSK	36	20	16.35	16.48	16.39	16.43	16.26	18.00
15	QPSK	36	39	16.30	16.38	16.44	16.35	16.26	18.00
15	QPSK	75	0	16.27	16.50	16.36	16.43	16.35	18.00
15	16QAM	1	0	16.35	16.35	16.90	16.53	16.42	18.00
15	16QAM	1	37	16.40	16.20	16.39	16.31	16.23	18.00
15	16QAM	1	74	16.46	16.53	16.06	16.17	16.23	18.00
15	16QAM	36	0	15.36	15.47	15.50	15.57	15.43	17.00
15	16QAM	36	20	15.31	15.47	15.24	15.47	15.29	17.00
15	16QAM	36	39	15.28	15.48	15.46	15.38	15.20	17.00
15	16QAM	75	0	15.27	15.40	15.38	15.50	15.31	17.00
15	64QAM	1	0	15.19	15.43	15.48	15.52	15.07	17.00
15	64QAM	1	37	15.50	15.21	15.44	15.36	15.22	17.00
15	64QAM	1	74	15.15	15.40	15.08	15.17	15.09	17.00

15	64QAM	36	0	14.39	14.48	14.53	14.46	14.41	16.00
15	64QAM	36	20	14.45	14.43	14.29	14.45	14.35	16.00
15	64QAM	36	39	14.33	14.44	14.51	14.49	14.28	16.00
15	64QAM	75	0	14.23	14.48	14.34	14.41	14.30	16.00
Channel				55290	55815	55990	56165	56690	Tune-up limit (dBm)
Frequency (MHz)				3555	3607.5	3625	3642.5	3695	
10	QPSK	1	0	17.46	17.52	17.63	17.46	17.46	19.00
10	QPSK	1	25	17.45	17.60	17.63	17.71	17.42	19.00
10	QPSK	1	49	17.42	17.48	17.37	17.33	17.45	19.00
10	QPSK	25	0	16.42	16.66	16.56	16.70	16.48	18.00
10	QPSK	25	12	16.53	16.64	16.69	16.67	16.55	18.00
10	QPSK	25	25	16.37	16.58	16.66	16.55	16.47	18.00
10	QPSK	50	0	16.47	16.69	16.49	16.66	16.49	18.00
10	16QAM	1	0	16.70	16.64	16.74	16.71	16.45	18.00
10	16QAM	1	25	16.24	16.53	16.87	16.45	16.55	18.00
10	16QAM	1	49	16.62	16.61	16.70	16.74	16.21	18.00
10	16QAM	25	0	15.57	15.65	15.60	15.80	15.54	17.00
10	16QAM	25	12	15.47	15.71	15.66	15.65	15.49	17.00
10	16QAM	25	25	15.43	15.59	15.70	15.56	15.48	17.00
10	16QAM	50	0	15.42	15.61	15.46	15.63	15.40	17.00
10	64QAM	1	0	15.26	15.29	15.77	15.51	15.09	17.00
10	64QAM	1	25	15.45	15.69	15.22	15.81	15.48	17.00
10	64QAM	1	49	15.29	15.18	15.65	15.20	15.46	17.00
10	64QAM	25	0	14.41	14.58	14.58	14.70	14.50	16.00
10	64QAM	25	12	14.57	14.73	14.72	14.72	14.51	16.00
10	64QAM	25	25	14.50	14.56	14.67	14.58	14.49	16.00
10	64QAM	50	0	14.40	14.62	14.54	14.60	14.50	16.00
Channel				55265	55810	55990	56170	56715	Tune-up limit (dBm)
Frequency (MHz)				3552.5	3607	3625	3643	3697.5	
5	QPSK	1	0	17.72	17.56	17.55	17.59	17.44	19.00
5	QPSK	1	12	17.83	17.49	17.93	17.63	17.38	19.00
5	QPSK	1	24	17.74	17.56	17.44	17.46	17.38	19.00
5	QPSK	12	0	16.64	16.63	16.62	16.54	16.52	18.00
5	QPSK	12	7	16.68	16.71	16.61	16.63	16.45	18.00
5	QPSK	12	13	16.65	16.60	16.62	16.58	16.48	18.00
5	QPSK	25	0	16.58	16.56	16.72	16.58	16.43	18.00
5	16QAM	1	0	17.31	16.64	16.67	16.42	16.50	18.00
5	16QAM	1	12	16.68	16.64	16.58	16.84	16.07	18.00
5	16QAM	1	24	16.64	16.70	16.64	16.66	16.18	18.00
5	16QAM	12	0	15.62	15.60	15.54	15.67	15.42	17.00
5	16QAM	12	7	15.85	15.61	15.67	15.63	15.45	17.00
5	16QAM	12	13	15.61	15.65	15.48	15.44	15.44	17.00
5	16QAM	25	0	15.68	15.59	15.57	15.59	15.48	17.00
5	64QAM	1	0	16.13	15.17	15.43	15.13	15.25	17.00
5	64QAM	1	12	15.56	15.72	15.69	15.74	15.20	17.00
5	64QAM	1	24	15.52	15.34	15.15	15.43	15.24	17.00
5	64QAM	12	0	14.67	14.56	14.78	14.55	14.51	16.00
5	64QAM	12	7	14.63	14.65	14.58	14.66	14.52	16.00
5	64QAM	12	13	14.63	14.52	14.62	14.61	14.39	16.00
5	64QAM	25	0	14.63	14.57	14.67	14.60	14.37	16.00

11. UL/DL Carrier aggregation

LTE DL Carrier Aggregation

General Note:

1. According to 202410 TCB workshop, the downlink (DL) pertains to receiver functionality, thus it is not related to RF exposure compliance limits related to cumulative effects of different transmitters.
2. According to 202410 TCB workshop, equipment authorization applications shall refer to the worst-case UL powers resulting from all the possible modes of operations. Accordingly, CA-DL cases do not need to be analyzed separately, unless pertinent to establishing UL power setting.
3. This device supports LTE carrier aggregation in the downlink. All uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded

LTE UL carrier aggregation

General Note:

1. The device supports intra-band uplink carrier aggregation with a maximum of two 20MHz component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre 3GPP requirement.
2. 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.
3. 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.
4. 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.
5. Additional SAR measurement for LTE UL CA whit other DL CA combinations active were not required since the maximum output power for this configuration was not 0.25dB higher than the maximum output power for UL CA active.

2CC Uplink Carrier Aggregation	
Number	Combination
01	48B

【CA_48C_4th】

Combination 20MHz+20MHz (100RB+100RB)								
PCC Channel	SCC Channel	Modulation	PCC		SCC		Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB Offset	RB Size	RB Offset		
55340	55538	QPSK	1	0	0	0	16.84	18.00
55830	55632	QPSK	1	0	1	99	16.97	18.00
56150	55952	QPSK	1	0	1	99	16.98	18.00
56640	56442	QPSK	1	0	1	99	17.06	18.00

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

General Note:

1. Referencing the procedure in KDB 941225, the test procedures are outlined as below
 - a. For DFT-OFDM output power measurement, full measurement was done for PI/2 BPSK and QPSK and for the largest supported bandwidth, repeat test for 16QAM/64QAM/256QAM under 1RB 1Offset configuration. For smaller bandwidth, measure conducted power for PI/2 BPSK and 1RB 1Offset configuration.
 - b. According to the tune-up, CP-OFDM output power is not ½ dB higher than DFT-OFDM mode, and the reported SAR of DFT-OFDM mode reported SAR is ≤ 1.45 W/kg, SAR test and thus conducted power for CP-OFDM mode is not required.
 - c. To start SAR test for the largest channel bandwidth for PI/2 BPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. Also do SAR test for 50% RB allocation for PI/2 BPSK SAR testing using 1RB PI/2 BPSK allocation procedure
 - d. For PI/2 BPSK with 100% RB allocation, SAR test is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is ≤ 1.45 W/kg, the remaining required test channels must also be tested.
 - e. For higher modulation QPSK/16QAM/64QAM/256QAM, according to tune-up document the power level is not ½ dB higher than the same configuration in PI/2 BPSK, also reported SAR for the PI/2 BPSK configuration is less than 1.45 W/kg, QPSK/16QAM/64QAM/256QAM SAR testing are not required.
 - f. Smaller bandwidth output power for each RB allocation configuration for this device is not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device
2. Due to test setup limitations, SAR testing for NR was performed using Factory Test Mode software to establish the connection and perform SAR with 100% transmission. 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		

【FR1 n41_ FCC_3rd】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				509202	518598	528000	Tune-up limit (dBm)
Frequency (MHz)				2546.01	2592.99	2640	
100	PI/2 BPSK	1	1	24.02	24.07	23.87	25.50
100	PI/2 BPSK	1	137	23.63	23.72	23.51	25.50
100	PI/2 BPSK	1	271	23.57	23.70	23.50	25.50
100	PI/2 BPSK	135	0	23.17	23.33	23.00	25.00
100	PI/2 BPSK	135	69	23.81	23.87	23.65	25.50
100	PI/2 BPSK	135	138	23.19	23.32	23.01	25.00
100	PI/2 BPSK	270	0	23.26	23.39	23.05	25.00
100	QPSK	1	1	23.81	23.96	23.72	25.50
100	QPSK	1	137	23.53	23.52	23.50	25.50
100	QPSK	1	271	23.55	23.57	23.54	25.50
100	QPSK	135	0	22.75	22.89	22.59	24.50
100	QPSK	135	69	23.66	23.75	23.52	25.50
100	QPSK	135	138	22.50	22.66	22.51	24.50
100	QPSK	270	0	22.71	22.77	22.53	24.50
100	16QAM	1	1	22.73	22.92	22.59	24.50
100	64QAM	1	1	21.73	21.87	21.54	23.00
100	256QAM	1	1	19.18	19.35	19.07	21.00
Channel				508200	518598	528996	Tune-up limit (dBm)
Frequency (MHz)				2541	2592.99	2644.98	
90	PI/2 BPSK	1	1	23.94	23.94	23.70	25.50
Channel				507204	518598	529998	Tune-up limit (dBm)
Frequency (MHz)				2536.02	2592.99	2649.99	
80	PI/2 BPSK	1	1	23.96	23.88	23.73	25.50
Channel				505200	518598	531996	Tune-up limit (dBm)
Frequency (MHz)				2526	2592.99	2659.98	
60	PI/2 BPSK	1	1	23.94	23.90	23.68	25.50
Channel				504204	518598	532998	Tune-up limit (dBm)
Frequency (MHz)				2521.02	2592.99	2664.99	
50	PI/2 BPSK	1	1	23.88	23.97	23.76	25.50
Channel				503202	518598	534000	Tune-up limit (dBm)
Frequency (MHz)				2516.01	2592.99	2670	
40	PI/2 BPSK	1	1	23.98	23.90	23.68	25.50
Channel				502200	518598	534996	Tune-up limit (dBm)
Frequency (MHz)				2511	2592.99	2674.98	
30	PI/2 BPSK	1	1	23.83	23.90	23.68	25.50
Channel				501204	518598	535998	Tune-up limit (dBm)
Frequency (MHz)				2506.02	2592.99	2679.99	
20	PI/2 BPSK	1	1	23.90	23.98	23.73	25.50
Channel				500700	518598	536496	Tune-up limit (dBm)
Frequency (MHz)				2503.5	2592.99	2682.48	
15	PI/2 BPSK	1	1	23.92	23.97	23.79	25.50
Channel				500202	518598	537000	Tune-up limit (dBm)
Frequency (MHz)				2501.01	2592.99	2685	
10	PI/2 BPSK	1	1	24.00	24.03	23.85	25.50

【FR1 n41__FCC_4th】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				509202	518598	528000	Tune-up limit (dBm)
Frequency (MHz)				2546.01	2592.99	2640	
100	PI/2 BPSK	1	1	24.54	23.80	23.75	25.50
100	PI/2 BPSK	1	137	24.29	23.66	23.52	25.50
100	PI/2 BPSK	1	271	24.42	23.78	23.62	25.50
100	PI/2 BPSK	135	0	23.90	23.21	23.15	25.00
100	PI/2 BPSK	135	69	24.25	23.65	23.52	25.50
100	PI/2 BPSK	135	138	23.72	23.14	23.00	25.00
100	PI/2 BPSK	270	0	23.94	23.23	23.12	25.00
100	QPSK	1	1	24.44	23.78	23.71	25.50
100	QPSK	1	137	24.20	23.59	23.53	25.50
100	QPSK	1	271	24.39	23.71	23.53	25.50
100	QPSK	135	0	23.39	22.70	22.56	24.50
100	QPSK	135	69	24.26	23.64	23.52	25.50
100	QPSK	135	138	23.37	22.68	22.59	24.50
100	QPSK	270	0	23.38	22.72	22.58	24.50
100	16QAM	1	1	23.21	22.53	22.52	24.50
100	64QAM	1	1	22.04	21.47	21.33	23.00
100	256QAM	1	1	19.61	19.13	19.02	21.00
Channel				508200	518598	528996	Tune-up limit (dBm)
Frequency (MHz)				2541	2592.99	2644.98	
90	PI/2 BPSK	1	1	24.37	23.68	23.54	25.50
Channel				507204	518598	529998	Tune-up limit (dBm)
Frequency (MHz)				2536.02	2592.99	2649.99	
80	PI/2 BPSK	1	1	24.37	23.61	23.61	25.50
Channel				505200	518598	531996	Tune-up limit (dBm)
Frequency (MHz)				2526	2592.99	2659.98	
60	PI/2 BPSK	1	1	24.36	23.64	23.63	25.50
Channel				504204	518598	532998	Tune-up limit (dBm)
Frequency (MHz)				2521.02	2592.99	2664.99	
50	PI/2 BPSK	1	1	24.38	23.58	23.63	25.50
Channel				503202	518598	534000	Tune-up limit (dBm)
Frequency (MHz)				2516.01	2592.99	2670	
40	PI/2 BPSK	1	1	24.41	23.66	23.61	25.50
Channel				502200	518598	534996	Tune-up limit (dBm)
Frequency (MHz)				2511	2592.99	2674.98	
30	PI/2 BPSK	1	1	24.34	23.60	23.63	25.50
Channel				501204	518598	535998	Tune-up limit (dBm)
Frequency (MHz)				2506.02	2592.99	2679.99	
20	PI/2 BPSK	1	1	24.34	23.64	23.59	25.50
Channel				500700	518598	536496	Tune-up limit (dBm)
Frequency (MHz)				2503.5	2592.99	2682.48	
15	PI/2 BPSK	1	1	24.40	23.63	23.55	25.50
Channel				500202	518598	537000	Tune-up limit (dBm)
Frequency (MHz)				2501.01	2592.99	2685	
10	PI/2 BPSK	1	1	24.34	23.64	23.64	25.50

【FR1 n41_ FCC_HPUE_3rd】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				509202	518598	528000	Tune-up limit (dBm)
Frequency (MHz)				2546.01	2592.99	2640	
100	PI/2 BPSK	1	1	26.15	26.32	26.23	27.50
100	PI/2 BPSK	1	137	25.52	25.55	25.50	27.50
100	PI/2 BPSK	1	271	25.61	25.92	25.77	27.50
100	PI/2 BPSK	135	0	25.10	25.34	25.19	27.00
100	PI/2 BPSK	135	69	25.50	25.55	25.50	27.50
100	PI/2 BPSK	135	138	25.00	25.04	25.00	27.00
100	PI/2 BPSK	270	0	25.12	25.30	25.19	27.00
100	QPSK	1	1	26.03	26.26	26.09	27.50
100	QPSK	1	137	25.51	25.58	25.50	27.50
100	QPSK	1	271	25.61	25.84	25.61	27.50
100	QPSK	135	0	25.02	25.24	25.13	26.50
100	QPSK	135	69	25.51	25.55	25.52	27.50
100	QPSK	135	138	24.68	24.89	24.79	26.50
100	QPSK	270	0	24.82	25.13	24.97	26.50
100	16QAM	1	1	25.57	25.75	25.60	26.50
100	64QAM	1	1	23.80	24.06	23.96	25.00
100	256QAM	1	1	21.54	21.69	21.58	23.00
Channel				508200	518598	528996	Tune-up limit (dBm)
Frequency (MHz)				2541	2592.99	2644.98	
90	PI/2 BPSK	1	1	25.97	26.14	26.11	27.50
Channel				507204	518598	529998	Tune-up limit (dBm)
Frequency (MHz)				2536.02	2592.99	2649.99	
80	PI/2 BPSK	1	1	25.95	26.29	26.06	27.50
Channel				505200	518598	531996	Tune-up limit (dBm)
Frequency (MHz)				2526	2592.99	2659.98	
60	PI/2 BPSK	1	1	26.13	26.27	26.03	27.50
Channel				504204	518598	532998	Tune-up limit (dBm)
Frequency (MHz)				2521.02	2592.99	2664.99	
50	PI/2 BPSK	1	1	26.11	26.16	26.21	27.50
Channel				503202	518598	534000	Tune-up limit (dBm)
Frequency (MHz)				2516.01	2592.99	2670	
40	PI/2 BPSK	1	1	26.00	26.16	26.16	27.50
Channel				502200	518598	534996	Tune-up limit (dBm)
Frequency (MHz)				2511	2592.99	2674.98	
30	PI/2 BPSK	1	1	26.11	26.16	26.16	27.50
Channel				501204	518598	535998	Tune-up limit (dBm)
Frequency (MHz)				2506.02	2592.99	2679.99	
20	PI/2 BPSK	1	1	26.06	26.30	26.17	27.50
Channel				500700	518598	536496	Tune-up limit (dBm)
Frequency (MHz)				2503.5	2592.99	2682.48	
15	PI/2 BPSK	1	1	26.09	26.23	26.19	27.50
Channel				500202	518598	537000	Tune-up limit (dBm)
Frequency (MHz)				2501.01	2592.99	2685	
10	PI/2 BPSK	1	1	26.11	26.16	26.21	27.50

【FR1 n41__FCC_HPUE_4th】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				509202	518598	528000	
Frequency (MHz)				2546.01	2592.99	2640	
100	PI/2 BPSK	1	1	26.58	25.90	25.77	27.50
100	PI/2 BPSK	1	137	26.36	25.76	25.58	27.50
100	PI/2 BPSK	1	271	26.41	25.84	25.56	27.50
100	PI/2 BPSK	135	0	25.89	25.35	25.13	27.00
100	PI/2 BPSK	135	69	26.38	25.80	25.57	27.50
100	PI/2 BPSK	135	138	25.77	25.24	25.08	27.00
100	PI/2 BPSK	270	0	25.94	25.34	25.09	27.00
100	QPSK	1	1	26.42	25.88	25.70	27.50
100	QPSK	1	137	26.35	25.82	25.62	27.50
100	QPSK	1	271	26.43	25.79	25.59	27.50
100	QPSK	135	0	25.29	24.67	24.54	26.50
100	QPSK	135	69	26.22	25.66	25.55	27.50
100	QPSK	135	138	25.29	24.66	24.53	26.50
100	QPSK	270	0	25.32	24.70	24.55	26.50
100	16QAM	1	1	25.91	25.30	25.05	26.50
100	64QAM	1	1	24.11	23.55	23.37	25.00
100	256QAM	1	1	21.82	21.30	21.10	23.00
Channel				508200	518598	528996	Tune-up limit (dBm)
Frequency (MHz)				2541	2592.99	2644.98	
90	PI/2 BPSK	1	1	26.52	25.70	25.58	27.50
Channel				507204	518598	529998	Tune-up limit (dBm)
Frequency (MHz)				2536.02	2592.99	2649.99	
80	PI/2 BPSK	1	1	26.51	25.71	25.61	27.50
Channel				505200	518598	531996	Tune-up limit (dBm)
Frequency (MHz)				2526	2592.99	2659.98	
60	PI/2 BPSK	1	1	26.50	25.87	25.69	27.50
Channel				504204	518598	532998	Tune-up limit (dBm)
Frequency (MHz)				2521.02	2592.99	2664.99	
50	PI/2 BPSK	1	1	26.54	25.81	25.73	27.50
Channel				503202	518598	534000	Tune-up limit (dBm)
Frequency (MHz)				2516.01	2592.99	2670	
40	PI/2 BPSK	1	1	26.52	25.71	25.71	27.50
Channel				502200	518598	534996	Tune-up limit (dBm)
Frequency (MHz)				2511	2592.99	2674.98	
30	PI/2 BPSK	1	1	26.41	25.86	25.67	27.50
Channel				501204	518598	535998	Tune-up limit (dBm)
Frequency (MHz)				2506.02	2592.99	2679.99	
20	PI/2 BPSK	1	1	26.51	25.75	25.59	27.50
Channel				500700	518598	536496	Tune-up limit (dBm)
Frequency (MHz)				2503.5	2592.99	2682.48	
15	PI/2 BPSK	1	1	26.40	25.78	25.58	27.50
Channel				500202	518598	537000	Tune-up limit (dBm)
Frequency (MHz)				2501.01	2592.99	2685	
10	PI/2 BPSK	1	1	26.53	25.87	25.58	27.50

【FR1 n48_FCC_Part 96 (3550~3700MHz)_3rd】

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	18.24	18.41	18.22	19.50
40	PI/2 BPSK	1	53	17.98	18.29	17.99	19.50
40	PI/2 BPSK	1	104	18.15	18.37	18.04	19.50
40	PI/2 BPSK	50	0	17.61	17.82	17.53	19.00
40	PI/2 BPSK	50	28	17.99	18.25	17.98	19.50
40	PI/2 BPSK	50	56	17.57	17.76	17.44	19.00
40	PI/2 BPSK	100	0	17.46	17.77	17.57	19.00
40	QPSK	1	1	18.07	18.33	18.07	19.50
40	QPSK	1	53	18.04	18.28	18.02	19.50
40	QPSK	1	104	18.01	18.31	18.06	19.50
40	QPSK	50	0	16.99	17.28	16.99	18.50
40	QPSK	50	28	17.95	18.23	17.93	19.50
40	QPSK	50	56	17.01	17.21	16.94	18.50
40	QPSK	100	0	17.00	17.27	17.03	18.50
40	16QAM	1	1	17.41	17.60	17.34	18.50
40	64QAM	1	1	15.72	15.99	15.77	17.00
40	256QAM	1	1	13.74	13.88	13.69	15.00
Channel				637668	641666	645666	Tune-up limit (dBm)
Frequency (MHz)				3565.02	3624.99	3684.99	
30	PI/2 BPSK	1	1	18.16	18.38	18.16	19.50
Channel				637334	641666	646000	Tune-up limit (dBm)
Frequency (MHz)				3560.01	3624.99	3690	
20	PI/2 BPSK	1	1	18.15	18.33	18.17	19.50
Channel				637168	641666	646166	Tune-up limit (dBm)
Frequency (MHz)				3557.52	3624.99	3692.49	
15	PI/2 BPSK	1	1	18.18	18.38	18.20	19.50
Channel				637000	641666	646332	Tune-up limit (dBm)
Frequency (MHz)				3555	3624.99	3694.98	
10	PI/2 BPSK	1	1	18.19	18.34	18.15	19.50

【FR1 n48 _FCC_ Part 96 (3550~3700MHz)_4th】

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	
Frequency (MHz)				3570	3624.99	3679.98	
40	PI/2 BPSK	1	1	17.34	17.55	17.41	19.00
40	PI/2 BPSK	1	53	17.14	17.42	17.24	19.00
40	PI/2 BPSK	1	104	17.25	17.52	17.33	19.00
40	PI/2 BPSK	50	0	16.67	16.91	16.72	18.50
40	PI/2 BPSK	50	28	17.16	17.40	17.18	19.00
40	PI/2 BPSK	50	56	16.54	16.88	16.61	18.50
40	PI/2 BPSK	100	0	16.63	16.90	16.70	18.50
40	QPSK	1	1	17.09	17.36	17.18	19.00
40	QPSK	1	53	17.01	17.32	17.08	19.00
40	QPSK	1	104	17.08	17.40	17.22	19.00
40	QPSK	50	0	16.12	16.41	16.27	18.00
40	QPSK	50	28	17.08	17.36	17.08	19.00
40	QPSK	50	56	16.04	16.37	16.12	18.00
40	QPSK	100	0	16.07	16.36	16.15	18.00
40	16QAM	1	1	16.55	16.84	16.68	18.00
40	64QAM	1	1	14.96	15.25	15.04	16.50
40	256QAM	1	1	12.70	12.95	12.71	14.50
Channel				637668	641666	645666	Tune-up limit (dBm)
Frequency (MHz)				3565.02	3624.99	3684.99	
30	PI/2 BPSK	1	1	17.32	17.41	17.38	19.00
Channel				637334	641666	646000	Tune-up limit (dBm)
Frequency (MHz)				3560.01	3624.99	3690	
20	PI/2 BPSK	1	1	17.24	17.40	17.34	19.00
Channel				637168	641666	646166	Tune-up limit (dBm)
Frequency (MHz)				3557.52	3624.99	3692.49	
15	PI/2 BPSK	1	1	17.20	17.46	17.28	19.00
Channel				637000	641666	646332	Tune-up limit (dBm)
Frequency (MHz)				3555	3624.99	3694.98	
10	PI/2 BPSK	1	1	17.28	17.49	17.33	19.00

【FR1 n77 (27Q) _FCC_Part 27Q (3450~3550MHz)_3rd】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				633000	633332	633666	Tune-up limit (dBm)
Frequency (MHz)				3495	3499.98	3504.99	(dBm)
100	PI/2 BPSK	1	1	23.58	23.60	23.55	25.50
100	PI/2 BPSK	1	137		23.65		25.50
100	PI/2 BPSK	1	271		23.56		25.50
100	PI/2 BPSK	135	0		23.07		25.00
100	PI/2 BPSK	135	69		23.54		25.50
100	PI/2 BPSK	135	138		23.01		25.00
100	PI/2 BPSK	270	0		23.01		25.00
100	QPSK	1	1		23.60		25.50
100	QPSK	1	137		23.53		25.50
100	QPSK	1	271		23.57		25.50
100	QPSK	135	0		22.60		24.50
100	QPSK	135	69		23.54		25.50
100	QPSK	135	138		22.51		24.50
100	QPSK	270	0		22.56		24.50
100	16QAM	1	1		22.53		24.50
100	64QAM	1	1		21.02		23.00
100	256QAM	1	1		19.08		21.00
Channel				633000	633332	633666	Tune-up limit (dBm)
Frequency (MHz)				3495	3499.98	3504.99	(dBm)
90	PI/2 BPSK	1	1	23.58	23.60	23.55	25.50
Channel				632668	633332	634000	Tune-up limit (dBm)
Frequency (MHz)				3490.02	3499.98	3510	(dBm)
80	PI/2 BPSK	1	1	23.53	23.50	23.59	25.50
Channel				632334	633332	634332	Tune-up limit (dBm)
Frequency (MHz)				3485.01	3499.98	3514.98	(dBm)
70	PI/2 BPSK	1	1	23.51	23.50	23.54	25.50
Channel				632000	633332	634666	Tune-up limit (dBm)
Frequency (MHz)				3480	3499.98	3519.99	(dBm)
60	PI/2 BPSK	1	1	23.52	23.57	23.56	25.50
Channel				631668	633332	635000	Tune-up limit (dBm)
Frequency (MHz)				3475.02	3499.98	3525	(dBm)
50	PI/2 BPSK	1	1	23.61	23.52	23.53	25.50
Channel				631334	633332	635332	Tune-up limit (dBm)
Frequency (MHz)				3470.01	3499.98	3529.98	(dBm)
40	PI/2 BPSK	1	1	23.61	23.57	23.50	25.50
Channel				631000	633332	635666	Tune-up limit (dBm)
Frequency (MHz)				3465	3499.98	3534.99	(dBm)
30	PI/2 BPSK	1	1	23.54	23.58	23.51	25.50
Channel				630668	633332	636000	Tune-up limit (dBm)
Frequency (MHz)				3460.02	3499.98	3540	(dBm)
20	PI/2 BPSK	1	1	23.59	23.55	23.52	25.50
Channel				630500	633332	636166	Tune-up limit (dBm)
Frequency (MHz)				3457.5	3499.98	3542.49	(dBm)
15	PI/2 BPSK	1	1	23.50	23.51	23.52	25.50
Channel				630334	633332	636332	Tune-up limit (dBm)
Frequency (MHz)				3455.01	3499.98	3544.98	(dBm)
10	PI/2 BPSK	1	1	23.57	23.53	23.54	25.50

【FR1 n77 (270) _FCC_Part 270 (3700~3980MHz)_3rd】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				650000	656000	662000	
Frequency (MHz)				3750	3840	3930	
100	PI/2 BPSK	1	1	23.72	23.76	23.69	25.50
100	PI/2 BPSK	1	137	23.55	23.73	23.60	25.50
100	PI/2 BPSK	1	271	23.58	23.74	23.65	25.50
100	PI/2 BPSK	135	0	23.12	23.20	23.08	25.00
100	PI/2 BPSK	135	69	23.59	23.70	23.52	25.50
100	PI/2 BPSK	135	138	23.03	23.22	23.04	25.00
100	PI/2 BPSK	270	0	23.08	23.19	23.04	25.00
100	QPSK	1	1	23.59	23.70	23.53	25.50
100	QPSK	1	137	23.58	23.69	23.53	25.50
100	QPSK	1	271	23.51	23.66	23.53	25.50
100	QPSK	135	0	22.56	22.68	22.52	24.50
100	QPSK	135	69	23.56	23.62	23.54	25.50
100	QPSK	135	138	22.56	22.62	22.56	24.50
100	QPSK	270	0	22.50	22.62	22.51	24.50
100	16QAM	1	1	22.63	22.69	22.52	24.50
100	64QAM	1	1	21.17	21.29	21.21	23.00
100	256QAM	1	1	19.04	19.15	19.06	21.00
Channel				649668	656000	662332	Tune-up limit (dBm)
Frequency (MHz)				3745.02	3840	3934.98	
90	PI/2 BPSK	1	1	23.57	23.64	23.67	25.50
Channel				649334	656000	662666	Tune-up limit (dBm)
Frequency (MHz)				3740.01	3840	3939.99	
80	PI/2 BPSK	1	1	23.63	23.67	23.58	25.50
Channel				649000	656000	663000	Tune-up limit (dBm)
Frequency (MHz)				3735	3840	3945	
70	PI/2 BPSK	1	1	23.70	23.72	23.55	25.50
Channel				648668	656000	663332	Tune-up limit (dBm)
Frequency (MHz)				3730.02	3840	3949.98	
60	PI/2 BPSK	1	1	23.57	23.63	23.59	25.50
Channel				648334	656000	663666	Tune-up limit (dBm)
Frequency (MHz)				3725.01	3840	3954.99	
50	PI/2 BPSK	1	1	23.62	23.64	23.62	25.50
Channel				648000	656000	664000	Tune-up limit (dBm)
Frequency (MHz)				3720	3840	3960	
40	PI/2 BPSK	1	1	23.59	23.71	23.64	25.50
Channel				647668	656000	664332	Tune-up limit (dBm)
Frequency (MHz)				3715.02	3840	3964.98	
30	PI/2 BPSK	1	1	23.63	23.70	23.61	25.50
Channel				647334	656000	664666	Tune-up limit (dBm)
Frequency (MHz)				3710.01	3840	3969.99	
20	PI/2 BPSK	1	1	23.62	23.70	23.56	25.50
Channel				647168	656000	664832	Tune-up limit (dBm)
Frequency (MHz)				3707.52	3840	3972.48	
15	PI/2 BPSK	1	1	23.70	23.62	23.61	25.50
Channel				647000	656000	665000	Tune-up limit (dBm)
Frequency (MHz)				3705	3840	3975	
10	PI/2 BPSK	1	1	23.67	23.75	23.56	25.50

【FR1 n77 (27Q) _FCC_Part 27Q (3450~3550MHz)_4th】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel					633332		
Frequency (MHz)					3499.98		
100	PI/2 BPSK	1	1		23.61		25.50
100	PI/2 BPSK	1	137		23.50		25.50
100	PI/2 BPSK	1	271		23.53		25.50
100	PI/2 BPSK	135	0		23.08		25.00
100	PI/2 BPSK	135	69		23.52		25.50
100	PI/2 BPSK	135	138		23.04		25.00
100	PI/2 BPSK	270	0		23.03		25.00
100	QPSK	1	1		23.50		25.50
100	QPSK	1	137		23.55		25.50
100	QPSK	1	271		23.50		25.50
100	QPSK	135	0		22.59		24.50
100	QPSK	135	69		23.51		25.50
100	QPSK	135	138		22.51		24.50
100	QPSK	270	0		22.51		24.50
100	16QAM	1	1		22.67		24.50
100	64QAM	1	1		21.22		23.00
100	256QAM	1	1		19.01		21.00
Channel				633000	633332	633666	Tune-up limit
Frequency (MHz)				3495	3499.98	3504.99	(dBm)
90	PI/2 BPSK	1	1	23.52	23.55	23.50	25.50
Channel				632668	633332	634000	Tune-up limit
Frequency (MHz)				3490.02	3499.98	3510	(dBm)
80	PI/2 BPSK	1	1	23.54	23.51	23.54	25.50
Channel				632334	633332	634332	Tune-up limit
Frequency (MHz)				3485.01	3499.98	3514.98	(dBm)
70	PI/2 BPSK	1	1	23.53	23.57	23.56	25.50
Channel				632000	633332	634666	Tune-up limit
Frequency (MHz)				3480	3499.98	3519.99	(dBm)
60	PI/2 BPSK	1	1	23.55	23.52	23.53	25.50
Channel				631668	633332	635000	Tune-up limit
Frequency (MHz)				3475.02	3499.98	3525	(dBm)
50	PI/2 BPSK	1	1	23.56	23.57	23.55	25.50
Channel				631334	633332	635332	Tune-up limit
Frequency (MHz)				3470.01	3499.98	3529.98	(dBm)
40	PI/2 BPSK	1	1	23.50	23.58	23.57	25.50
Channel				631000	633332	635666	Tune-up limit
Frequency (MHz)				3465	3499.98	3534.99	(dBm)
30	PI/2 BPSK	1	1	23.54	23.50	23.51	25.50
Channel				630668	633332	636000	Tune-up limit
Frequency (MHz)				3460.02	3499.98	3540	(dBm)
20	PI/2 BPSK	1	1	23.51	23.56	23.52	25.50
Channel				630500	633332	636166	Tune-up limit
Frequency (MHz)				3457.5	3499.98	3542.49	(dBm)
15	PI/2 BPSK	1	1	23.55	23.50	23.53	25.50
Channel				630334	633332	636332	Tune-up limit
Frequency (MHz)				3455.01	3499.98	3544.98	(dBm)
10	PI/2 BPSK	1	1	23.54	23.51	23.56	25.50

【FR1 n77 (270) _FCC_Part 270 (3700~3980MHz)_4th】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				650000	656000	662000	
Frequency (MHz)				3750	3840	3930	
100	PI/2 BPSK	1	1	23.77	23.80	23.64	25.50
100	PI/2 BPSK	1	137	23.72	23.77	23.52	25.50
100	PI/2 BPSK	1	271	23.64	23.74	23.53	25.50
100	PI/2 BPSK	135	0	23.10	23.27	23.09	25.00
100	PI/2 BPSK	135	69	23.67	23.78	23.50	25.50
100	PI/2 BPSK	135	138	23.06	23.20	23.02	25.00
100	PI/2 BPSK	270	0	23.16	23.21	23.02	25.00
100	QPSK	1	1	23.65	23.79	23.60	25.50
100	QPSK	1	137	23.59	23.77	23.51	25.50
100	QPSK	1	271	23.62	23.77	23.57	25.50
100	QPSK	135	0	22.66	22.78	22.55	24.50
100	QPSK	135	69	23.66	23.73	23.54	25.50
100	QPSK	135	138	22.54	22.72	22.53	24.50
100	QPSK	270	0	22.58	22.73	22.51	24.50
100	16QAM	1	1	22.53	22.55	22.52	24.50
100	64QAM	1	1	21.32	21.37	21.17	23.00
100	256QAM	1	1	19.08	19.18	19.00	21.00
Channel				649668	656000	662332	Tune-up limit (dBm)
Frequency (MHz)				3745.02	3840	3934.98	
90	PI/2 BPSK	1	1	23.59	23.59	23.50	25.50
Channel				649334	656000	662666	Tune-up limit (dBm)
Frequency (MHz)				3740.01	3840	3939.99	
80	PI/2 BPSK	1	1	23.63	23.58	23.50	25.50
Channel				649000	656000	663000	Tune-up limit (dBm)
Frequency (MHz)				3735	3840	3945	
70	PI/2 BPSK	1	1	23.60	23.57	23.51	25.50
Channel				648668	656000	663332	Tune-up limit (dBm)
Frequency (MHz)				3730.02	3840	3949.98	
60	PI/2 BPSK	1	1	23.54	23.58	23.51	25.50
Channel				648334	656000	663666	Tune-up limit (dBm)
Frequency (MHz)				3725.01	3840	3954.99	
50	PI/2 BPSK	1	1	23.54	23.61	23.55	25.50
Channel				648000	656000	664000	Tune-up limit (dBm)
Frequency (MHz)				3720	3840	3960	
40	PI/2 BPSK	1	1	23.55	23.59	23.53	25.50
Channel				647668	656000	664332	Tune-up limit (dBm)
Frequency (MHz)				3715.02	3840	3964.98	
30	PI/2 BPSK	1	1	23.63	23.56	23.50	25.50
Channel				647334	656000	664666	Tune-up limit (dBm)
Frequency (MHz)				3710.01	3840	3969.99	
20	PI/2 BPSK	1	1	23.62	23.63	23.54	25.50
Channel				647168	656000	664832	Tune-up limit (dBm)
Frequency (MHz)				3707.52	3840	3972.48	
15	PI/2 BPSK	1	1	23.66	23.60	23.50	25.50
Channel				647000	656000	665000	Tune-up limit (dBm)
Frequency (MHz)				3705	3840	3975	
10	PI/2 BPSK	1	1	23.56	23.62	23.52	25.50

【FR1 n77 (27Q) _FCC_Part 27Q
(3450~3550MHz)_HPUE_3rd】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel					633332		
Frequency (MHz)					3499.98		
100	PI/2 BPSK	1	1		25.65		27.50
100	PI/2 BPSK	1	137		25.54		27.50
100	PI/2 BPSK	1	271		25.58		27.50
100	PI/2 BPSK	135	0		25.08		27.00
100	PI/2 BPSK	135	69		25.51		27.50
100	PI/2 BPSK	135	138		25.02		27.00
100	PI/2 BPSK	270	0		25.04		27.00
100	QPSK	1	1		25.59		27.50
100	QPSK	1	137		25.53		27.50
100	QPSK	1	271		25.58		27.50
100	QPSK	135	0		24.56		26.50
100	QPSK	135	69		25.51		27.50
100	QPSK	135	138		25.52		26.50
100	QPSK	270	0		24.50		26.50
100	16QAM	1	1		24.88		26.50
100	64QAM	1	1		23.29		25.00
100	256QAM	1	1		21.02		23.00
Channel				633000	633332	633666	Tune-up limit
Frequency (MHz)				3495	3499.98	3504.99	(dBm)
90	PI/2 BPSK	1	1	25.56	25.60	25.50	27.50
Channel				632668	633332	634000	Tune-up limit
Frequency (MHz)				3490.02	3499.98	3510	(dBm)
80	PI/2 BPSK	1	1	25.52	25.59	25.50	27.50
Channel				632334	633332	634332	Tune-up limit
Frequency (MHz)				3485.01	3499.98	3514.98	(dBm)
70	PI/2 BPSK	1	1	25.50	25.55	25.50	27.50
Channel				632000	633332	634666	Tune-up limit
Frequency (MHz)				3480	3499.98	3519.99	(dBm)
60	PI/2 BPSK	1	1	25.54	25.54	25.59	27.50
Channel				631668	633332	635000	Tune-up limit
Frequency (MHz)				3475.02	3499.98	3525	(dBm)
50	PI/2 BPSK	1	1	25.52	25.54	25.50	27.50
Channel				631334	633332	635332	Tune-up limit
Frequency (MHz)				3470.01	3499.98	3529.98	(dBm)
40	PI/2 BPSK	1	1	25.52	25.52	25.56	27.50
Channel				631000	633332	635666	Tune-up limit
Frequency (MHz)				3465	3499.98	3534.99	(dBm)
30	PI/2 BPSK	1	1	25.52	25.51	25.57	27.50
Channel				630668	633332	636000	Tune-up limit
Frequency (MHz)				3460.02	3499.98	3540	(dBm)
20	PI/2 BPSK	1	1	25.52	25.58	25.51	27.50
Channel				630500	633332	636166	Tune-up limit
Frequency (MHz)				3457.5	3499.98	3542.49	(dBm)
15	PI/2 BPSK	1	1	25.50	25.55	25.50	27.50
Channel				630334	633332	636332	Tune-up limit
Frequency (MHz)				3455.01	3499.98	3544.98	(dBm)
10	PI/2 BPSK	1	1	25.60	25.55	25.59	27.50

【FR1 n77 (270)_FCC_Part 270
(3700~3980MHz)_HPUE_3rd】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				650000	656000	662000	
Frequency (MHz)				3750	3840	3930	
100	PI/2 BPSK	1	1	25.77	25.78	25.73	27.50
100	PI/2 BPSK	1	137	25.54	25.70	25.55	27.50
100	PI/2 BPSK	1	271	25.71	25.74	25.54	27.50
100	PI/2 BPSK	135	0	25.07	25.16	25.08	27.00
100	PI/2 BPSK	135	69	25.60	25.69	25.51	27.50
100	PI/2 BPSK	135	138	25.04	25.14	25.03	27.00
100	PI/2 BPSK	270	0	25.12	25.17	25.09	27.00
100	QPSK	1	1	25.71	25.77	25.67	27.50
100	QPSK	1	137	25.63	25.68	25.50	27.50
100	QPSK	1	271	25.59	25.71	25.59	27.50
100	QPSK	135	0	24.64	24.67	24.52	26.50
100	QPSK	135	69	25.59	25.68	25.61	27.50
100	QPSK	135	138	24.61	24.66	24.60	26.50
100	QPSK	270	0	24.66	24.70	24.59	26.50
100	16QAM	1	1	24.60	24.65	24.52	26.50
100	64QAM	1	1	23.00	23.14	23.05	25.00
100	256QAM	1	1	21.12	21.14	21.03	23.00
Channel				649668	656000	662332	Tune-up limit (dBm)
Frequency (MHz)				3745.02	3840	3934.98	
90	PI/2 BPSK	1	1	25.68	25.73	25.67	27.50
Channel				649334	656000	662666	Tune-up limit (dBm)
Frequency (MHz)				3740.01	3840	3939.99	
80	PI/2 BPSK	1	1	25.73	25.74	25.70	27.50
Channel				649000	656000	663000	Tune-up limit (dBm)
Frequency (MHz)				3735	3840	3945	
70	PI/2 BPSK	1	1	25.70	25.69	25.66	27.50
Channel				648668	656000	663332	Tune-up limit (dBm)
Frequency (MHz)				3730.02	3840	3949.98	
60	PI/2 BPSK	1	1	25.70	25.69	25.63	27.50
Channel				648334	656000	663666	Tune-up limit (dBm)
Frequency (MHz)				3725.01	3840	3954.99	
50	PI/2 BPSK	1	1	25.76	25.75	25.66	27.50
Channel				648000	656000	664000	Tune-up limit (dBm)
Frequency (MHz)				3720	3840	3960	
40	PI/2 BPSK	1	1	25.74	25.74	25.64	27.50
Channel				647668	656000	664332	Tune-up limit (dBm)
Frequency (MHz)				3715.02	3840	3964.98	
30	PI/2 BPSK	1	1	25.72	25.71	25.61	27.50
Channel				647334	656000	664666	Tune-up limit (dBm)
Frequency (MHz)				3710.01	3840	3969.99	
20	PI/2 BPSK	1	1	25.72	25.67	25.70	27.50
Channel				647168	656000	664832	Tune-up limit (dBm)
Frequency (MHz)				3707.52	3840	3972.48	
15	PI/2 BPSK	1	1	25.72	25.72	25.63	27.50
Channel				647000	656000	665000	Tune-up limit (dBm)
Frequency (MHz)				3705	3840	3975	
10	PI/2 BPSK	1	1	25.63	25.73	25.68	27.50

【FR1 n77 (27Q) _FCC_Part 27Q
(3450~3550MHz)_HPUE_4th】

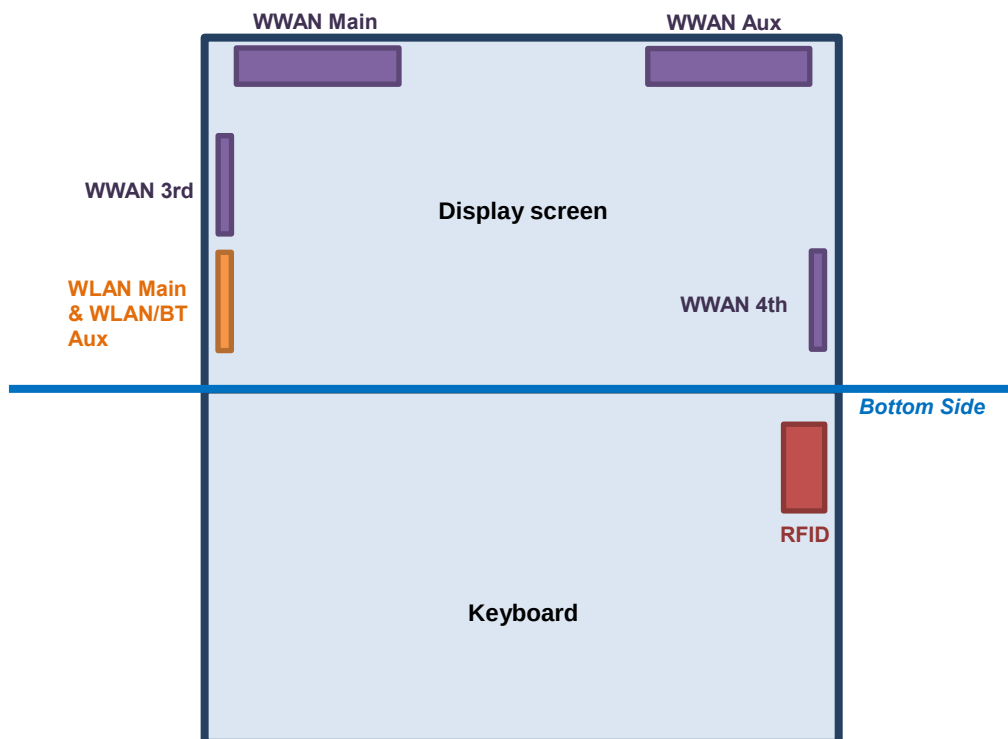
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel					633332		
Frequency (MHz)					3499.98		
100	PI/2 BPSK	1	1		25.65		27.50
100	PI/2 BPSK	1	137		25.51		27.50
100	PI/2 BPSK	1	271		25.56		27.50
100	PI/2 BPSK	135	0		25.06		27.00
100	PI/2 BPSK	135	69		25.54		27.50
100	PI/2 BPSK	135	138		25.00		27.00
100	PI/2 BPSK	270	0		25.03		27.00
100	QPSK	1	1		25.53		27.50
100	QPSK	1	137		25.50		27.50
100	QPSK	1	271		25.51		27.50
100	QPSK	135	0		24.57		26.50
100	QPSK	135	69		25.52		27.50
100	QPSK	135	138		25.50		26.50
100	QPSK	270	0		24.50		26.50
100	16QAM	1	1		24.50		26.50
100	64QAM	1	1		23.22		25.00
100	256QAM	1	1		21.01		23.00
Channel				633000	633332	633666	Tune-up limit
Frequency (MHz)				3495	3499.98	3504.99	(dBm)
90	PI/2 BPSK	1	1	25.63	25.57	25.59	27.50
Channel				632668	633332	634000	Tune-up limit
Frequency (MHz)				3490.02	3499.98	3510	(dBm)
80	PI/2 BPSK	1	1	25.52	25.54	25.62	27.50
Channel				632334	633332	634332	Tune-up limit
Frequency (MHz)				3485.01	3499.98	3514.98	(dBm)
70	PI/2 BPSK	1	1	25.54	25.58	25.55	27.50
Channel				632000	633332	634666	Tune-up limit
Frequency (MHz)				3480	3499.98	3519.99	(dBm)
60	PI/2 BPSK	1	1	25.58	25.62	25.65	27.50
Channel				631668	633332	635000	Tune-up limit
Frequency (MHz)				3475.02	3499.98	3525	(dBm)
50	PI/2 BPSK	1	1	25.57	25.62	25.63	27.50
Channel				631334	633332	635332	Tune-up limit
Frequency (MHz)				3470.01	3499.98	3529.98	(dBm)
40	PI/2 BPSK	1	1	25.50	25.60	25.61	27.50
Channel				631000	633332	635666	Tune-up limit
Frequency (MHz)				3465	3499.98	3534.99	(dBm)
30	PI/2 BPSK	1	1	25.59	25.59	25.64	27.50
Channel				630668	633332	636000	Tune-up limit
Frequency (MHz)				3460.02	3499.98	3540	(dBm)
20	PI/2 BPSK	1	1	25.51	25.61	25.57	27.50
Channel				630500	633332	636166	Tune-up limit
Frequency (MHz)				3457.5	3499.98	3542.49	(dBm)
15	PI/2 BPSK	1	1	25.59	25.61	25.62	27.50
Channel				630334	633332	636332	Tune-up limit
Frequency (MHz)				3455.01	3499.98	3544.98	(dBm)
10	PI/2 BPSK	1	1	25.58	25.59	25.54	27.50

【FR1 n77 (270)_FCC_Part 270
(3700~3980MHz)_HPUE_4th】

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				650000	656000	662000	
Frequency (MHz)				3750	3840	3930	
100	PI/2 BPSK	1	1	25.80	25.83	25.77	27.50
100	PI/2 BPSK	1	137	25.64	25.80	25.72	27.50
100	PI/2 BPSK	1	271	25.68	25.79	25.64	27.50
100	PI/2 BPSK	135	0	25.15	25.25	25.07	27.00
100	PI/2 BPSK	135	69	25.60	25.75	25.54	27.50
100	PI/2 BPSK	135	138	25.13	25.21	25.09	27.00
100	PI/2 BPSK	270	0	25.16	25.25	25.05	27.00
100	QPSK	1	1	25.62	25.68	25.58	27.50
100	QPSK	1	137	25.62	25.74	25.56	27.50
100	QPSK	1	271	25.64	25.80	25.62	27.50
100	QPSK	135	0	24.55	24.73	24.55	26.50
100	QPSK	135	69	25.64	25.73	25.58	27.50
100	QPSK	135	138	24.59	24.75	24.62	26.50
100	QPSK	270	0	24.59	24.75	24.61	26.50
100	16QAM	1	1	24.51	24.62	24.52	26.50
100	64QAM	1	1	23.09	23.20	23.13	25.00
100	256QAM	1	1	21.21	21.27	21.14	23.00
Channel				649668	656000	662332	Tune-up limit (dBm)
Frequency (MHz)				3745.02	3840	3934.98	
90	PI/2 BPSK	1	1	25.65	25.68	25.58	27.50
Channel				649334	656000	662666	Tune-up limit (dBm)
Frequency (MHz)				3740.01	3840	3939.99	
80	PI/2 BPSK	1	1	25.64	25.69	25.64	27.50
Channel				649000	656000	663000	Tune-up limit (dBm)
Frequency (MHz)				3735	3840	3945	
70	PI/2 BPSK	1	1	25.62	25.65	25.65	27.50
Channel				648668	656000	663332	Tune-up limit (dBm)
Frequency (MHz)				3730.02	3840	3949.98	
60	PI/2 BPSK	1	1	25.67	25.68	25.60	27.50
Channel				648334	656000	663666	Tune-up limit (dBm)
Frequency (MHz)				3725.01	3840	3954.99	
50	PI/2 BPSK	1	1	25.68	25.68	25.57	27.50
Channel				648000	656000	664000	Tune-up limit (dBm)
Frequency (MHz)				3720	3840	3960	
40	PI/2 BPSK	1	1	25.66	25.65	25.61	27.50
Channel				647668	656000	664332	Tune-up limit (dBm)
Frequency (MHz)				3715.02	3840	3964.98	
30	PI/2 BPSK	1	1	25.64	25.68	25.53	27.50
Channel				647334	656000	664666	Tune-up limit (dBm)
Frequency (MHz)				3710.01	3840	3969.99	
20	PI/2 BPSK	1	1	25.61	25.58	25.52	27.50
Channel				647168	656000	664832	Tune-up limit (dBm)
Frequency (MHz)				3707.52	3840	3972.48	
15	PI/2 BPSK	1	1	25.57	25.60	25.65	27.50
Channel				647000	656000	665000	Tune-up limit (dBm)
Frequency (MHz)				3705	3840	3975	
10	PI/2 BPSK	1	1	25.57	25.61	25.61	27.50

13. Antenna Location

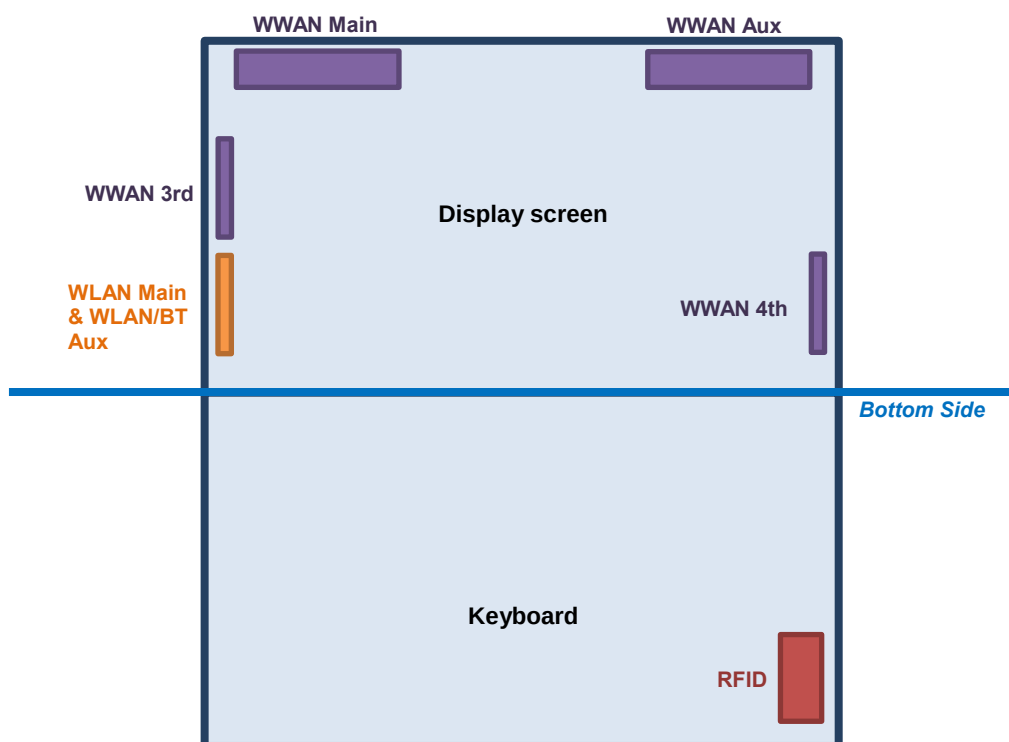
<WWAN + WLAN + RFID(RI24A)>



The separation distance for antenna to edge :

Antenna	To Bottom Side (mm)
WWAN Main Antenna	254.2
WWAN Aux Antenna	254.2
WWAN 3rd Antenna	159.6
WWAN 4th Antenna	69.2
WLAN Main Antenna	69.4
WLAN/BT Aux Antenna	110.7

<WWAN + WLAN + RFID(RI23B)>



The separation distance for antenna to edge :

Antenna	To Bottom Side (mm)
WWAN Main Antenna	254.2
WWAN Aux Antenna	254.2
WWAN 3rd Antenna	159.6
WWAN 4th Antenna	69.2
WLAN Main Antenna	69.4
WLAN/BT Aux Antenna	110.7

SAR test exclusion table
General Note:

1. The below table, when the distance is 50 mm exclusion threshold is "Ratio", when the distance is < 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR}$$
 - f(GHz) is the RF channel transmit frequency in GHz
 - Power and distance are rounded to the nearest mW and mm before calculation
 - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* 50 mm, the SAR test exclusion threshold is determined according to the following
 - a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
 - b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at 1500 MHz and ≤ 6 GHz

<Main>

Exposure Position	Wireless Interface	WCDMA Band V	WCDMA Band IV	WCDMA Band II	LTE Band 71	LTE Band 12	LTE Band 13	LTE Band 14	LTE Band 17	LTE Band 5	LTE Band 26	LTE Band 4	LTE Band 66	LTE Band 2	LTE Band 25	LTE Band 7	LTE Band 41 HPUE	FR1 n70	FR1 n71	FR1 n12	FR1 n13	FR1 n14	FR1 n5	FR1 n26	FR1 n66	FR1 n2	FR1 n25	FR1 n7	FR1 n41 HPUE	FR1 n48	FR1 n77 HPUE
	Calculated Frequency (MHz)	846	1750	1907	695	715	784	795	713	848	848	1754	1779	1909	1914	2567	2687	1702.5	681	708	782	793	848	837	1779	1909	1883	2535	2593	3625	3940
	Maximum power (dBm)	24.5	24.5	24.5	24.0	24.0	24.5	24.0	24.0	24.5	24.0	24.5	24.5	24.0	24.0	24.0	24.0	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	27.5	19.0	27.5
	Maximum rated power(mW)	281.84	281.84	281.84	251.19	251.19	281.84	251.19	251.19	281.84	251.19	281.84	281.84	281.84	251.19	251.19	251.19	354.81	354.81	354.81	354.81	354.81	354.81	354.81	354.81	354.81	354.81	354.81	562.34	79.43	562.34
Bottom Side	Separation distance(mm)	254.2																													
	exclusion threshold	1315.0	2155.0	2151.0	1126.0	1151.0	1237.0	1250.0	1148.0	1317.0	1317.0	2155.0	2154.0	2151.0	2150.0	2136.0	2134.0	65.6	1109.0	1142.0	1234.0	1248.0	1317.0	1303.0	2154.0	2151.0	2151.0	2136.0	2135.0	2121.0	2118.0
	Testing required?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

<Aux>

Exposure Position	Wireless Interface	FR1 n41 HPUE	FR1 n48	FR1 n77 HPUE
	Calculated Frequency (MHz)	2593	3625	3940
	Maximum power (dBm)	27.5	19.0	27.5
	Maximum rated power(mW)	562.34	79.43	562.34
Bottom Side	Separation distance(mm)	254.2		
	exclusion threshold	2135.0	2121.0	2118.0
	Testing required?	No	No	No

14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For 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 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.

5G NR Note:

1. Referencing the procedure in KDB 941225, the test procedures are outlined as below:
 - a. To start SAR test for the largest channel bandwidth for PI/2 BPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. Also do SAR test for 50% RB allocation for PI/2 BPSK SAR testing using 1RB PI/2 BPSK allocation procedure
 - b. For PI/2 BPSK with 100% RB allocation, SAR test is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is 1.45 W/kg, the remaining required test channels must also be tested.
 - c. For higher modulation QPSK/16QAM/64QAM/256QAM, according to tune-up document the power level is not $\frac{1}{2}$ 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. 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. And only for TDD power class2 was performed using Factory Test Mode software to establish the connection and perform SAR with 50% transmission
 - g. For NR FDD was establishing connections via a base station simulator to use for output power measurement and SAR testing.

14.1 Body SAR

【LTE SAR】

Plot No	Band	BW	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-Up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	LTE Band 48	20M	QPSK	1	99	Bottom Side	0mm	3rd	55990	3625	17.35	19.00	1.462	62.9	1.006	0.10	0.030	0.044
	LTE Band 48	20M	QPSK	50	0	Bottom Side	0mm	3rd	55990	3625	16.33	18.00	1.469	62.9	1.006	0.01	0.026	0.038
	LTE Band 48	20M	QPSK	1	49	Bottom Side	0mm	4th	56640	3690	17.96	19.00	1.271	62.9	1.006	0.04	0.033	0.042
	LTE Band 48	20M	QPSK	50	0	Bottom Side	0mm	4th	56640	3690	16.51	18.00	1.409	62.9	1.006	0.02	0.024	0.034

【FR1 SAR】

Plot No	Band	BW	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Antenna	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	100M	BPSK	1	1	Bottom Side	0mm	3rd	518598	2592.99	24.07	25.50	1.39	-0.16	0.006	0.008
02	FR1 n41	100M	BPSK	135	69	Bottom Side	0mm	3rd	518598	2592.99	23.87	25.50	1.455	0.17	0.006	0.009
	FR1 n41_HPUE	100M	BPSK	1	1	Bottom Side	0mm	3rd	518598	2592.99	26.32	27.50	1.312	-0.17	0.005	0.007
	FR1 n41	100M	BPSK	1	1	Bottom Side	0mm	4th	518598	2592.99	23.80	25.50	1.479	0.18	0.004	0.006
	FR1 n41	100M	BPSK	135	69	Bottom Side	0mm	4th	518598	2592.99	23.65	25.50	1.531	0.11	0.006	0.009
	FR1 n41_HPUE	100M	BPSK	1	1	Bottom Side	0mm	4th	518598	2592.99	25.90	27.50	1.445	0.10	0.005	0.007
	FR1 n48	40M	BPSK	1	1	Bottom Side	0mm	3rd	641666	3624.99	18.41	19.50	1.285	-0.11	0.021	0.027
03	FR1 n48	40M	BPSK	50	28	Bottom Side	0mm	3rd	641666	3624.99	18.25	19.50	1.334	0.17	0.033	0.044
	FR1 n77	100M	BPSK	1	1	Bottom Side	0mm	3rd	633332	3499.98	23.65	25.50	1.531	0.14	0.073	0.112
	FR1 n77	100M	BPSK	135	69	Bottom Side	0mm	3rd	633332	3499.98	23.54	25.50	1.57	0.07	0.061	0.096
	FR1 n77_HPUE	100M	BPSK	1	1	Bottom Side	0mm	3rd	633332	3499.98	25.65	27.50	1.531	-0.03	0.054	0.083
	FR1 n77	100M	BPSK	1	1	Bottom Side	0mm	4th	633332	3499.98	23.61	25.50	1.545	0.12	0.125	0.193
	FR1 n77	100M	BPSK	135	69	Bottom Side	0mm	4th	633332	3499.98	23.52	25.50	1.578	0.06	0.113	0.178
	FR1 n77_HPUE	100M	BPSK	1	1	Bottom Side	0mm	4th	633332	3499.98	25.65	27.50	1.531	-0.07	0.089	0.136
	FR1 n77	100M	BPSK	1	1	Bottom Side	0mm	3rd	656000	3840	23.76	25.50	1.493	0.16	0.105	0.157
	FR1 n77	100M	BPSK	135	69	Bottom Side	0mm	3rd	656000	3840	23.70	25.50	1.514	-0.03	0.086	0.131
	FR1 n77_HPUE	100M	BPSK	1	1	Bottom Side	0mm	3rd	656000	3840	25.78	27.50	1.486	-0.06	0.090	0.134
	FR1 n77	100M	BPSK	1	1	Bottom Side	0mm	4th	656000	3840	23.80	25.50	1.479	0.00	0.124	0.183
04	FR1 n77	100M	BPSK	135	69	Bottom Side	0mm	4th	656000	3840	23.78	25.50	1.486	0.01	0.135	0.201
	FR1 n77_HPUE	100M	BPSK	1	1	Bottom Side	0mm	4th	656000	3840	25.83	27.50	1.469	-0.12	0.115	0.169

14.2 Power Class 2 and Power Class 3 Linearity

General Note:

This device support Power Class 2 and Power Class 3 operations. 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 and FR1 configuration and exposure condition combination, according to the highest time averaged power for 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%

	FR1 n41_Ant 3rd (Power Class 3)	FR1 n41_Ant 3rd (Power Class 2)
Maximum Tune up Power (dBm)	25.5	27.5
Reported 1g SAR (W/kg)	0.009	0.007
Duty Cycle	100.00%	50.00%
Frame Averaged (mW)	354.81	281.17
Linearity SAR(W/kg)	0.01	
% deviation from expected linearity		-1.85%

	FR1 n41_Ant 4th (Power Class 3)	FR1 n41_Ant 4th (Power Class 2)
Maximum Tune up Power (dBm)	25.5	27.5
Reported 1g SAR (W/kg)	0.009	0.007
Duty Cycle	100.00%	50.00%
Frame Averaged (mW)	354.81	281.17
Linearity SAR(W/kg)	0.01	
% deviation from expected linearity		-1.85%

	FR1 n77_Ant 3rd (Power Class 3)	FR1 n77_Ant 3rd (Power Class 2)
Maximum Tune up Power (dBm)	25.5	27.5
Reported 1g SAR (W/kg)	0.157	0.134
Duty Cycle	100.00%	50.00%
Frame Averaged (mW)	354.81	281.17
Linearity SAR(W/kg)	0.12	
% deviation from expected linearity		7.70%

	FR1 n77_Ant 4th (Power Class 3)	FR1 n77_Ant 4th (Power Class 2)
Maximum Tune up Power (dBm)	25.5	27.5
Reported 1g SAR (W/kg)	0.201	0.169
Duty Cycle	100.00%	50.00%
Frame Averaged (mW)	354.81	281.17
Linearity SAR(W/kg)	0.16	
% deviation from expected linearity		6.10%

15. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
WWAN Main + WWAN Aux + WLAN + RFID		
1.	WWAN Main + WWAN Aux + WLAN2.4GHz MIMO + RFID RI24A	Yes
2.	WWAN Main + WWAN Aux + WLAN5GHz Main + Bluetooth Aux + RFID RI24A	Yes
3.	WWAN Main + WWAN Aux + WLAN5GHz Aux + Bluetooth Aux + RFID RI24A	Yes
4.	WWAN Main + WWAN Aux + WLAN5GHz MIMO + Bluetooth Aux + RFID RI24A	Yes
5.	WWAN Main + WWAN Aux + WLAN2.4GHz Main + Bluetooth Aux + RFID RI24A	Yes
6.	WWAN Main + WWAN Aux + WLAN2.4GHz MIMO + RFID RI23B	Yes
7.	WWAN Main + WWAN Aux + WLAN5GHz Main + Bluetooth Aux + RFID RI23B	Yes
8.	WWAN Main + WWAN Aux + WLAN5GHz Aux + Bluetooth Aux + RFID RI23B	Yes
9.	WWAN Main + WWAN Aux + WLAN5GHz MIMO + Bluetooth Aux + RFID RI23B	Yes
10.	WWAN Main + WWAN Aux + WLAN6GHz Main + WLAN6GHz Aux+ Bluetooth Aux	Yes
11.	WWAN Main + WWAN Aux + WLAN2.4GHz Main + Bluetooth Aux + RFID RI23B	Yes
WWAN Main + WWAN 3rd + WLAN + RFID		
12.	WWAN Main + WWAN 3rd + WLAN2.4GHz MIMO + RFID RI24A	Yes
13.	WWAN Main + WWAN 3rd + WLAN5GHz Main + Bluetooth Aux + RFID RI24A	Yes
14.	WWAN Main + WWAN 3rd + WLAN5GHz Aux + Bluetooth Aux + RFID RI24A	Yes
15.	WWAN Main + WWAN 3rd + WLAN5GHz MIMO + Bluetooth Aux + RFID RI24A	Yes
16.	WWAN Main + WWAN 3rd + WLAN2.4GHz Main + Bluetooth Aux + RFID RI24A	Yes
17.	WWAN Main + WWAN 3rd + WLAN2.4GHz MIMO + RFID RI23B	Yes
18.	WWAN Main + WWAN 3rd + WLAN5GHz Main + Bluetooth Aux + RFID RI23B	Yes
19.	WWAN Main + WWAN 3rd + WLAN5GHz Aux + Bluetooth Aux + RFID RI23B	Yes
20.	WWAN Main + WWAN 3rd + WLAN5GHz MIMO + Bluetooth Aux + RFID RI23B	Yes
21.	WWAN Main + WWAN 3rd + WLAN6GHz Main + WLAN6GHz Aux+ Bluetooth Aux	Yes
22.	WWAN Main + WWAN 3rd + WLAN2.4GHz Main + Bluetooth Aux + RFID RI23B	Yes
WWAN Main + WWAN 4th + WLAN + RFID		
23.	WWAN Main + WWAN 4th + WLAN2.4GHz MIMO + RFID RI24A	Yes
24.	WWAN Main + WWAN 4th + WLAN5GHz Main + Bluetooth Aux + RFID RI24A	Yes
25.	WWAN Main + WWAN 4th + WLAN5GHz Aux + Bluetooth Aux + RFID RI24A	Yes
26.	WWAN Main + WWAN 4th + WLAN5GHz MIMO + Bluetooth Aux + RFID RI24A	Yes
27.	WWAN Main + WWAN 4th + WLAN2.4GHz Main + Bluetooth Aux + RFID RI24A	Yes
28.	WWAN Main + WWAN 4th + WLAN2.4GHz MIMO + RFID RI23B	Yes
29.	WWAN Main + WWAN 4th + WLAN5GHz Main + Bluetooth Aux + RFID RI23B	Yes
30.	WWAN Main + WWAN 4th + WLAN5GHz Aux + Bluetooth Aux + RFID RI23B	Yes
31.	WWAN Main + WWAN 4th + WLAN5GHz MIMO + Bluetooth Aux + RFID RI23B	Yes
32.	WWAN Main + WWAN 4th + WLAN6GHz Main + WLAN6GHz Aux+ Bluetooth Aux	Yes
33.	WWAN Main + WWAN 4th + WLAN2.4GHz Main + Bluetooth Aux + RFID RI23B	Yes
WWAN Aux + WWAN 3rd + WLAN + RFID		
34.	WWAN Aux + WWAN 3rd + WLAN2.4GHz MIMO + RFID RI24A	Yes
35.	WWAN Aux + WWAN 3rd + WLAN5GHz Main + Bluetooth Aux + RFID RI24A	Yes
36.	WWAN Aux + WWAN 3rd + WLAN5GHz Aux + Bluetooth Aux + RFID RI24A	Yes
37.	WWAN Aux + WWAN 3rd + WLAN5GHz MIMO + Bluetooth Aux + RFID RI24A	Yes
38.	WWAN Aux + WWAN 3rd + WLAN2.4GHz Main + Bluetooth Aux + RFID RI24A	Yes
39.	WWAN Aux + WWAN 3rd + WLAN2.4GHz MIMO + RFID RI23B	Yes
40.	WWAN Aux + WWAN 3rd + WLAN5GHz Main + Bluetooth Aux + RFID RI23B	Yes
41.	WWAN Aux + WWAN 3rd + WLAN6GHz Main + WLAN6GHz Aux+ Bluetooth Aux	Yes
42.	WWAN Aux + WWAN 3rd + WLAN5GHz MIMO + Bluetooth Aux + RFID RI23B	Yes

43.	WWAN Aux + WWAN 3rd + WLAN6GHz Main + WLAN6GHz Aux+ Bluetooth Aux	Yes
44.	WWAN Aux + WWAN 3rd + WLAN2.4GHz Main + Bluetooth Aux + RFID RI23B	Yes
WWAN Aux + WWAN 4th + WLAN + RFID		
45.	WWAN Aux + WWAN 4th + WLAN2.4GHz MIMO + RFID RI24A	Yes
46.	WWAN Aux + WWAN 4th + WLAN5GHz Main + Bluetooth Aux + RFID RI24A	Yes
47.	WWAN Aux + WWAN 4th + WLAN5GHz Aux + Bluetooth Aux + RFID RI24A	Yes
48.	WWAN Aux + WWAN 4th + WLAN5GHz MIMO + Bluetooth Aux + RFID RI24A	Yes
49.	WWAN Aux + WWAN 4th + WLAN2.4GHz Main + Bluetooth Aux + RFID RI24A	Yes
50.	WWAN Aux + WWAN 4th + WLAN2.4GHz MIMO + RFID RI23B	Yes
51.	WWAN Aux + WWAN 4th + WLAN5GHz Main + Bluetooth Aux + RFID RI23B	Yes
52.	WWAN Aux + WWAN 4th + WLAN5GHz Aux + Bluetooth Aux + RFID RI23B	Yes
53.	WWAN Aux + WWAN 4th + WLAN5GHz MIMO + Bluetooth Aux + RFID RI23B	Yes
54.	WWAN Aux + WWAN 4th + WLAN6GHz Main + WLAN6GHz Aux+ Bluetooth Aux	Yes
55.	WWAN Aux + WWAN 4th + WLAN2.4GHz Main + Bluetooth Aux + RFID RI23B	Yes
WWAN 3rd + WWAN 4th + WLAN + RFID		
56.	WWAN 3rd + WWAN 4th + WLAN2.4GHz MIMO + RFID RI24A	Yes
57.	WWAN 3rd + WWAN 4th + WLAN5GHz Main + Bluetooth Aux + RFID RI24A	Yes
58.	WWAN 3rd + WWAN 4th + WLAN5GHz Aux + Bluetooth Aux + RFID RI24A	Yes
59.	WWAN 3rd + WWAN 4th + WLAN5GHz MIMO + Bluetooth Aux + RFID RI24A	Yes
60.	WWAN 3rd + WWAN 4th + WLAN2.4GHz Main + Bluetooth Aux + RFID RI24A	Yes
61.	WWAN 3rd + WWAN 4th + WLAN2.4GHz MIMO + RFID RI23B	Yes
62.	WWAN 3rd + WWAN 4th + WLAN5GHz Main + Bluetooth Aux + RFID RI23B	Yes
63.	WWAN 3rd + WWAN 4th + WLAN5GHz Aux + Bluetooth Aux + RFID RI23B	Yes
64.	WWAN 3rd + WWAN 4th + WLAN5GHz MIMO + Bluetooth Aux + RFID RI23B	Yes
65.	WWAN 3rd + WWAN 4th + WLAN6GHz Main + WLAN6GHz Aux+ Bluetooth Aux	Yes
66.	WWAN 3rd + WWAN 4th + WLAN2.4GHz Main + Bluetooth Aux + RFID RI23B	Yes

General Note:

- Per KDB 447498 D01 SAR test exemption in section 13, the standalone SAR testing is not required for this device, the estimated 1g SAR 0.4 W/kg is used for simultaneous transmission analysis when the separation distance is > 50mm.
- The Scaled SAR summation is calculated based on the same configuration and test position.
- Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - Scalar SAR summation < 1.6W/kg.
 - $SPLSR = (SAR1 + SAR2)^{1.5} / (\min. \text{separation distance, mm})$, 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.
 - If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary.
 - Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
 - The SPLSR calculated results please refer to section 15.2.



15.1 Body Exposure Conditions

WWAN + WLAN +RFID(RI24A)

WWAN Ant	WWAN Ant	Exposure Position	1	2	3	4	5	6	7	8	9	10	11	12	1+2+5+12	1+2+6+11+12	1+2+7+11+12	1+2+8+11+12	1+2+3+11+12	1+2+6+11+12	Case No	1+2+7+11+12	Case No	1+2+8+11+12	Case No	1+2+3+11+12	Case No
			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)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)	SPLSR	Case No	SPLSR	Case No	SPLSR	Case No	SPLSR	Case No
Main	Aux	Bottom Side at 0mm	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.201	1.601	1.601	1.601	1.601	0.020	Case 1	0.020	Case 2	0.020	Case 3	0.020	Case 4
Main	3rd	Bottom Side at 0mm	0.400	0.157	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.358	1.358	1.358	1.358	1.358								
Main	4th	Bottom Side at 0mm	0.400	0.201	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.402	1.402	1.402	1.402	1.402								
Aux	3rd	Bottom Side at 0mm	0.400	0.157	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.358	1.358	1.358	1.358	1.358								
Aux	4th	Bottom Side at 0mm	0.400	0.201	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.402	1.402	1.402	1.402	1.402								
3rd	4th	Bottom Side at 0mm	0.155	0.201	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.157	1.157	1.157	1.157	1.157								

WWAN + WLAN +RFID(RI23B)

WWAN Ant	WWAN Ant	Exposure Position	1	2	3	4	5	6	7	8	9	10	11	12	1+2+5+12	1+2+6+11+12	1+2+7+11+12	1+2+8+11+12	1+2+3+11+12	1+2+6+11+12	Case No	1+2+7+11+12	Case No	1+2+8+11+12	Case No	1+2+3+11+12	Case No
			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)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)	SPLSR	Case No	SPLSR	Case No	SPLSR	Case No	SPLSR	Case No
Main	Aux	Bottom Side at 0mm	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.201	1.601	1.601	1.601	1.601	0.020	Case 1	0.020	Case 2	0.020	Case 3	0.020	Case 4
Main	3rd	Bottom Side at 0mm	0.400	0.157	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.358	1.358	1.358	1.358	1.358								
Main	4th	Bottom Side at 0mm	0.400	0.201	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.402	1.402	1.402	1.402	1.402								
Aux	3rd	Bottom Side at 0mm	0.400	0.157	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.358	1.358	1.358	1.358	1.358								
Aux	4th	Bottom Side at 0mm	0.400	0.201	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.402	1.402	1.402	1.402	1.402								
3rd	4th	Bottom Side at 0mm	0.155	0.201	0.400	0.400	0.400	0.400	0.400	0.400	0.001	0.001	0.400	0.001	1.157	1.157	1.157	1.157	1.157								

15.2 SPLSR Evaluation and Analysis

General Note:

- According to antenna location the minimum distance between each transmit antenna is using for SPLSR analysis
- 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.
- $SPLSR = (SAR_1 + SAR_2)^{1.5} / (\text{min. separation distance, mm})$. If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary
- 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.

Case 1	Band	Position	SAR (W/kg)	Gap (mm)	min distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WWAN Main+WLAN5GHz Main+Bluetooth Aux+RFID	Bottom Side	1.201	0	104.0	1.60	0.02	Not required
	WWAN Aux		0.4	0				
Case 2	Band	Position	SAR (W/kg)	Gap (mm)	min distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WWAN Main+WLAN5GHz Aux+Bluetooth Aux+RFID	Bottom Side	1.201	0	104.0	1.60	0.02	Not required
	WWAN Aux		0.4	0				
Case 3	Band	Position	SAR (W/kg)	Gap (mm)	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WWAN Main+WLAN5GHz MIMO+Bluetooth Aux+RFID	Bottom Side	1.201	0	104.0	1.60	0.02	Not required
	WWAN Aux		0.4	0				
Case 4	Band	Position	SAR (W/kg)	Gap (mm)	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WWAN Main+WLAN2.4GHz+Bluetooth Aux+RFID	Bottom Side	1.201	0	104.0	1.60	0.02	Not required
	WWAN Aux		0.4	0				

Test Engineer : Samy Lo and Teddy Chang

16. 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.

17. References

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992
- [3] IEEE Std. 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 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.