

FCC SAR Test Report

APPLICANT : Lenovo (Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT : Portable Tablet Computer
BRAND NAME : Lenovo
MODEL NAME : TB332ZJ
FCC ID : O57TB332ZJ
STANDARD : FCC 47 CFR Part 2 (2.1093)

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.



Approved by: Si Zhang

Sporton International Inc. (Kunshan)

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China**



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1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Lenovo (Shanghai) Electronics Technology Co., Ltd., Portable Tablet Computer, TB332ZJ**, are as follows.

Highest 1g SAR Summary				
Equipment Class	Frequency Band		Body (Separation 0mm)	Highest Simultaneous Transmission 1g SAR (W/kg)
			1g SAR (W/kg)	
Licensed	WCDMA	WCDMA V	0.76	1.50
	LTE	LTE Band 26/5	0.76	
		LTE Band 41	1.12	
		LTE Band 42	0.26	
	5G NR	FR1 n77/78	1.16	
DTS	WLAN	2.4GHz WLAN	0.73	1.50
NII		5GHz WLAN	0.80	1.48
DSS	Bluetooth	2.4GHz Bluetooth	0.60	1.36
Date of Testing:			2025/3/10 ~ 2025/3/12	
Remark:				
1. This device supports LTE B5 and B26. Since the supported frequency span for LTE B5 falls completely within the support's frequency span for LTE B26, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B26.				
2. This device supports 5G NR n78 and n77. Since the supported frequency span for 5G NR n78 falls completely within the support's frequency span for n77, both 5G NR bands have the same target power, and both 5G NR bands share the same transmission path; therefore, SAR was only assessed for n77.				

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Product Specific 10g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.



2. Administration Data

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR05-KS	CN1257	314309

Applicant	
Company Name	Lenovo(Shanghai) Electronics Technology Co., Ltd.
Address	Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone

Manufacturer	
Company Name	Lenovo PC HK Limited
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong, China

3. Data Reuse Approach

3.1 Introduction Section

This application re-uses data collected on a similar device, FCC ID: O57TB336ZU (reference model) and FCC ID: O57TB332ZJ (variant model). Due to the same design are identical between parent model and variant model, SAR data reuse is requested and spot check data in this report is used to justify the SAR data reuse.

Per KDB 484596 D01 v02r03, the deviation of variant model 1g SAR and 10g SAR spot check result was no larger than 3 dB, the WWAN/WLAN/BT max SAR summary was always choosing the higher SAR between parent model and variant model.

The applicant should take full responsibility that the test data as referenced in this report represent compliance for this FCC ID: O57TB332ZJ

3.2 Model Difference Information

The **main** difference between FCC ID: O57TB336ZU and FCC ID: O57TB332ZJ is as below:

- Removed GSM Band850/900/1800/1900, WCDMA Band 2/4/6/19, LTE Band 2/4/7/12/13/19/20/25/66/38/40 and 5G NR n2/n5/n7/n8/n20/n26/n38/n40/n41/n66/n71.
- Added LTE Band 11/42
- LTE Band 41 Ant 4 upgraded to PC2 via software.
- 5GNR n77/78 supported bandwidth change
- 5GNR n78 only limited to ant 3.

Other differences and all the details of similarity and difference can be found in the confidential documents (TB332ZJ_Operational Description of Product Equality Declaration).

3.3 Reference detail Section

Rule Part	Equipment Class	Wireless Technology	Frequency Band (MHz)	FCC ID (Reference)	Type Grant/ Permissive Change	Reference Title	FCC ID Filling (Variant)	Test on the variant
2. Part 1093	PCE	WCDMA	B5	O57TB336ZU	Original Grant	FA512510	O57TB332ZJ	Spot check
		LTE	B5/B41 Ant7/B26	O57TB336ZU	Original Grant	FA512510	O57TB332ZJ	Spot check
		LTE	B41 Ant4/B42				O57TB332ZJ	Full Test
		5GNR FR1	n77 Ant6/8				O57TB332ZJ	Full Test
		5GNR FR1	n77 Ant3/7 /n78 Ant3	O57TB336ZU	Original Grant	FA512510	O57TB332ZJ	Spot check
	DTS	BLE/ WiFi	2400~2483.5	O57TB336ZU	Original Grant	FA512510	O57TB332ZJ	Spot check
	NII	Wi-Fi	5150 ~ 5250 5250 ~ 5350 5470 ~ 5725 5725 ~ 5850	O57TB336ZU	Original Grant	FA512510	O57TB332ZJ	Spot check
	DSS	Bluetooth	2400~2483.5	O57TB336ZU	Original Grant	FA512510	O57TB332ZJ	Spot check



4. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 484596 D01 Referencing Test Data v02r03

5. Equipment Under Test (EUT) Information

5.1 General Information

Product Feature & Specification	
Equipment Name	Portable Tablet Computer
Brand Name	Lenovo
Model Name	TB332ZJ
FCC ID	O57TB332ZJ
IMEI Code	Sample 1: IMEI 1: 869660070006698 IMEI 2: 869660070006706 Sample 2: IMEI 1: 869660070008132 IMEI 2: 869660070008140 Sample 3: IMEI 1: 869660070010211 IMEI 2: 869660070010229
Wireless Technology and Frequency Range	WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 42: 3450 MHz ~ 3550 MHz 5G NR n77: 3700 MHz ~ 3980 MHz, 3450MHz ~ 3550MHz 5G NR n78: 3700 MHz ~ 3800 MHz, 3450MHz ~ 3550MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	RMC 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+(16QAM uplink is not supported) LTE: QPSK, 16QAM, 64QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	TB332ZJ
SW Version	Lenovo ZUI 17.0
EUT Stage	Identical Prototype
Remark: 1. This device does not support voice function. 2. The device implements Proximity sensors mechanism for the power management for SAR compliance at different exposure conditions (Body). The device will invoke corresponding work scenarios power level base on frequency bands/antennas, which can refer to appendix E. power table. The maximum power that this device transmits in the field is limited among the 3 power tables (default, sensor off, sensor on). Full power (default power) is available only in the conducted setup. 3. This device supports dual SIM dual standby. The WWAN radio transmission will be enabled by either one SIM at a time (single active). 4. For 5G NR bands, using FTM to perform SAR with default 100% transmission. 5. This device supports HPUE for LTE Band 41 with class 2 level, HPUE power has been measured separately. For HPUE power is higher than power class 3 but with lower duty cycle, the maximum average power for class 2 and class 3 is almost the same, so power class 3 was chosen to perform full SAR testing and power class 2 verify the worst case of power class 3 SAR. 6. This device supports HPUE mode for 5G NR n77/n78 HPUE with higher power, so power class 2 was chosen to perform full SAR testing and power class 2 SAR can represent power class 3 SAR.	



- 7. For 5G NR EN-DC mode, standalone SAR performed for 5G NR NSA band with the maximum power, EN-DC SAR summed EN-DC mode 5G NR standalone SAR and LTE standalone SAR, the result of EN-DC SAR is more conservatively.
- 8. This device will be equipped with keyboard, and its working modes are laptop and tablet, for the tablet mode test is more conservatively, so no need to evaluate laptop mode separately.
- 9. There are three samples. The difference between them could be referred to the TB332ZJ_Operational Description of Product Equality Declaration which is exhibited separately. According to the differences, we choose sample 1 to perform full test, and the sample 2/3 are verified the difference with the sample 1.
- 10. This device supports 5G NR FR1 bands as following table, including NSA mode and SA mode. NSA and SA mode performed SAR separately.

Mode	Band	Duplex	SCS(KHz)	Bandwidths(BW)
NSA	n78	TDD	30	60, 100
SA	n77	TDD	30	40, 100
	n78	TDD	30	60, 100

5.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05																																																															
FCC ID	O57TB332ZJ																																																														
Equipment Name	Portable Tablet Computer																																																														
Operating Frequency Range of each LTE transmission band	LTE Band 5: 824 MHz ~ 849 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 42: 3450 MHz ~ 3550 MHz																																																														
Channel Bandwidth	LTE Band 5: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 26: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 42: 5MHz, 10MHz, 15MHz, 20MHz																																																														
Uplink Modulations used	QPSK / 16QAM / 64QAM																																																														
LTE Voice / Data requirements	Voice and Data																																																														
LTE Release Version	R15																																																														
CA Support	Yes, Uplink and Downlink																																																														
LTE MPR permanently built-in by design	<p>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table>	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
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256 QAM	≥ 1						≤ 5																																																								
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)																																																														
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																																														
Power reduction applied to satisfy SAR compliance	Yes, when operating in Proximity sensors detect mechanism; body will trigger reduced power for some bands applied to satisfy SAR compliance, the detail please referred to section 14.																																																														
LTE Carrier Aggregation Combinations	Intra-Band and Inter-Band possible combinations and the detail power verification please referred to section 14.																																																														
LTE Carrier Aggregation Additional Information	<p>(1) This device supports LTE Carrier Aggregation (CA) in the uplink for intra-band with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per FCC Guidance.</p> <p>(2) This device supports maximum of 2 carriers in the downlink and 2 carriers in the uplink.</p>																																																														

Transmission (H, M, L) channel numbers and frequencies in each LTE band										
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)
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 26										
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506
LM	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
HM	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

LTE Band 42								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	42115	3452.5	42140	3455	42165	3457.5	42190	3460
M	42590	3500	42590	3500	42590	3500	42590	3500
H	43065	3547.5	43040	3545	43015	3542.5	42990	3540

<For LTE Overlap Bands Description>

1) LTE Bands BW

Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
LTE Band 5	Yes	Yes	Yes	Yes		
LTE Band 26	Yes	Yes	Yes	Yes	Yes	

2) LTE Bands tune up:

Band	Antenna	Sensor on Tune-up Limit	Sensor Off Tune-up Limit	Default Tune-up Limit
LTE Band 5	Ant 4	14.00	24.00	24.00
LTE Band 26	Ant 4	16.50	24.00	24.00

5.3 General 5G NR SAR Test and Reporting Considerations

5G NR Information	
Operating Frequency Range of each 5G NR transmission band	5G NR n77: 3700 MHz ~ 3980 MHz, 3450MHz ~ 3550MHz 5G NR n78: 3700 MHz ~ 3800 MHz, 3450MHz ~ 3550MHz
Channel Bandwidth	The detail please refers to section 5.1 5GNR FR1 bands table.
SCS	FDD: SCS15KHz, TDD: SCS30KHz
uplink modulations used	DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM CP-OFDM: QPSK / 16QAM / 64QAM / 256QAM
A-MPR (Additional MPR) disabled for SAR Testing?	Yes
LTE Anchor Bands for n78	LTE B41

Transmission (H, M, L) channel numbers and frequencies in each 5G NR band				
NR Band 77 SCS30KHz				
	Bandwidth 40MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	648000	3720	650000	3750
M	656000	3840	656000	3840
H	664000	3960	662000	3930

NR Band 78 SCS30KHz				
	Bandwidth 60MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	648668	3730.02		
M	650000	3750	650000	3750
H	651334	3770.01		

NR Band 77 SCS30KHz				
	Bandwidth 40MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	631334	3470.01		
M	633334	3500.01	633334	3500.01
H	635334	3530.01		

NR Band 78 SCS30KHz				
	Bandwidth 60MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	632000	3480		
M	633332	3499.98	633332	3499.98
H	634668	3520.02		

<For NR Overlap Bands Description>

1) NR Bands BW

Band	Duplex	SCS(KHz)	Bandwidths(BW)
n77	TDD	30	40, 100
n78	TDD	30	60, 100

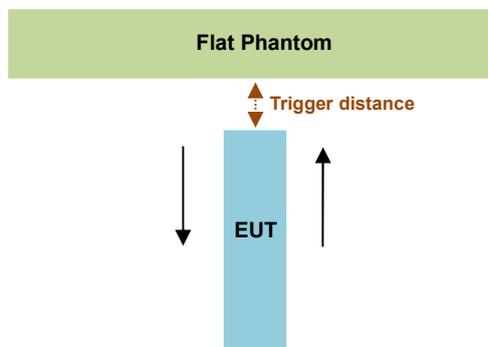
2) NR Bands Tune up:

Band	Antenna	Sensor Off Tune-up Limit	Default Tune-up Limit
5G NR n77	Ant 3	17.50	23.50
5G NR n78	Ant 3	17.50	23.50
5G NR n77 HPUE	Ant 3	17.50	26.50
5G NR n78 HPUE	Ant 3	17.50	26.50

6. Proximity Sensor Triggering Test

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

1. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed and the tissue-equivalent medium for highest frequency (5825MHz) and lowest frequency (850MHz) was used for proximity sensor triggering testing.
2. Capacitive proximity sensor placed coincident with antenna elements at the Bottom Face, Edge 1 and Edge 2 of the device are utilized to determine when the device comes in proximity of the user's body at the Bottom Face or Edge 1 or Edge 2 side of the device. There is no need to do sensor coverage testing for the proximity sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the proximity sensor entirely covers the antenna.
3. When the sensor is active, all WWAN/WLAN bands reduced power will be active.
4. The sensors used to detect the proximity of the user's body at the Bottom Face for Ant1 and Bottom Face or Edge 1 side for Ant4 and Bottom Face or Edge 1 or Edge 2 side for Ant6/7 of the device use a detection threshold distance. The data shown in the sections below shows the distance(s).



<Ant1 Frequency Bands>

Proximity Sensor Triggering Distance (mm)		
Position	Bottom Face	
	Moving towards	Moving away
Minimum	20	23

<Ant4 Frequency Bands>

Proximity Sensor Triggering Distance (mm)				
Position	Bottom Face		Edge 1	
	Moving towards	Moving away	Moving towards	Moving away
Minimum	18	19	24	29

< Ant6/7 Frequency Bands>

Proximity Sensor Triggering Distance (mm)						
Position	Bottom Face		Edge 1		Edge 2	
	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
Minimum	23	25	14	15	20	24

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

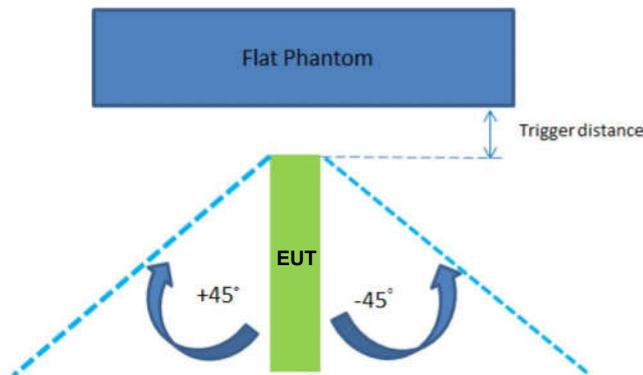
If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.

Illustrated in the internal photo exhibit, although the sensor is spatially offset, there is no trigger condition where the antenna is next to the user but the sensor is laterally further away, therefore proximity sensor coverage testing is not required.

This procedure is not required because antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

<Tablet Tilt angle influences to proximity sensor triggering (KDB 616217 D04 section 6.4)>:

The influence of table tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, the detail please refers to following tables. Rotating the tablet around the edge next to the phantom in $\leq 10^\circ$ increments until the tablet is $\pm 45^\circ$ from the vertical position at 0° , and the maximum output power remains in the reduced mode.



<Ant4 Frequency Bands>

The Sensor Trigger Distance (mm)	
Position	Edge 1
Minimum	24

< Ant6/7 Frequency Bands>

The Sensor Trigger Distance (mm)		
Position	Edge 1	Edge 2
Minimum	14	20

Proximity sensor power reduction

Exposure Position / wireless mode for Ant1	Bottom Face ⁽¹⁾	Edge 1	Edge 2	Edge 3	Edge 4
WLAN 2.4GHz	8.5 dB	0 dB	0 dB	0 dB	0 dB
WLAN 5.2GHz	10.5 dB	0 dB	0 dB	0 dB	0 dB
WLAN 5.3GHz	10.5 dB	0 dB	0 dB	0 dB	0 dB
WLAN 5.5GHz	11.5 dB	0 dB	0 dB	0 dB	0 dB
WLAN 5.8GHz	9.5 dB	0 dB	0 dB	0 dB	0 dB

Exposure Position / wireless mode for Ant4	Bottom Face ⁽¹⁾	Edge 1 ⁽¹⁾	Edge 2	Edge 3	Edge 4
WCDMA Band V Ant 4	8.50 dB	8.50 dB	0 dB	0 dB	0 dB
LTE Band 5 Ant 4	10.00 dB	10.00 dB	0 dB	0 dB	0 dB
LTE Band 26 Ant 4	7.50 dB	7.50 dB	0 dB	0 dB	0 dB
LTE Band 41 Ant 4	9.00 dB	9.00 dB	0 dB	0 dB	0 dB
LTE Band 41 HPUE Ant 4	10.40 dB	10.40 dB	0 dB	0 dB	0 dB

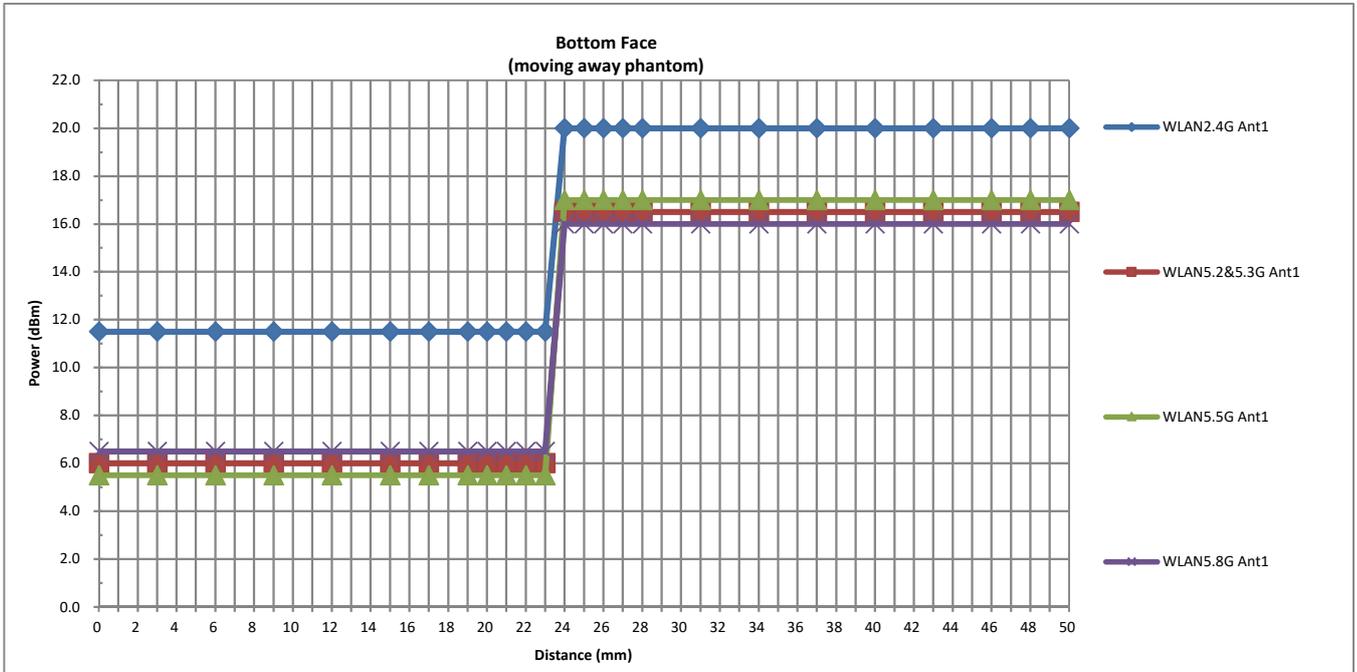
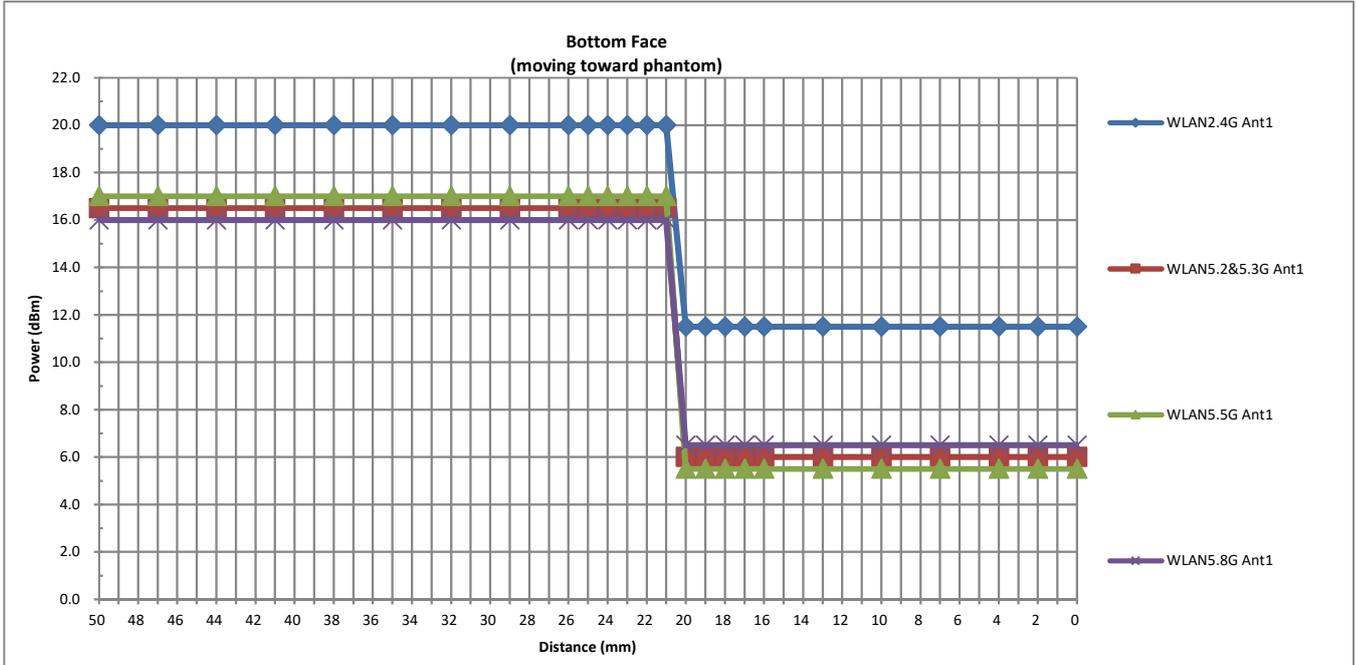
Exposure Position / wireless mode for Ant6/7	Bottom Face ⁽¹⁾	Edge 1 ⁽¹⁾	Edge 2 ⁽¹⁾	Edge 3	Edge 4
LTE Band 41 Ant 7	10.00 dB	10.00 dB	10.00 dB	0 dB	0 dB
5G NR n77 Ant 6	8.00 dB	8.00 dB	8.00 dB	0 dB	0 dB
5G NR n77HPUE Ant 6	11.00 dB	11.00 dB	11.00 dB	0 dB	0 dB
5G NR n77 Ant 7	12.00 dB	12.00 dB	12.00 dB	0 dB	0 dB
5G NR n77 HPUE Ant 7	15.00 dB	15.00 dB	15.00 dB	0 dB	0 dB

Remark:

- (1): Reduced maximum limit applied by activation of proximity sensor.
- Power reduction is not applicable for Bluetooth.
- Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit "P-Sensor operational description"
- For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
 - For Ant1:
 - Bottom Face: 19mm
 - For Ant4:
 - Bottom Face: 17mm
 - Edge 1: 23mm
 - For Ant6/7:
 - Bottom Face: 22mm
 - Edge 1: 13mm
 - Edge 2: 19mm

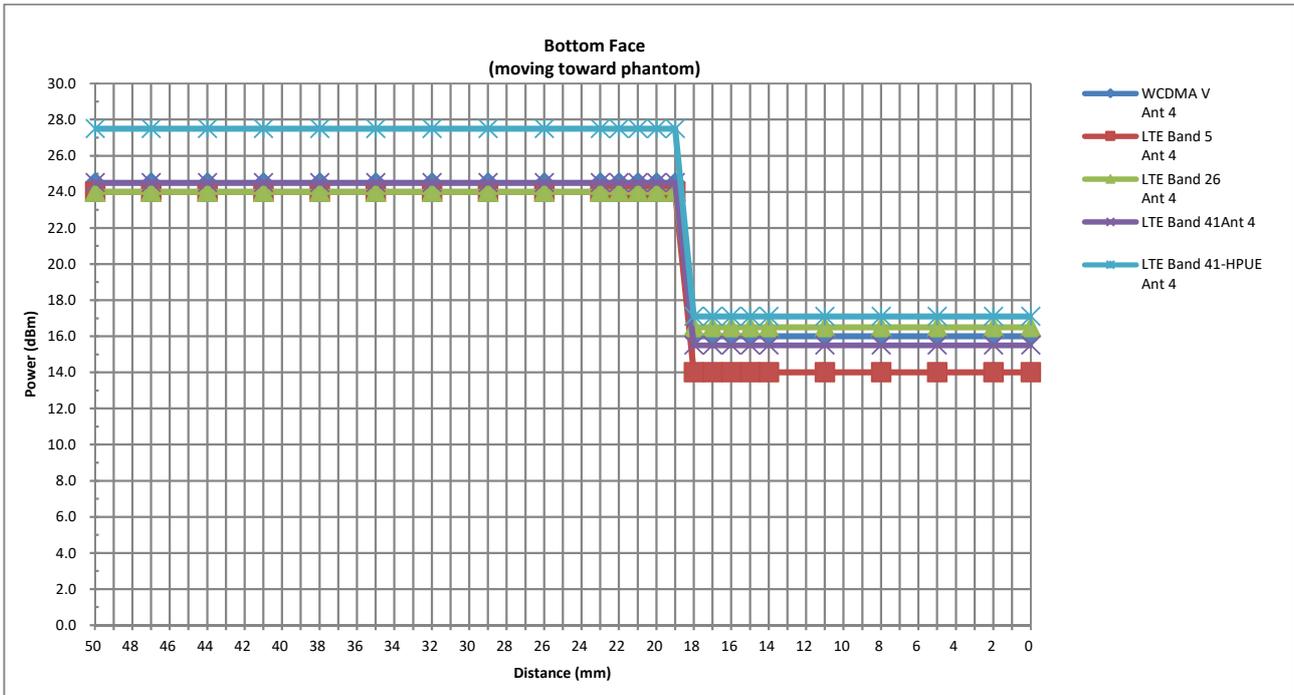
Power Measurement during Sensor Trigger distance testing

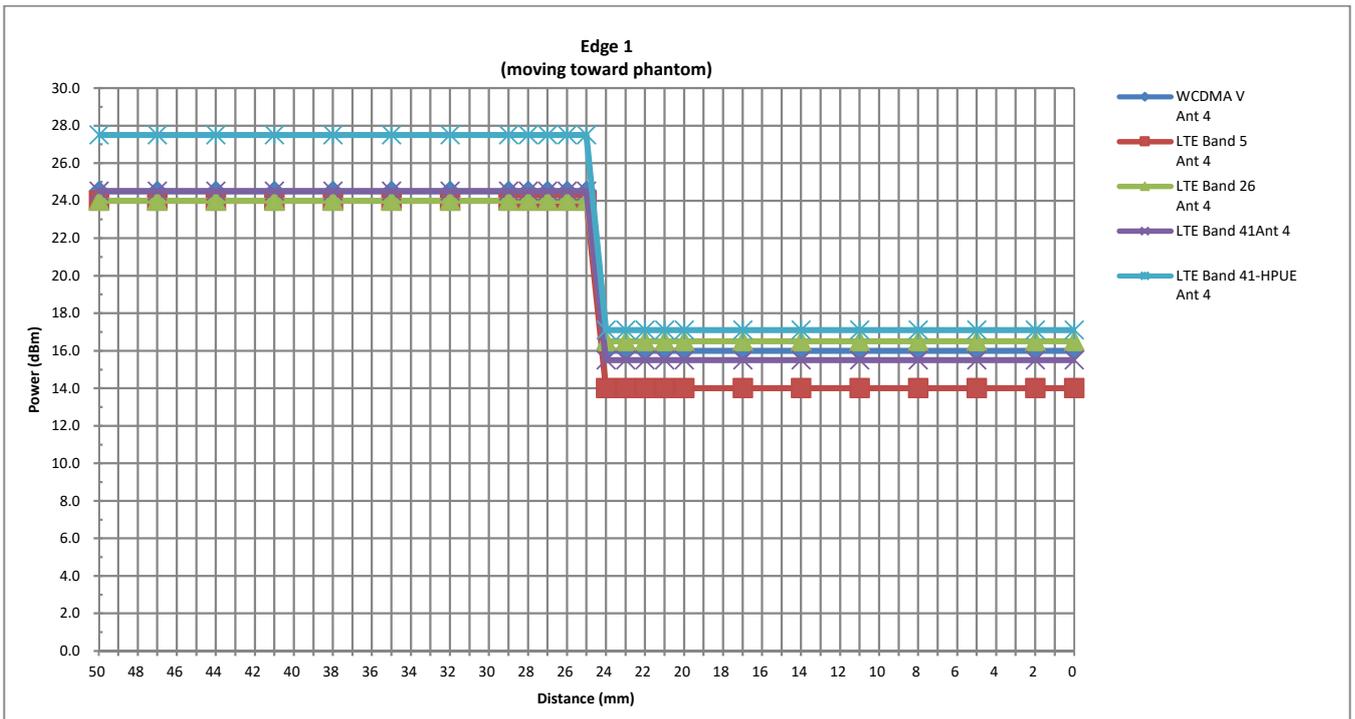
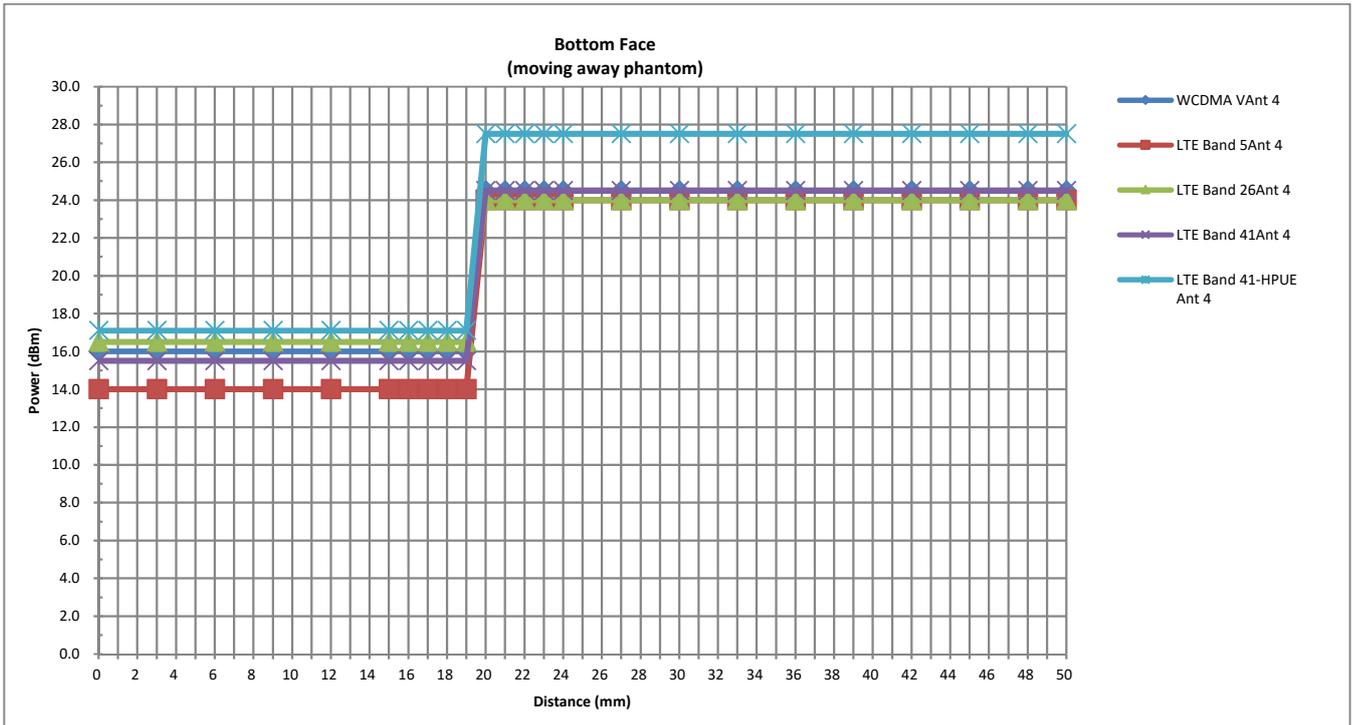
Band/Mode for Ant1	Measured power reduction (dBm)		Reduction Levels (dB)
	w/o power back-off	w/ power back-off	
WLAN 2.4GHz	20.00	11.50	8.5
WLAN 5.2GHz	16.50	6.00	10.5
WLAN 5.3GHz	16.50	6.00	10.5
WLAN 5.5GHz	17.00	5.50	11.5
WLAN 5.8GHz	16.00	6.50	9.5

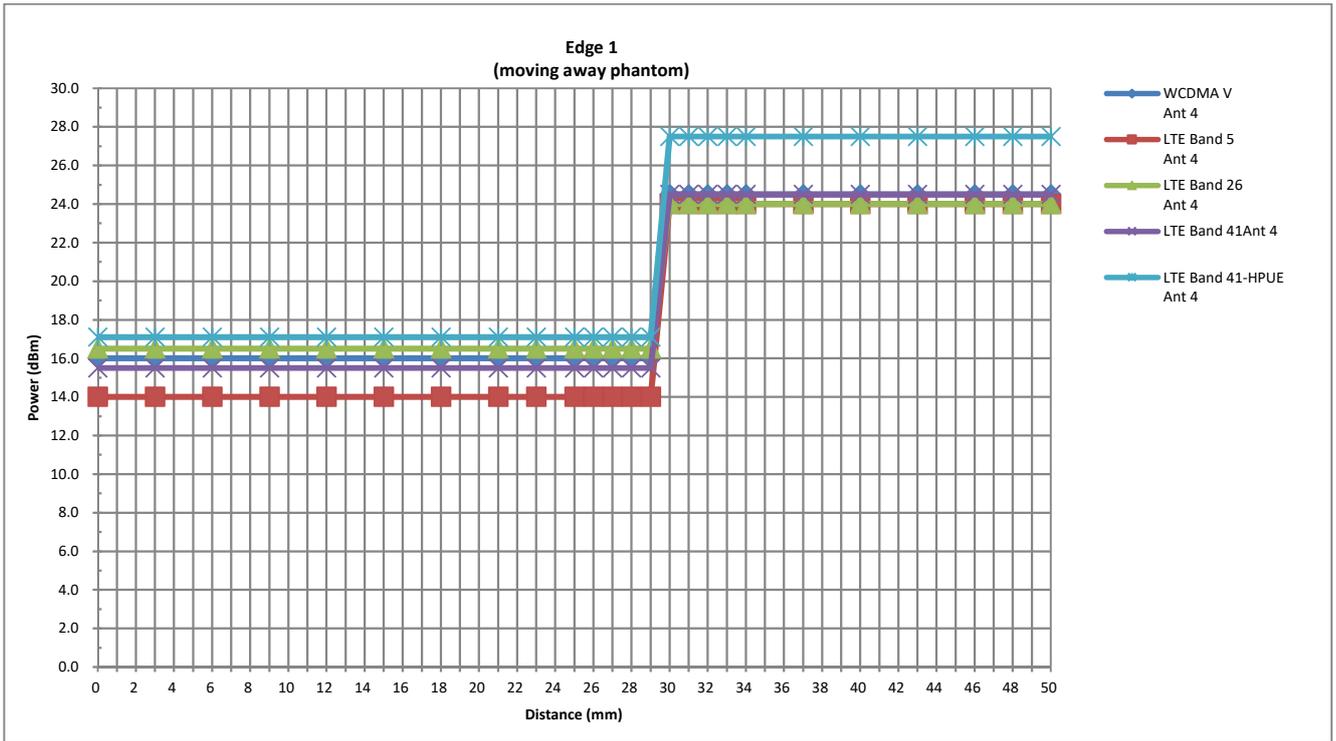




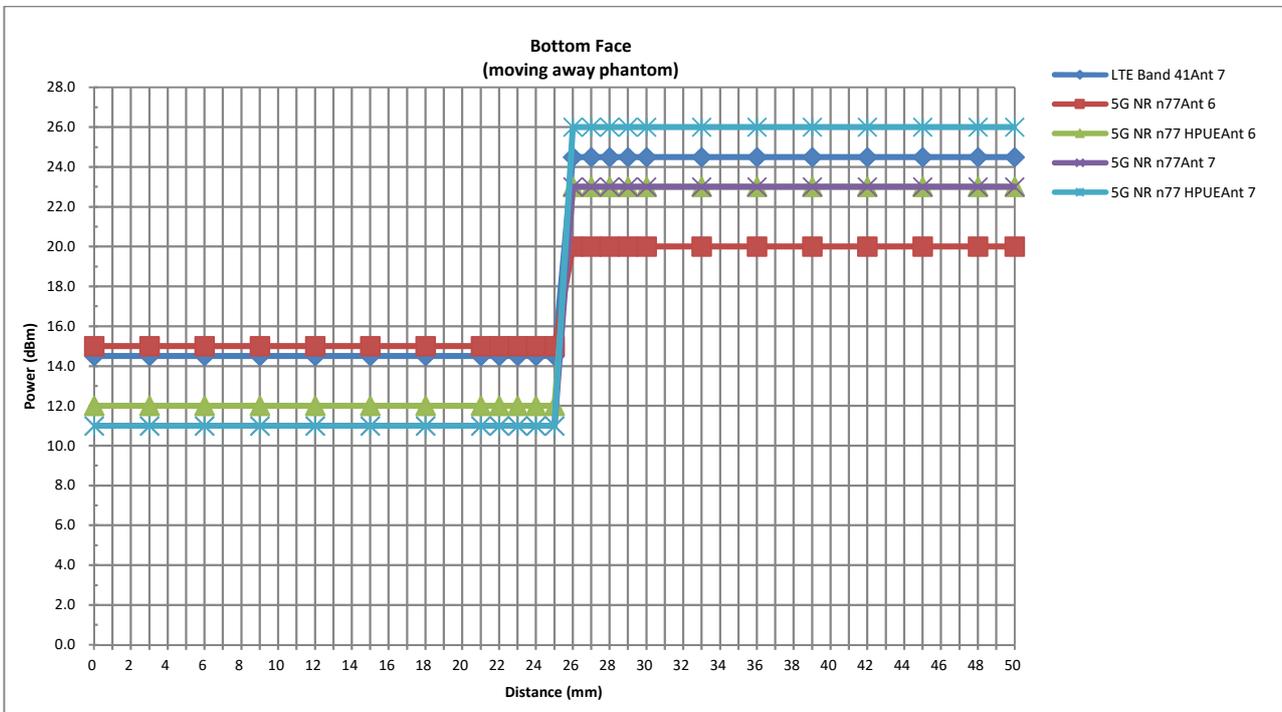
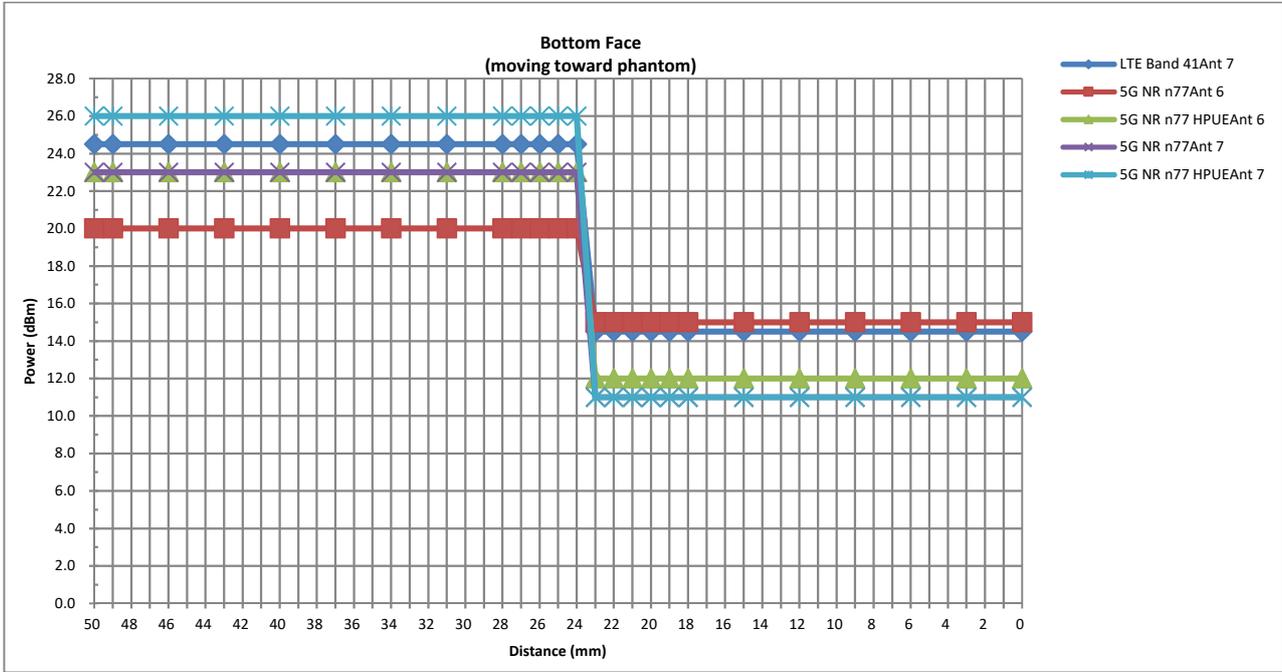
Band/Mode for Ant Ant4	Measured power reduction (dBm)		Reduction Levels (dB)
	w/o power back-off	w/ power back-off	
WCDMA Band V Ant 4	24.50	16.00	8.50
LTE Band 5 Ant 4	24.00	14.00	10.00
LTE Band 26 Ant 4	24.00	16.50	7.50
LTE Band 41 Ant 4	24.50	15.50	9.00
LTE Band 41 HPUE Ant 4	27.50	17.10	10.40

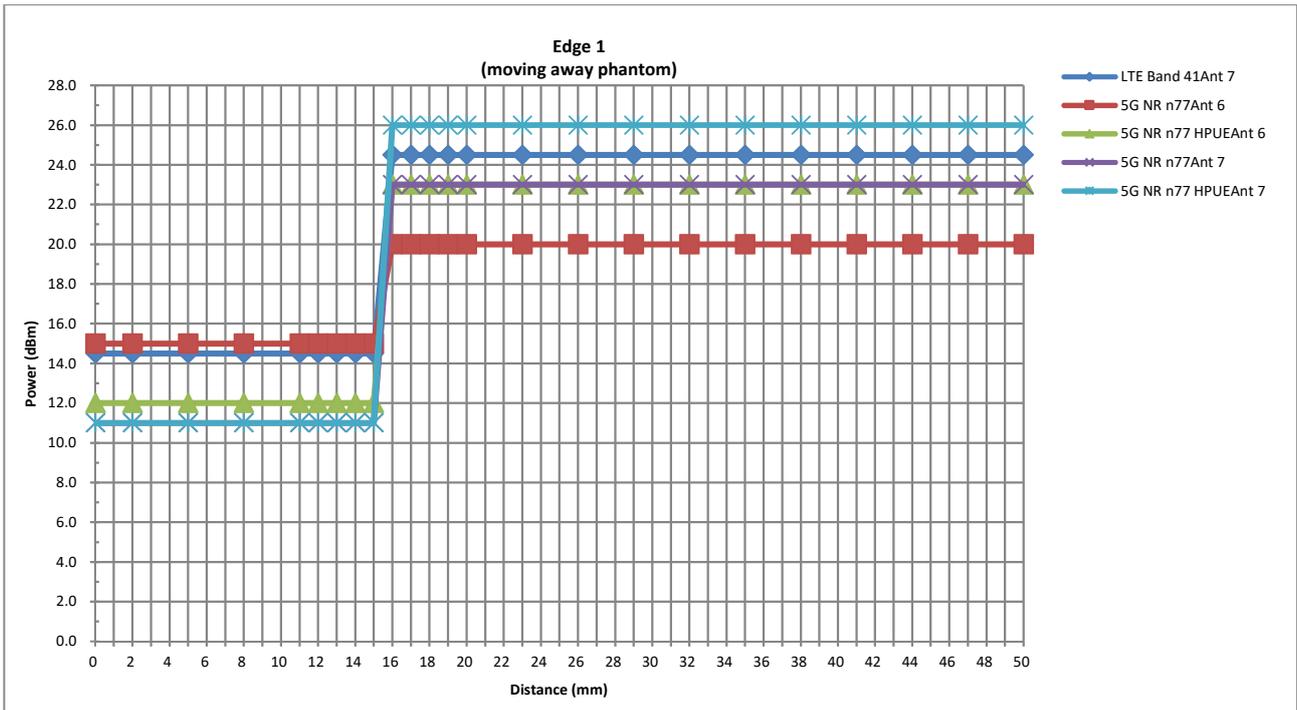
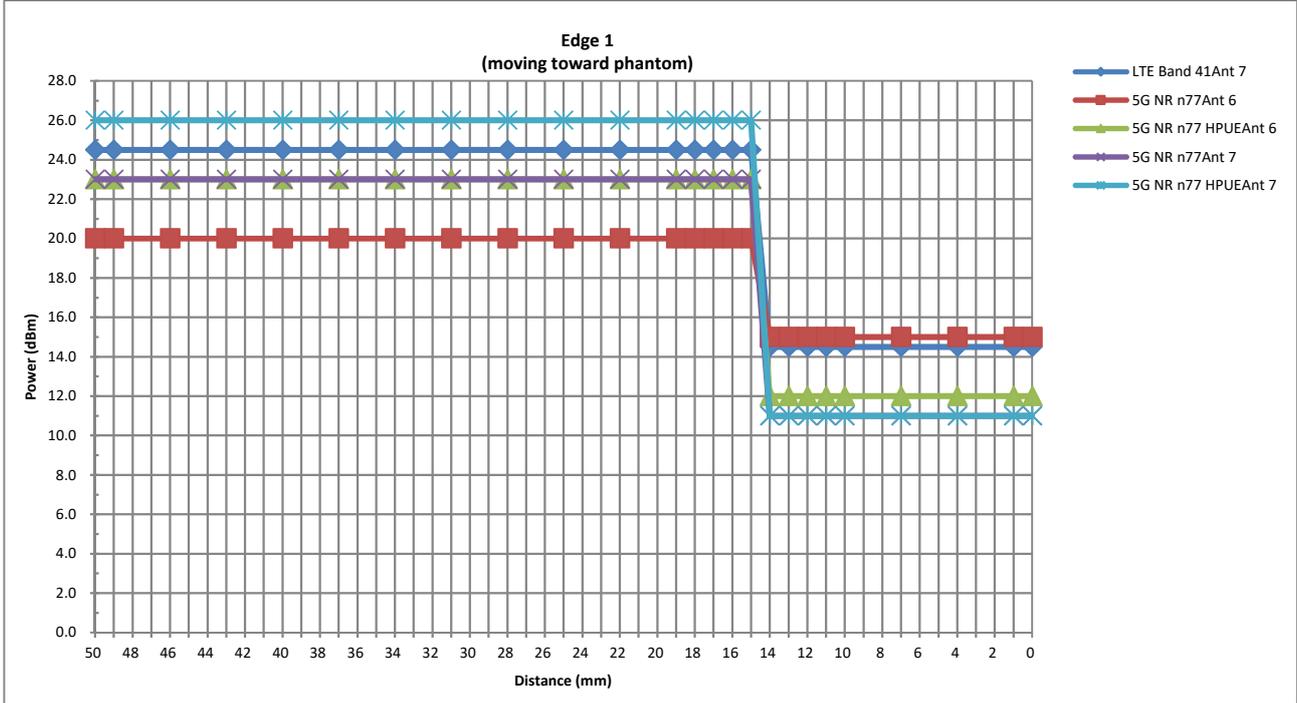


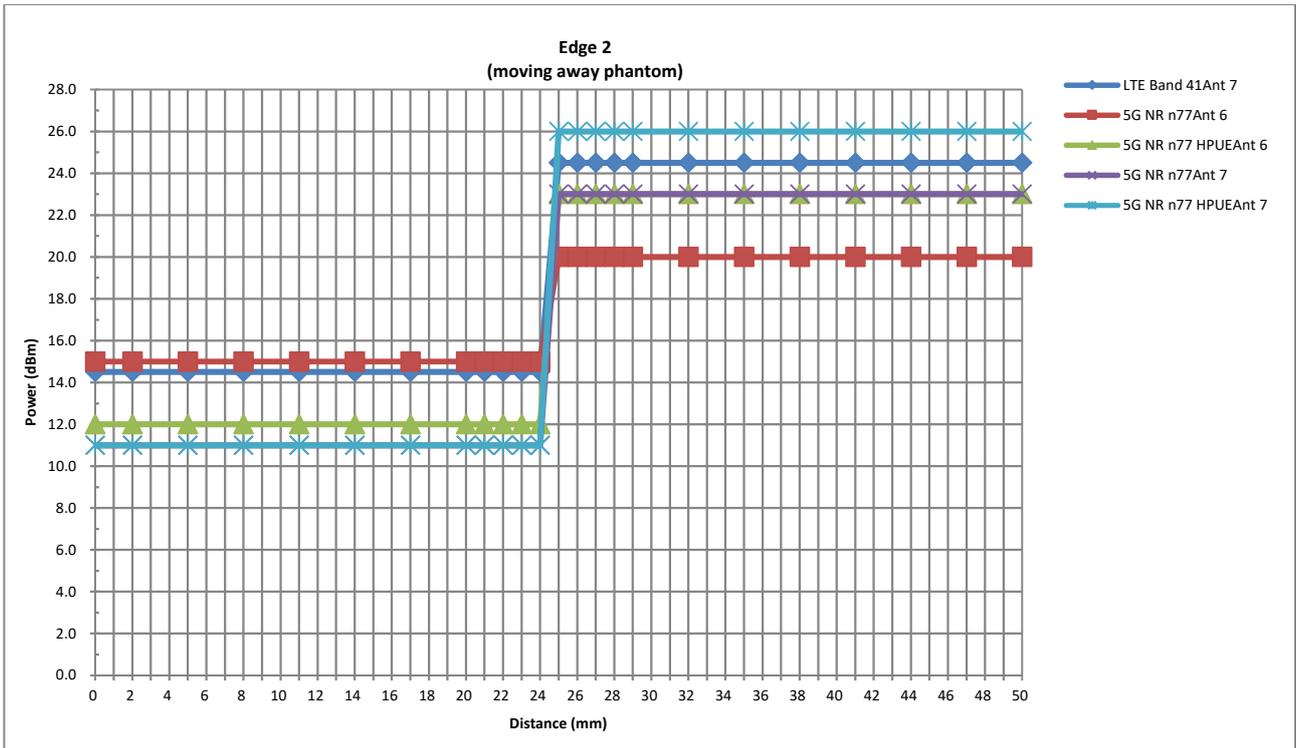
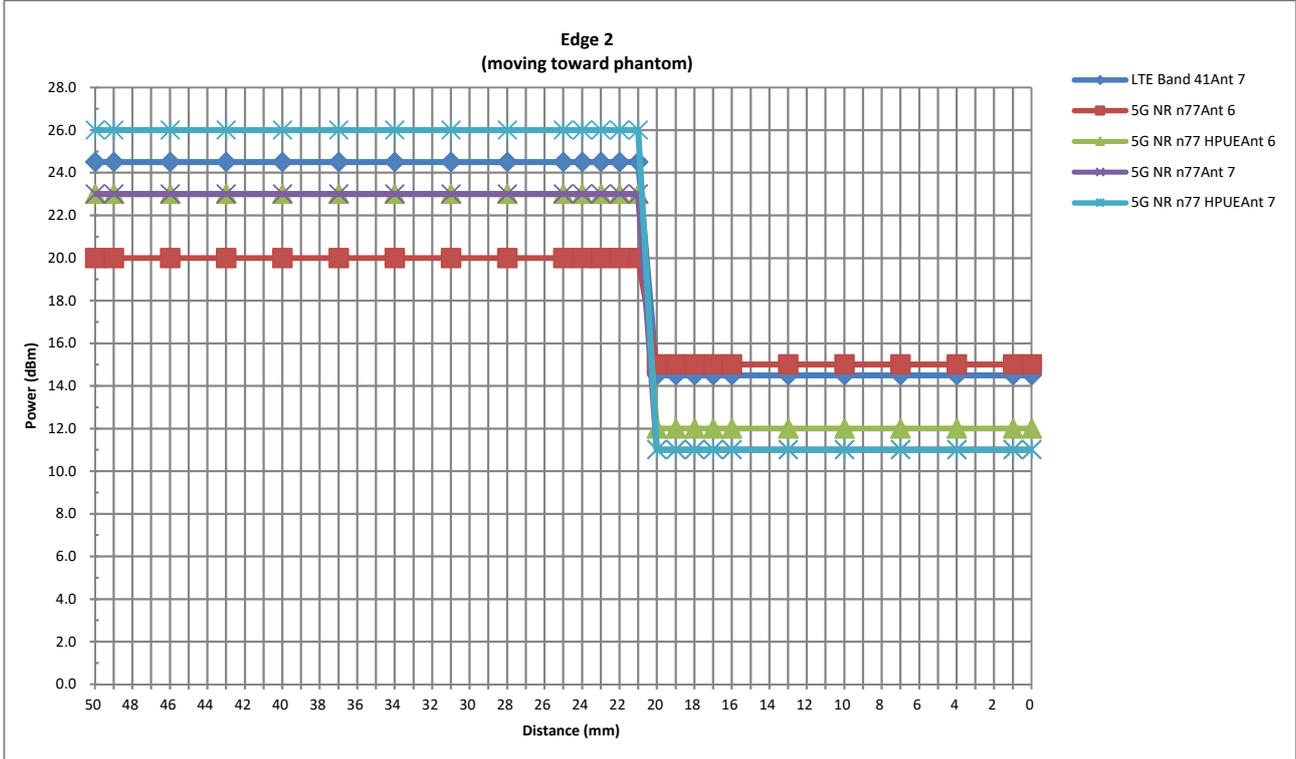




Band/Mode for Ant Ant6/7	Measured power reduction (dBm)		Reduction Levels (dB)
	w/o power back-off	w/ power back-off	
LTE Band 41 Ant 7	24.50	14.50	10.00
5G NR n77 Ant 6	20.00	12.00	8.00
5G NR n77HPUE Ant 6	23.00	12.00	11.00
5G NR n77 Ant 7	23.00	11.00	12.00
5G NR n77 HPUE Ant 7	26.00	11.00	15.00







7. RF Exposure Limits

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

8. Specific Absorption Rate (SAR)

8.1 Introduction

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

8.2 SAR Definition

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

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

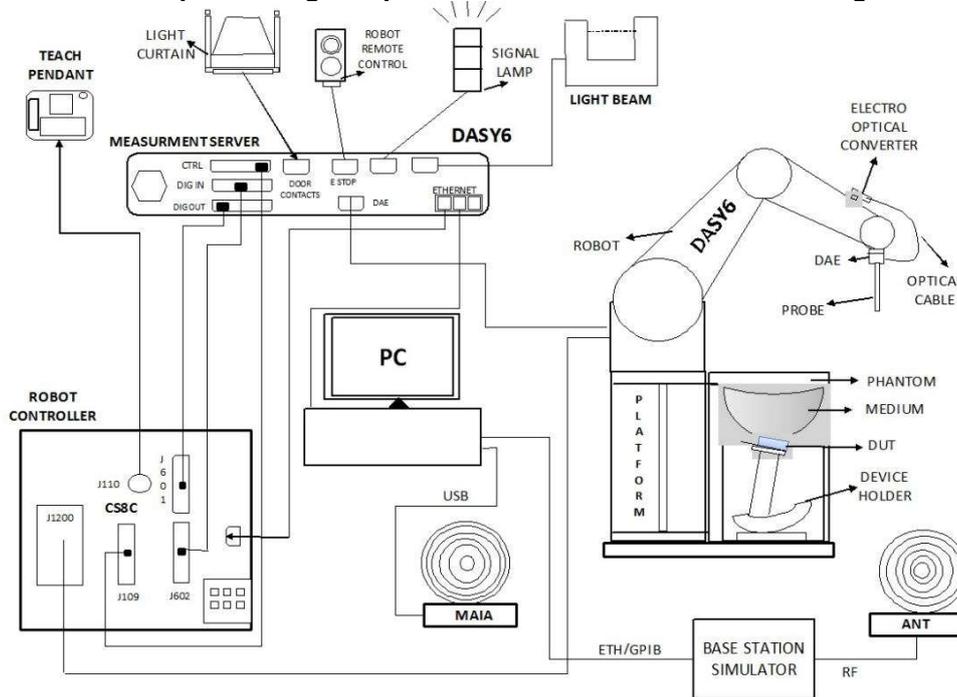
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

9. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 or Win10 and the DASY5 or DASY6/8 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

9.1 E-Field Probe

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

<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 – 10 GHz Linearity: ± 0.2 dB (30 MHz – 10 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	

9.2 Data Acquisition Electronics (DAE)

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

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



Photo of DAE

9.3 Phantom

<SAM Twin Phantom>

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

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

<ELI Phantom>

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

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

9.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

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



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

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

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



Mounting Device for Laptops

10. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

- (a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
- (d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

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

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

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

10.1 Spatial Peak SAR Evaluation

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

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

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

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

10.2 Power Reference Measurement

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

10.3 Area Scan

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

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

	≤ 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° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

10.4 Zoom Scan

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

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

		≤ 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between 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
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <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.				

10.5 Volume Scan Procedures

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

10.6 Power Drift Monitoring

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



11. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d162	2024/12/13	2025/12/12
SPEAG	2450MHz System Validation Kit	D2450V2	1095	2024/2/8	2027/2/7
SPEAG	2600MHz System Validation Kit	D2600V2	1112	2023/12/18	2026/12/17
SPEAG	3500MHz System Validation Kit	D3500V2	1037	2023/11/20	2026/11/19
SPEAG	3900MHz System Validation Kit	D3900V2	1048	2023/3/9	2026/3/6
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	2022/9/23	2025/9/21
SPEAG	Data Acquisition Electronics	DAE4	1691	2024/4/19	2025/4/18
SPEAG	Dosimetric E-Field Probe	EX3DV4	7764	2024/9/2	2025/9/1
SPEAG	ELI Phantom	ELI V8.0	TP-2151	NCR	NCR
CHIGO	Thermo-Hygrometer	HTC-1	55009	2025/1/2	2026/1/1
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio Communication Analyzer	MT8821C	6262306175	2024/7/4	2025/7/3
Agilent	ENA Series Network Analyzer	E5071C	MY46112129	2024/7/4	2025/7/3
SPEAG	Dielectric Probe Kit	DAK-3.5	1144	2024/8/20	2025/8/19
Anritsu	Vector Signal Generator	MG3710A	6201682672	2025/1/3	2026/1/2
Rohde & Schwarz	Power Meter	NRVD	102081	2024/7/4	2025/7/3
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	2024/7/4	2025/7/3
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	2024/7/4	2025/7/3
R&S	BLUETOOTH TESTER	CBT	101246	2024/7/4	2025/7/3
Rohde & Schwarz	Spectrum Analyzer	FSV7	101631	2024/10/11	2025/10/10
TES	DIGITAC THERMOMETER	TYPE-K	220305411	2025/1/2	2026/1/1
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note 1	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note 1	
Agilent	Dual Directional Coupler	778D	20500	Note 1	
Agilent	Dual Directional Coupler	11691D	MY48151020	Note 1	
ARRA	Power Divider	A3200-2	N/A	Note 1	
MCL	Attenuation1	BW-S10W5+	N/A	Note 1	
MCL	Attenuation2	BW-S10W5+	N/A	Note 1	
MCL	Attenuation3	BW-S10W5+	N/A	Note 1	

Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check 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.

12. System Verification

12.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid.. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1.



Fig 10.1 Photo of Liquid Height for Body SAR

12.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (εr)	Conductivity Target (σ)	Permittivity Target (εr)	Delta (σ) (%)	Delta (εr) (%)	Limit (%)	Date
835	Head	22.8	0.938	42.4	0.90	41.50	4.22	2.17	±5	2025/3/10
2600	Head	22.6	2.01	40.6	1.96	39.00	2.55	4.10	±5	2025/3/10
3500	Head	22.8	2.83	39.1	2.91	37.90	-2.75	3.17	±5	2025/3/11
3900	Head	22.7	3.23	38.4	3.32	37.50	-2.71	2.40	±5	2025/3/11
2450	Head	22.9	1.84	39.2	1.80	39.20	2.22	0.00	±5	2025/3/12
5250	Head	22.7	4.64	36.5	4.71	35.90	-1.49	1.67	±5	2025/3/12
5600	Head	22.6	4.99	35.9	5.07	35.50	-1.58	1.13	±5	2025/3/12
5750	Head	22.7	5.22	35.6	5.22	35.40	0.00	0.56	±5	2025/3/12

12.3 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2025/3/10	835	Head	50	4d162	7764	1691	0.469	9.08	9.38	3.30
2025/3/10	2600	Head	50	1112	7764	1691	2.79	55.10	55.8	1.27
2025/3/11	3500	Head	50	1037	7764	1691	3.43	65.40	68.6	4.89
2025/3/11	3900	Head	50	1048	7764	1691	3.45	69.10	69	-0.14
2025/3/12	2450	Head	50	1095	7764	1691	2.67	52.60	53.4	1.52
2025/3/12	5250	Head	50	1113	7764	1691	4.10	81.50	82	0.61
2025/3/12	5600	Head	50	1113	7764	1691	4.42	82.60	88.4	7.02
2025/3/12	5750	Head	50	1113	7764	1691	4.23	80.80	84.6	4.70

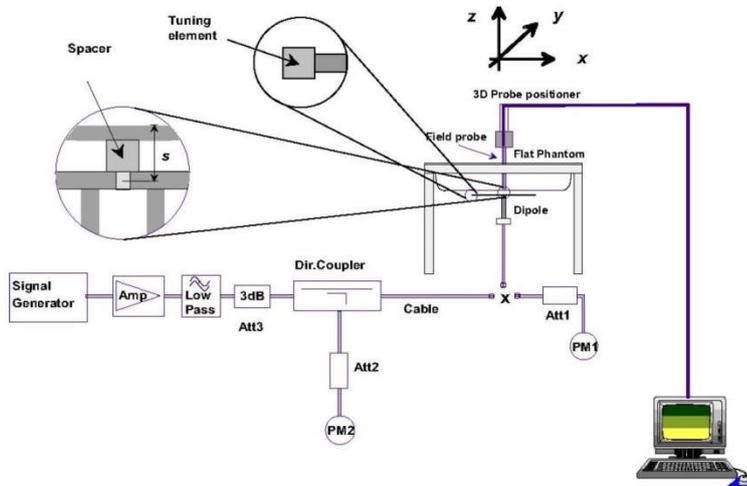


Fig 10.3.1 System Performance Check Setup



Fig 10.3.2 Setup Photo



13. RF Exposure Positions

13.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

<EUT Setup Photos>

Please refer to Appendix D for the test setup photos.

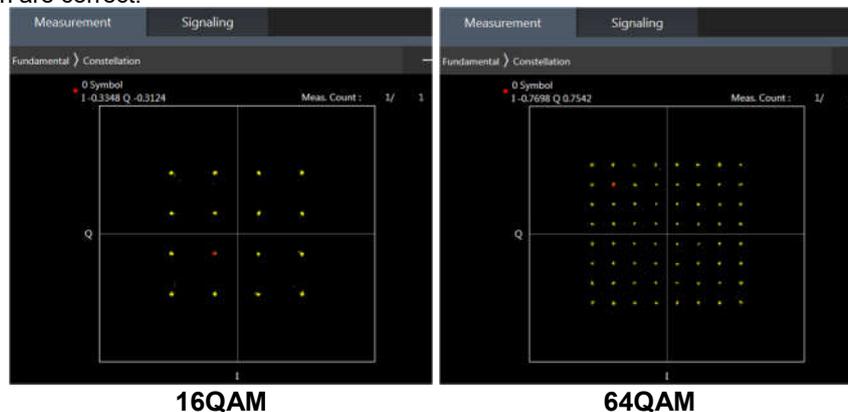
14. Conducted RF Output Power (Unit: dBm)

The detailed conducted power table can refer to Appendix E.

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM/64QAM 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/64QAM SAR testing is not required.
7. 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.
8. For LTE B5 / B26 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE B5 SAR test was covered by B26; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
 - a. the maximum output power, including tolerance, for the smaller band is \leq the larger band to qualify for the SAR test exclusion
 - b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band
10. According to May 2017 TCB workshop, for 16QAM and 64QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >> constellation" mode of the device connect to the MT8821C base station, therefore, the device 64QAM and 16QAM signal modulation are correct.



<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

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

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

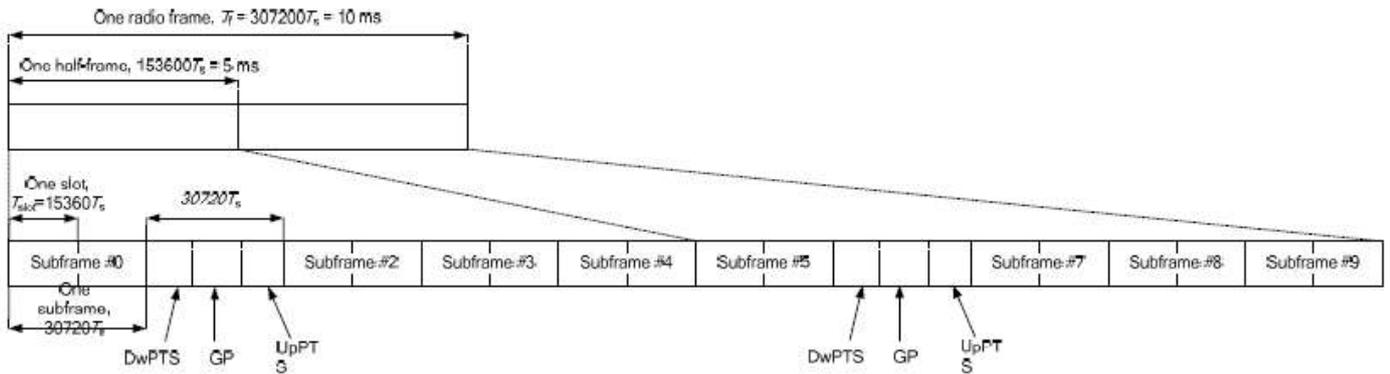


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

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

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

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

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

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

The highest duty factor is resulted from:

For LTE TDD Power class 2

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

For LTE TDD Power class 3

- i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 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.

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

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



<LTE Carrier Aggregation>

The detailed LTE Carrier Aggregation conducted power table can refer to Appendix F.

General Note:

- a. Per Oct. 2024 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.
- b. Per Oct. 2024 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.
- c. Per Oct. 2024 TCB workshop, Manufacturer declares that TX power measurement for multiple DL CA configurations is deemed not required as the DL CA has no impact on the TX power according to preliminary scan. TX power measured in LTE standalone operation represents the worst case.
- d. 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 Carrier Aggregation Conducted Power (Uplink)

LTE Uplink CA	2CC Uplink Carrier Aggregation
Intra-band	Antenna Tx
CA_41C	Ant4
CA_42C	Ant3

<Intra-band>

General Note:

- i. The device supports intra-band uplink carrier aggregation for LTE B42/41 with a maximum of two uplink component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre 3GPP requirement.
- ii. According Nov. 2017 TCB workshop, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.
- iii. 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.

5G NR Output Power (Unit: dBm)

General Note:

1. 5G NR n78 is NSA mode.
2. 5G NR n77/n78 is SA mode.
3. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
 - a. For DFT-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class2 and 3, the CP-OFDM mode will not higher than DFT-OFDM mode, therefore, similar FCC KDB 941225 D05 procedure for other modulation output power for each RB allocation configuration is > not $\frac{1}{2}$ dB higher than the same configuration in DFT-s QPSK and the reported SAR for the DFT-s QPSK configuration is ≤ 1.45 W/kg; CP-OFDM testing is not required.
 - b. For DFT-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class2 and 3, for 16QAM/64QAM/256QAM and smaller bandwidth output power will spot check largest channel bandwidth worst RB configuration to ensure the 16QAM/64QAM/256QAM and smaller bandwidth output power will not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth.
 - c. SAR testing start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel
 - d. 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure
 - e. QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested
 - f. $\pi/2$ BPSK/16QAM/64QAM/256QAM output powers according to 3GPP MPR will not $\frac{1}{2}$ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configuration is less than 1.45 W/kg, $\pi/2$ BPSK /16QAM/64QAM/256QAM SAR testing are not required.
 - g. Smaller bandwidth output power for each RB allocation configuration for this device will not $\frac{1}{2}$ 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
4. For 5G NR test, using FTM (Factory Test Mode) to perform SAR with default 100% transmission.
5. NSA and SA mode should perform SAR separately. For the maximum power of NSA mode is the same as SA total power level, so SA SAR can represent NSA mode SAR.
6. 5G NR NSA mode, the power level is the same as 5G NR SA mode, so 5G NR NSA mode and SA mode power table only show one time.
7. 5G NR supports CP-OFDM and DFT-s-OFDM modulation, for DFT-s-OFDM power is higher than CP-OFDM, so only show DFT-s-OFDM power table and chose DFT-s-OFDM to perform SAR testing.
8. For DFT-s-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for the CP-OFDM mode will not higher than DFT-s-OFDM mode, therefore, CP-OFDM measurement is unnecessary.
9. For 5G NR EN-DC mode, standalone SAR performed for 5G NR NSA band with the maximum power, EN-DC SAR summed EN-DC mode 5G NR standalone SAR and LTE standalone SAR, the result of EN-DC SAR is more conservatively.

<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	$\leq 3.5^1$ $\leq 0.5^2$	$\leq 1.2^1$ $\leq 0.5^2$	$\leq 0.2^1$ 0^2
	QPSK		≤ 1	0
	16 QAM		≤ 2	≤ 1
	64 QAM		≤ 2.5	
	256 QAM		≤ 4.5	
CP-OFDM	QPSK	≤ 3		≤ 1.5
	16 QAM	≤ 3		≤ 2
	64 QAM		≤ 3.5	
	256 QAM		≤ 6.5	

NOTE 1: Applicable for UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and if the IE *powerBoostPi2BPSK* is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. The reference power of 0 dB MPR is 26 dBm.

NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79 with Pi/2 BPSK modulation and if the IE *powerBoostPi2BPSK* is set to 0 and if more than 40 % of slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79.

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

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5	≤ 0.5	0
	QPSK	≤ 3.5	≤ 1	0
	16 QAM	≤ 3.5	≤ 2	≤ 1
	64 QAM	≤ 3.5		≤ 2.5
	256 QAM		≤ 4.5	
CP-OFDM	QPSK	≤ 3.5	≤ 3	≤ 1.5
	16 QAM	≤ 3.5	≤ 3	≤ 2
	64 QAM		≤ 3.5	
	256 QAM		≤ 6.5	

<EN-DC combination>

ENDC	LTE TX	NR TX
DC_41A_n78A	Ant7	Ant3

15. Antenna Location

The detailed antenna location information can refer to SAR Test Setup Photos.

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

For Ant 1

Exposure Position	Wireless Interface	BT	2.4GHz WLAN	5GHz WLAN
		Calculated Frequency (MHz)	2480	2462
	Maximum power (dBm)	13.5	20.0	17.0
	Maximum rated power(mW)	22.39	100.00	50.12
Bottom Face	Separation distance(mm)	5.0	5.0	5.0
	exclusion threshold	7.1	31.4	24.2
	Testing required?	Yes	Yes	Yes
Edge 1	Separation distance(mm)	5.0	5.0	5.0
	exclusion threshold	7.1	31.4	24.2
	Testing required?	Yes	Yes	Yes
Edge 2	Separation distance(mm)	200.8	200.8	200.8
	exclusion threshold	1603.0	1604.0	1570.0
	Testing required?	No	No	No
Edge 3	Separation distance(mm)	143.6	143.6	143.6
	exclusion threshold	1032.0	1032.0	999.0
	Testing required?	No	No	No
Edge 4	Separation distance(mm)	24.8	24.8	24.8
	exclusion threshold	1.4	6.3	4.9
	Testing required?	No	Yes	Yes



For Ant 3

Exposure Position	Wireless Interface	LTE Band 42	Part27O FR1 n77(78) HPUE	Part27Q FR1 n77(78) HPUE
	Calculated Frequency (MHz)	3550	3930	3500.01
	Maximum power (dBm)	24.5	26.5	26.5
	Maximum rated power(mW)	281.84	446.68	446.68
Bottom Face	Separation distance(mm)	5.0		
	exclusion threshold	106.2	177.1	167.1
	Testing required?	Yes	Yes	Yes
Edge 1	Separation distance(mm)	147.3		
	exclusion threshold	1053.0	1049.0	1053.0
	Testing required?	No	No	No
Edge 2	Separation distance(mm)	231.7		
	exclusion threshold	1896.0	1892.0	1897.0
	Testing required?	No	No	No
Edge 3	Separation distance(mm)	5.0		
	exclusion threshold	106.2	177.1	167.1
	Testing required?	Yes	Yes	Yes
Edge 4	Separation distance(mm)	5.0		
	exclusion threshold	106.2	177.1	167.1
	Testing required?	Yes	Yes	Yes

For Ant 4

Exposure Position	Wireless Interface	WCDMA Band V	LTE Band 5	LTE Band 26	LTE Band 41
	Calculated Frequency (MHz)	846	848	848	2687
	Maximum power (dBm)	24.5	24.0	24.0	27.5
	Maximum rated power(mW)	281.84	251.19	251.19	562.34
Bottom Face	Separation distance(mm)	5.0			
	exclusion threshold	51.9	46.3	46.3	184.4
	Testing required?	Yes	Yes	Yes	Yes
Edge 1	Separation distance(mm)	5.0			
	exclusion threshold	51.9	46.3	46.3	184.4
	Testing required?	Yes	Yes	Yes	Yes
Edge 2	Separation distance(mm)	138.3			
	exclusion threshold	661.0	662.0	1046.0	974.0
	Testing required?	No	No	No	No
Edge 3	Separation distance(mm)	166.1			
	exclusion threshold	818.0	820.0	1324.0	1253.0
	Testing required?	No	No	No	No
Edge 4	Separation distance(mm)	53.2			
	exclusion threshold	181.0	181.0	194.0	123.0
	Testing required?	Yes	Yes	Yes	Yes



For Ant 6

Exposure Position	Wireless Interface	Part27O FR1 n77HPUE	Part27Q FR1 n77 HPUE
		Calculated Frequency (MHz)	3930
	Maximum power (dBm)	23.0	23.0
	Maximum rated power(mW)	199.53	199.53
Bottom Face	Separation distance(mm)	5.0	
	exclusion threshold	79.1	74.7
	Testing required?	Yes	Yes
Edge 1	Separation distance(mm)	5.0	
	exclusion threshold	79.1	74.7
	Testing required?	Yes	Yes
Edge 2	Separation distance(mm)	18.8	
	exclusion threshold	21.0	19.9
	Testing required?	Yes	Yes
Edge 3	Separation distance(mm)	166.1	
	exclusion threshold	1237.0	1242.0
	Testing required?	No	No
Edge 4	Separation distance(mm)	186.1	
	exclusion threshold	1436.0	1441.0
	Testing required?	No	No

For Ant 7

Exposure Position	Wireless Interface	LTE Band 41	Part27O FR1 n77 HPUE	Part27Q FR1 n77HPUE
		Calculated Frequency (MHz)	2687	3930
	Maximum power (dBm)	24.5	26.0	26.0
	Maximum rated power(mW)	281.84	398.11	398.11
Bottom Face	Separation distance(mm)	5.0		
	exclusion threshold	92.4	157.8	149.0
	Testing required?	Yes	Yes	Yes
Edge 1	Separation distance(mm)	5.0		
	exclusion threshold	92.4	157.8	149.0
	Testing required?	Yes	Yes	Yes
Edge 2	Separation distance(mm)	5.0		
	exclusion threshold	92.4	157.8	149.0
	Testing required?	Yes	Yes	Yes
Edge 3	Separation distance(mm)	130.2		
	exclusion threshold	894.0	878.0	883.0
	Testing required?	No	No	No
Edge 4	Separation distance(mm)	254.0		
	exclusion threshold	2132.0	2116.0	2120.0
	Testing required?	No	No	No



For Ant 8

Exposure Position	Wireless Interface	Part27O FR1 n77 HPUE	Part27Q FR1 n77 HPUE
	Calculated Frequency (MHz)	3930	3500.01
	Maximum power (dBm)	22.0	22.0
	Maximum rated power(mW)	158.49	158.49
Bottom Face	Separation distance(mm)	5.0	
	exclusion threshold	62.8	59.3
	Testing required?	Yes	Yes
Edge 1	Separation distance(mm)	5.0	
	exclusion threshold	62.8	59.3
	Testing required?	Yes	Yes
Edge 2	Separation distance(mm)	254.0	
	exclusion threshold	2116.0	2120.0
	Testing required?	No	No
Edge 3	Separation distance(mm)	127.2	
	exclusion threshold	848.0	852.0
	Testing required?	No	No
Edge 4	Separation distance(mm)	5.0	
	exclusion threshold	62.8	59.3
	Testing required?	Yes	Yes

16. SAR Test Results

General Note:

1. According to section 3.3, spot check conducted power test against the variant project based on the worst-case SAR condition from the original project was performed in this filing to demonstrate the test data from original project remains representative for the variant project. Detail Conducted power measurement referred to appendix E.
2. SAR spot check verification on the worst cases from the original model was performed to demonstrate the test data from original model remains representative for the variant model.
3. Per KDB 484596 D01 v02r03, the variant filings must demonstrate that the referenced test data remain valid for the variant device by including spot-check measurements that meet the following criteria:
 - a. Spot-check measurements shall be made in correspondence to the worst-case scenario reported in the reference device filing, i.e., for those conditions that are the closest to non-compliance
 - b. Spot-check measurements, while being always compliant with the applicable rule part(s) for the test under consideration, may show a deviation dB from the reference data no larger than 3 dB:
$$d_{dB} = |VdB - RdB| \leq 3 \text{ dB} \quad (1)$$
where between VdB, the variant spot-check level in dB, and RdB is the corresponding measurement level in dB for the reference model.
4. The Spot check results showed that Deviation of the SAR results did not exceed 3 dB, therefore referring to the guidance in the KDB inquiry, SAR data reuse is justified.
5. 1st as parent model, 2nd as variant model.

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For SAR testing of Bluetooth signal with 83.3% theoretical duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle) *83.3%".
 - d. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
 - e. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
 - f. 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 (W/kg) = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
 - g. For TDD LTE SAR measurement of power class 2, the duty cycle 1:2.33 (42.9 %) was used perform testing and considering the theoretical duty cycle of 43.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 42.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 43.3%/42.9% = 1.009 is applied to scale-up the measured SAR result. The reported TDD LTE SAR (W/kg) = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - $\leq 0.8 \text{ W/kg}$ or 2.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\leq 100 \text{ MHz}$
 - $\leq 0.6 \text{ W/kg}$ or 1.5 W/kg , for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - $\leq 0.4 \text{ W/kg}$ or 1.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\geq 200 \text{ MHz}$
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is $\geq 0.8 \text{ W/kg}$.
4. According to Nov. 2017 TCB workshop, when the reported 1gSAR for UL CA configuration is $< 1.2 \text{ W/kg}$, UL CA 1gSAR is not required for all required test channels (PCC based).
5. The device implements Proximity sensors mechanism for the power management for SAR compliance at different exposure conditions (Body). The device will invoke corresponding work scenarios power level base on frequency bands/antennas, which can refer to appendix E. power table.

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/64QAM 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/64QAM 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.
6. For LTE B5 / B26 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
7. LTE B5 SAR test was covered by B26; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
 - a. the maximum output power, including tolerance, for the smaller band is \leq the larger band to qualify for the SAR test exclusion
 - b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

5G NR Note:

1. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
 - a. SAR testing start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
 - b. 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure
 - c. 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.
 - d. $\text{PI}/2$ BPSK/16QAM/64QAM/256QAM output powers according to 3GPP MPR will not $\frac{1}{2}$ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configuration is less than 1.45 W/kg, $\text{PI}/2$ BPSK /16QAM/64QAM/256QAM SAR testing are not required.
 - e. Smaller bandwidth output power for each RB allocation configuration for this device will 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
 - f. For 5G FR1 n77 the maximum bandwidth does not support three non-overlapping channels, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.



16.1 Body SAR

Plot No.	No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Sample	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)	Deviation (dB)
835MHz																							
01	1st	WCDMA V	-	-	-	-	RMC 12.2Kbps	Bottom Face	0mm	Ant 4	Sensor on	4182	836.4	1	14.93	16.00	1.279	-	-	0.04	0.597	0.764	0.94
	2nd	WCDMA V	-	-	-	-	RMC 12.2Kbps	Bottom Face	0mm	Ant 4	Sensor on	4182	836.4	1	14.98	16.00	1.265	-	-	0.08	0.486	0.615	
02	1st	LTE Band 5	10M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	20525	836.5	1	12.87	14.00	1.297	-	-	0.01	0.307	0.398	0.39
	2nd	LTE Band 5	10M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	20525	836.5	1	12.86	14.00	1.300	-	-	0.01	0.280	0.364	
03	1st	LTE Band 26	15M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	26865	831.5	1	14.86	16.50	1.459	-	-	0.11	0.522	0.762	0.83
	2nd	LTE Band 26	15M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	26865	831.5	1	14.89	16.50	1.449	-	-	0.02	0.434	0.629	
	2nd	LTE Band 26	15M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	26865	831.5	2	14.89	16.50	1.449	-	-	0.08	0.411	0.595	
	2nd	LTE Band 26	15M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	26865	831.5	3	14.89	16.50	1.449	-	-	0.01	0.409	0.593	
2600MHz																							
04	2nd	LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	40620	2593	1	14.32	15.50	1.312	62.9	1.006	0.08	0.219	0.289	0.06
	2nd	LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	39750	2506	1	14.02	15.50	1.406	62.9	1.006	0.05	0.265	0.375	
05	2nd	LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	40185	2549.5	1	14.13	15.50	1.371	62.9	1.006	0.03	0.236	0.325	0.45
	2nd	LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	41055	2636.5	1	14.16	15.50	1.361	62.9	1.006	-0.08	0.220	0.301	
	2nd	LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	41490	2680	1	14.11	15.50	1.377	62.9	1.006	-0.08	0.214	0.296	
	2nd	LTE Band 41	20M	QPSK	50	0	-	Bottom Face	0mm	Ant 4	Sensor on	40620	2593	1	14.24	15.50	1.337	62.9	1.006	0.1	0.191	0.257	
	2nd	LTE Band 41	20M	QPSK	100	0	-	Bottom Face	0mm	Ant 4	Sensor on	40620	2593	1	14.23	15.50	1.340	62.9	1.006	-0.18	0.188	0.253	
	2nd	LTE Band 41	20M	QPSK	1	0	-	Edge 1	0mm	Ant 4	Sensor on	40620	2593	1	14.32	15.50	1.312	62.9	1.006	0.1	0.123	0.162	
	2nd	LTE Band 41	20M	QPSK	50	0	-	Edge 1	0mm	Ant 4	Sensor on	40620	2593	1	14.24	15.50	1.337	62.9	1.006	0.12	0.097	0.130	
	2nd	LTE Band 41	20M	QPSK	1	0	-	Edge 4	0mm	Ant 4	Full power	40620	2593	1	23.11	24.50	1.377	62.9	1.006	0.08	0.104	0.144	
	2nd	LTE Band 41	20M	QPSK	50	0	-	Edge 4	0mm	Ant 4	Full power	40620	2593	1	22.15	23.50	1.365	62.9	1.006	-0.17	0.080	0.110	
	2nd	LTE Band 41 HPUE	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	39750	2506	1	15.63	17.10	1.403	42.9	1.009	0.01	0.338	0.478	
	2nd	LTE Band 41 HPUE	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	39750	2506	2	15.63	17.10	1.403	42.9	1.009	0.11	0.295	0.418	
	2nd	LTE Band 41 HPUE	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	39750	2506	3	15.63	17.10	1.403	42.9	1.009	-0.05	0.271	0.384	
	2nd	LTE Band 41C HPUE	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 4	Sensor on	39750+39948	2506+2525.8	1	15.77	17.10	1.358	42.9	1.009	0.01	0.315	0.432	
	2nd	LTE Band 41 HPUE	20M	QPSK	1	0	-	Bottom Face	17mm	Ant 4	Full power	39750	2506	1	25.80	27.50	1.479	42.9	1.009	-0.03	0.108	0.161	
	2nd	LTE Band 41 HPUE	20M	QPSK	1	0	-	Edge 1	23mm	Ant 4	Full power	39750	2506	1	25.80	27.50	1.479	42.9	1.009	0.14	0.055	0.082	
	06	1st	LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 7	Sensor on	40620	2593	1	13.41	14.50	1.285	62.9	1.006	0.02	0.863	
2nd		LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 7	Sensor on	40620	2593	1	13.29	14.50	1.321	62.9	1.006	0.06	0.828	1.101	
2nd		LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 7	Sensor on	40620	2593	2	13.29	14.50	1.321	62.9	1.006	0.03	0.811	1.078	
2nd		LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 7	Sensor on	40620	2593	3	13.29	14.50	1.321	62.9	1.006	-0.08	0.802	1.066	
3500MHz																							
07	2nd	LTE Band 42	20M	QPSK	1	0	DFT-SCS-30KHz	Bottom Face	0mm	Ant 3	Full power	42590	3500	1	23.10	24.50	1.380	62.9	1.006	0.11	0.035	0.049	0.25
	2nd	LTE Band 42	20M	QPSK	50	0	DFT-SCS-30KHz	Bottom Face	0mm	Ant 3	Full power	42590	3500	1	22.17	23.50	1.358	62.9	1.006	0	0.020	0.027	
	2nd	LTE Band 42	20M	QPSK	1	0	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Full power	42590	3500	1	23.10	24.50	1.380	62.9	1.006	0.03	0.185	0.257	
	2nd	LTE Band 42C	20M	QPSK	1	0	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Full power	42590+42788	3500+3519.8	1	23.04	24.50	1.400	62.9	1.006	-0.09	0.163	0.230	
	2nd	LTE Band 42	20M	QPSK	1	0	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Full power	42590	3500	2	23.10	24.50	1.380	62.9	1.006	0.18	0.148	0.206	
	2nd	LTE Band 42	20M	QPSK	1	0	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Full power	42590	3500	3	23.10	24.50	1.380	62.9	1.006	0.14	0.151	0.210	
	2nd	LTE Band 42	20M	QPSK	50	0	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Full power	42590	3500	1	22.17	23.50	1.358	62.9	1.006	-0.05	0.145	0.198	
	2nd	LTE Band 42	20M	QPSK	1	0	DFT-SCS-30KHz	Edge 4	0mm	Ant 3	Full power	42590	3500	1	23.10	24.50	1.380	62.9	1.006	0.18	0.169	0.235	
	2nd	LTE Band 42	20M	QPSK	50	0	DFT-SCS-30KHz	Edge 4	0mm	Ant 3	Full power	42590	3500	1	22.17	23.50	1.358	62.9	1.006	0.14	0.137	0.187	
	08	1st	FR1 n77 Part 27Q HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Sensor off	656000	3840	1	16.24	17.50	1.337	-	-	0.07	0.260	
2nd		FR1 n77 Part 27Q HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Sensor off	656000	3840	1	16.19	17.50	1.352	-	-	0.01	0.232	0.314	
1st		FR1 n77 Part 27Q HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Sensor off	633334	3500.01	1	16.25	17.50	1.334	-	-	0.07	0.298	0.397	
2nd		FR1 n77 Part 27Q HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Sensor off	633334	3500.01	1	16.20	17.50	1.349	-	-	0.08	0.239	0.322	
2nd		FR1 n77 Part 27Q HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Sensor off	633334	3500.01	2	16.20	17.50	1.349	-	-	-0.08	0.204	0.275	
2nd		FR1 n77 Part 27Q HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 3	0mm	Ant 3	Sensor off	633334	3500.01	3	16.20	17.50	1.349	-	-	0.1	0.188	0.254	
2nd		FR1 n77 Part 27Q HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	656000	3840	1	10.89	12.00	1.291	-	-	-0.05	0.787	1.016	
2nd		FR1 n77 Part 27Q HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	656000	3840	1	10.88	12.00	1.294	-	-	0.05	0.793	1.026	



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2nd	FR1 n77 Part 270 HPUE	100M	QPSK	270	0	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	656000	3840	1	10.79	12.00	1.321	-	-	0.18	0.678	0.896		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 1	0mm	Ant 6	Sensor on	656000	3840	1	10.89	12.00	1.291	-	-	0.14	0.144	0.186		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 1	0mm	Ant 6	Sensor on	656000	3840	1	10.88	12.00	1.294	-	-	-0.17	0.149	0.193		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 2	0mm	Ant 6	Sensor on	656000	3840	1	10.89	12.00	1.291	-	-	0.17	0.067	0.087		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 2	0mm	Ant 6	Sensor on	656000	3840	1	10.88	12.00	1.294	-	-	-0.05	0.069	0.089		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	22mm	Ant 6	Full power	656000	3840	1	21.45	23.00	1.429	-	-	0.01	0.218	0.311		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 1	13mm	Ant 6	Full power	656000	3840	1	21.45	23.00	1.429	-	-	0.1	0.185	0.264		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 2	19mm	Ant 6	Full power	656000	3840	1	21.45	23.00	1.429	-	-	-0.17	0.063	0.090		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	633334	3500.01	1	11.07	12.00	1.239	-	-	0.08	0.825	1.022		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	633334	3500.01	1	11.00	12.00	1.259	-	-	0.08	0.831	1.046		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	633334	3500.01	2	11.00	12.00	1.259	-	-	0.03	0.770	0.969		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	633334	3500.01	3	11.00	12.00	1.259	-	-	-0.08	0.794	1.000		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	270	0	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	633334	3500.01	1	11.03	12.00	1.250	-	-	-0.18	0.708	0.885		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 1	0mm	Ant 6	Sensor on	633334	3500.01	1	11.07	12.00	1.239	-	-	0.1	0.150	0.186		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 1	0mm	Ant 6	Sensor on	633334	3500.01	1	11.00	12.00	1.259	-	-	0.12	0.156	0.196		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 2	0mm	Ant 6	Sensor on	633334	3500.01	1	11.07	12.00	1.239	-	-	0.08	0.075	0.093		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 2	0mm	Ant 6	Sensor on	633334	3500.01	1	11.00	12.00	1.259	-	-	-0.17	0.070	0.088		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	22mm	Ant 6	Full power	633334	3500.01	1	21.82	23.00	1.312	-	-	-0.03	0.231	0.303		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 1	13mm	Ant 6	Full power	633334	3500.01	1	21.82	23.00	1.312	-	-	0.14	0.190	0.249		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 2	19mm	Ant 6	Full power	633334	3500.01	1	21.82	23.00	1.312	-	-	0.11	0.078	0.102		
1st	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 7	Sensor on	656000	3840	1	9.54	11.00	1.400	-	-	-0.09	0.825	1.155		
06	2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 7	Sensor on	656000	3840	1	9.52	11.00	1.406	-	-	0.01	0.781	1.098	0.22
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 7	Sensor on	656000	3840	2	9.52	11.00	1.406	-	-	-0.18	0.756	1.063		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 7	Sensor on	656000	3840	3	9.52	11.00	1.406	-	-	0.1	0.762	1.071		
1st	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 7	Sensor on	633334	3500.01	1	10.02	11.00	1.253	-	-	-0.03	0.846	1.060	0.41	
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 7	Sensor on	633334	3500.01	1	10.01	11.00	1.256	-	-	0.07	0.768	0.965		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Bottom Face	0mm	Ant 8	Sensor off	656000	3840	1	13.11	14.00	1.227	-	-	0.04	0.549	0.674		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 8	Sensor off	656000	3840	1	13.07	14.00	1.239	-	-	-0.01	0.404	0.500		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 1	0mm	Ant 8	Sensor off	656000	3840	1	13.11	14.00	1.227	-	-	-0.08	0.098	0.120		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 1	0mm	Ant 8	Sensor off	656000	3840	1	13.07	14.00	1.239	-	-	0.05	0.121	0.150		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 4	0mm	Ant 8	Sensor off	656000	3840	1	13.11	14.00	1.227	-	-	-0.01	0.633	0.777		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 4	0mm	Ant 8	Sensor off	656000	3840	2	13.11	14.00	1.227	-	-	0.06	0.611	0.750		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 4	0mm	Ant 8	Sensor off	656000	3840	3	13.11	14.00	1.227	-	-	-0.09	0.555	0.681		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 4	0mm	Ant 8	Sensor off	656000	3840	1	13.07	14.00	1.239	-	-	-0.08	0.528	0.654		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Bottom Face	0mm	Ant 8	Sensor off	633334	3500.01	1	13.11	14.00	1.227	-	-	0.13	0.483	0.593		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 8	Sensor off	633334	3500.01	1	13.06	14.00	1.242	-	-	0.12	0.355	0.441		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 1	0mm	Ant 8	Sensor off	633334	3500.01	1	13.11	14.00	1.227	-	-	0.03	0.086	0.106		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 1	0mm	Ant 8	Sensor off	633334	3500.01	1	13.06	14.00	1.242	-	-	0.18	0.107	0.133		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	1	1	DFT-SCS-30KHz	Edge 4	0mm	Ant 8	Sensor off	633334	3500.01	1	13.11	14.00	1.227	-	-	-0.03	0.554	0.680		
2nd	FR1 n77 Part 270 HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Edge 4	0mm	Ant 8	Sensor off	633334	3500.01	1	13.06	14.00	1.242	-	-	0.16	0.460	0.571		



FCC SAR Test Report

Report No. : FA512403

Plot No.	No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Sample	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)	Deviation (dB)
2450MHz																			
	1st	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Full power	1	2412	1	9.94	11.50	1.432	100	1.000	0.02	0.512	0.733	0.38
07	2nd	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Full power	1	2412	1	9.88	11.50	1.452	100	1.000	0.02	0.463	0.672	
	2nd	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Full power	1	2412	2	9.88	11.50	1.452	100	1.000	0.12	0.456	0.662	
	2nd	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Full power	1	2412	3	9.88	11.50	1.452	100	1.000	0.08	0.429	0.623	
	1st	Bluetooth	1Mbps	Bottom Face	0mm	Ant 1	Full power	78	2480	1	12.48	13.50	1.266	76.79	1.085	0.01	0.433	0.595	0.81
08	2nd	Bluetooth	1Mbps	Bottom Face	0mm	Ant 1	Full power	78	2480	1	12.33	13.50	1.309	76.79	1.085	-0.06	0.347	0.493	
5000MHz																			
	1st	WLAN5.3GHz	802.11n-HT40 MCS0	Bottom Face	19mm	Ant 1	Full power	54	5270	1	16.00	16.50	1.122	94.48	1.058	0.07	0.643	0.763	0.02
09	2nd	WLAN5.3GHz	802.11n-HT40 MCS0	Bottom Face	19mm	Ant 1	Full power	54	5270	1	15.95	16.50	1.135	94.48	1.058	0.01	0.632	0.759	
	2nd	WLAN5.3GHz	802.11n-HT40 MCS0	Bottom Face	19mm	Ant 1	Full power	54	5270	2	15.95	16.50	1.135	94.48	1.058	-0.17	0.601	0.722	
	2nd	WLAN5.3GHz	802.11n-HT40 MCS0	Bottom Face	19mm	Ant 1	Full power	54	5270	3	15.95	16.50	1.135	94.48	1.058	-0.03	0.593	0.712	
	1st	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	19mm	Ant 1	Full power	138	5690	1	16.06	17.00	1.241	89.92	1.112	0.03	0.580	0.801	0.11
10	2nd	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	19mm	Ant 1	Full power	138	5690	1	16.01	17.00	1.256	89.92	1.112	0.01	0.559	0.781	
	2nd	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	19mm	Ant 1	Full power	138	5690	2	16.01	17.00	1.256	89.92	1.112	0.14	0.511	0.714	
	2nd	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	19mm	Ant 1	Full power	138	5690	3	16.01	17.00	1.256	89.92	1.112	0.11	0.530	0.740	
	1st	WLAN5.8GHz	802.11ac-VHT80 MCS0	Bottom Face	19mm	Ant 1	Full power	155	5775	1	15.65	16.00	1.084	89.92	1.112	0.05	0.638	0.769	0.46
11	2nd	WLAN5.8GHz	802.11ac-VHT80 MCS0	Bottom Face	19mm	Ant 1	Full power	155	5775	1	15.55	16.00	1.109	89.92	1.112	0.07	0.560	0.691	
	2nd	WLAN5.8GHz	802.11ac-VHT80 MCS0	Bottom Face	19mm	Ant 1	Full power	155	5775	2	15.55	16.00	1.109	89.92	1.112	-0.05	0.539	0.665	
	2nd	WLAN5.8GHz	802.11ac-VHT80 MCS0	Bottom Face	19mm	Ant 1	Full power	155	5775	3	15.55	16.00	1.109	89.92	1.112	0.18	0.506	0.624	

16.2 Repeated SAR Measurement

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power State	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)	Ratio	Reported 1g SAR (W/kg)
1st	LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 7	Sensor on	40620	2593	13.29	14.50	1.321	62.9	1.006	0.06	0.828	1	1.101
2nd	LTE Band 41	20M	QPSK	1	0	-	Bottom Face	0mm	Ant 7	Sensor on	40620	2593	13.29	14.50	1.321	62.9	1.006	0.09	0.820	1.010	1.090
1st	FR1 n77 Part 27Q HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	633334	3500.01	11.00	12.00	1.259	-	-	0.08	0.831	1	1.046
2nd	FR1 n77 Part 27Q HPUE	100M	QPSK	135	69	DFT-SCS-30KHz	Bottom Face	0mm	Ant 6	Sensor on	633334	3500.01	11.00	12.00	1.259	-	-	0.01	0.814	1.021	1.025

General Note:

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



16.3 TDD LTE Linearity Data Analysis

General Note:

This device support Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operation is 43.3% using UL-DL configuration 1. Per FCC Guidance based on the device behavior, all SAR tests were performed using Power Class 3. Power Class 2 is tested using the highest SAR test configuration in Power Class 3 for each LTE configuration and exposure condition combination, according to the highest time averaged power for all applicable uplink-downlink configurations in Power Class 2. When the reported SAR vs. output power is linearly scaled with < 10% discrepancy between power classes and all reported SAR are < 1.4 W/kg for 1g and < 3.5 W/kg for 10g, Separate SAR testing for Power Class 2 is not required.

LTE B41(HPUE)-Linearity Data for Ant 4		
	LTE Band 41 (Power Class 3)	LTE Band 41 (Power Class 2)
Maximum Tune up Power (dBm)	15.50	17.10
Reported 1g SAR (W/kg)	0.447	0.478
Duty Cycle	63.30%	43.30%
Frame Averaged (mW)	22.46	22.21
Linearity SAR (W/kg)	0.442	
% deviation from expected linearity		8.15%

17. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Tablet Computer
		Body
1.	WWAN + 2.4GHz WLAN	Yes
2.	WWAN + 5GHz WLAN	Yes
3.	WWAN + Bluetooth	Yes

General Note:

1. EUT will choose each WCDMA, LTE and 5G NR according to the network signal condition; therefore, they will not operate simultaneously at any moment.
2. WWAN above includes 5G NR bands and EN-DC combination.
3. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment though they have independent antenna.
4. WLAN 2.4GHz and Bluetooth share the same antenna so can't transmit simultaneously.
5. According to the EUT characteristic, WLAN 5GHz and Bluetooth can't transmit simultaneously.
6. The worst case 5 GHz WLAN SAR for each configuration was used for SAR summation.
7. When stand-alone SAR is not required for a transmitter or antenna, its SAR is considered zero in the SAR summing process to assess Multi-band transmission SAR compliance.
8. All licensed modes share the same antenna part and cannot transmit simultaneously.
9. The reported SAR summation is calculated based on the same configuration and test position.
10. For standalone WWAN, always choose the highest SAR among all WWAN bands within the selected antenna for each exposure position to perform simultaneous transmission analysis with WLAN/BT. This is the worst co-located analysis and can represent each band.
11. For EN-DC SAR co-located with WLAN/Bluetooth, chose the worst SAR among the selected LTE bands within the selected antenna per each test position and also the worst SAR of the selected 5G NR Bands within the selected antenna to do co-located with WLAN/Bluetooth. This is the worst co-located analysis and can represent each LTE bands and each 5G NR bands.
12. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - i) 1g Scalar SAR summation < 1.6W/kg and 10g Scalar SAR summation < 4.0W/kg.
 - ii) $SPLSR = (SAR1 + SAR2)^{1.5} / (\min. \text{ separation distance, mm})$, 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.
 - iii) If $SPLSR \leq 0.04$ for 1g SAR and $SPLSR \leq 0.10$ for 10g SAR, simultaneously transmission SAR measurement is not necessary.
 - iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg.
 - v) The SPLSR calculated results please refer to section 17.2.

Conclusion:

1. The Spot check results from chapter 16.1, showed that Deviation of the SAR results did not exceed 3 dB, SAR data reuse is justified.
2. For simultaneously transmission SAR analysis, Simultaneous transmission analysis for the WWAN/WLAN/BT bands and each position are based on max SAR results chosen between the reference model SAR results (Sporton SAR report no.: FA512510) and Spot check results.

17.1 Body Exposure Conditions

WWAN Band	Exposure Position	1	2	3	4	1+2	1+3	1+4	SPLSR
		WWAN	WLAN2.4GHz Ant 1	WLAN5GHz Ant 1	Bluetooth Ant 1	Summed	Summed	Summed	
		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)	
LTE Band 41 Ant4	Bottom Face	0.478	0.733	0.716	0.595	1.21	1.19	1.07	
	Edge 1	0.162	0.433	0.608	0.008	0.60	0.77	0.17	
	Edge 2					0.00	0.00	0.00	
	Edge 3					0.00	0.00	0.00	
	Edge 4	0.144	0.132	0.091	0.001	0.28	0.24	0.15	
LTE Band 42 Ant3	Bottom Face	0.049	0.733	0.716	0.595	0.78	0.77	0.64	
	Edge 1	0.162	0.433	0.608	0.008	0.60	0.77	0.17	
	Edge 2	0.257				0.26	0.26	0.26	
	Edge 3					0.00	0.00	0.00	
	Edge 4	0.235	0.132	0.091	0.001	0.37	0.33	0.24	
FR1 n77 Ant 6	Bottom Face	1.046	0.733	0.716	0.595	1.78	1.76	1.64	1,2,3
	Edge 1	0.196	0.433	0.608	0.008	0.63	0.80	0.20	
	Edge 2	0.093				0.09	0.09	0.09	
	Edge 3					0.00	0.00	0.00	
	Edge 4		0.132	0.091	0.001	0.13	0.09	0.00	
FR1 n77 Ant 8	Bottom Face	0.674	0.733	0.716	0.595	1.41	1.39	1.27	
	Edge 1	0.150	0.433	0.608	0.008	0.58	0.76	0.16	
	Edge 2					0.00	0.00	0.00	
	Edge 3					0.00	0.00	0.00	
	Edge 4	0.777	0.132	0.091	0.001	0.91	0.87	0.78	
WCDMA V Ant4	Bottom Face	0.764	0.733	0.716	0.595	1.50	1.48	1.36	
	Edge 1	0.642	0.433	0.608	0.008	1.08	1.25	0.65	
	Edge 2					0.00	0.00	0.00	
	Edge 3					0.00	0.00	0.00	
	Edge 4	0.232	0.132	0.091	0.001	0.36	0.32	0.23	
LTE Band 5 Ant4	Bottom Face	0.398	0.733	0.716	0.595	1.13	1.11	0.99	
	Edge 1	0.279	0.433	0.608	0.008	0.71	0.89	0.29	
	Edge 2					0.00	0.00	0.00	
	Edge 3					0.00	0.00	0.00	
	Edge 4	0.252	0.132	0.091	0.001	0.38	0.34	0.25	
LTE Band 26 Ant 4	Bottom Face	0.762	0.733	0.716	0.595	1.50	1.48	1.36	
	Edge 1	0.532	0.433	0.608	0.008	0.97	1.14	0.54	
	Edge 2					0.00	0.00	0.00	
	Edge 3					0.00	0.00	0.00	
	Edge 4	0.249	0.132	0.091	0.001	0.38	0.34	0.25	
LTE Band 41 Ant 7	Bottom Face	1.116	0.733	0.716	0.595	1.85	1.83	1.71	25&26&27
	Edge 1	0.039	0.433	0.608	0.008	0.47	0.65	0.05	
	Edge 2	0.462				0.46	0.46	0.46	
	Edge 3					0.00	0.00	0.00	
	Edge 4		0.132	0.091	0.001	0.13	0.09	0.00	
FR1 n77 Ant3	Bottom Face	0.397	0.733	0.716	0.595	1.13	1.11	0.99	
	Edge 1		0.433	0.608	0.008	0.43	0.61	0.01	
	Edge 2	1.116				1.12	1.12	1.12	



	Edge 3	0.348				0.35	0.35	0.35	
	Edge 4	0.341	0.132	0.091	0.001	0.47	0.43	0.34	
FR1 n77 Ant7	Bottom Face	1.155	0.733	0.716	0.595	1.89	1.87	1.75	31&32&33
	Edge 1	0.060	0.433	0.608	0.008	0.49	0.67	0.07	
	Edge 2	0.441				0.44	0.44	0.44	
	Edge 3	1.116				1.12	1.12	1.12	
	Edge 4	1.116	0.132	0.091	0.001	1.25	1.21	1.12	

<ENDC>

WWAN Band	FR1 Band	Exposure Position	1	2	3	4	5	1+2+3	1+2+4	1+2+5	SPLSR
			WWAN	FR1	WLAN2.4GHz Ant 1	WLAN5GHz Ant 1	Bluetooth Ant 1	Summed	Summed	Summed	
			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)	
Band41 Ant7	FR1 n77 Ant3	Bottom Face	1.116	0.052	0.733	0.716	0.595	1.90	1.88	1.76	52&53&54
		Edge 1	0.039		0.433	0.608	0.008	0.47	0.65	0.05	
		Edge 2	0.462					0.46	0.46	0.46	
		Edge 3		0.397				0.40	0.40	0.40	
		Edge 4		0.345	0.132	0.091	0.001	0.48	0.44	0.35	



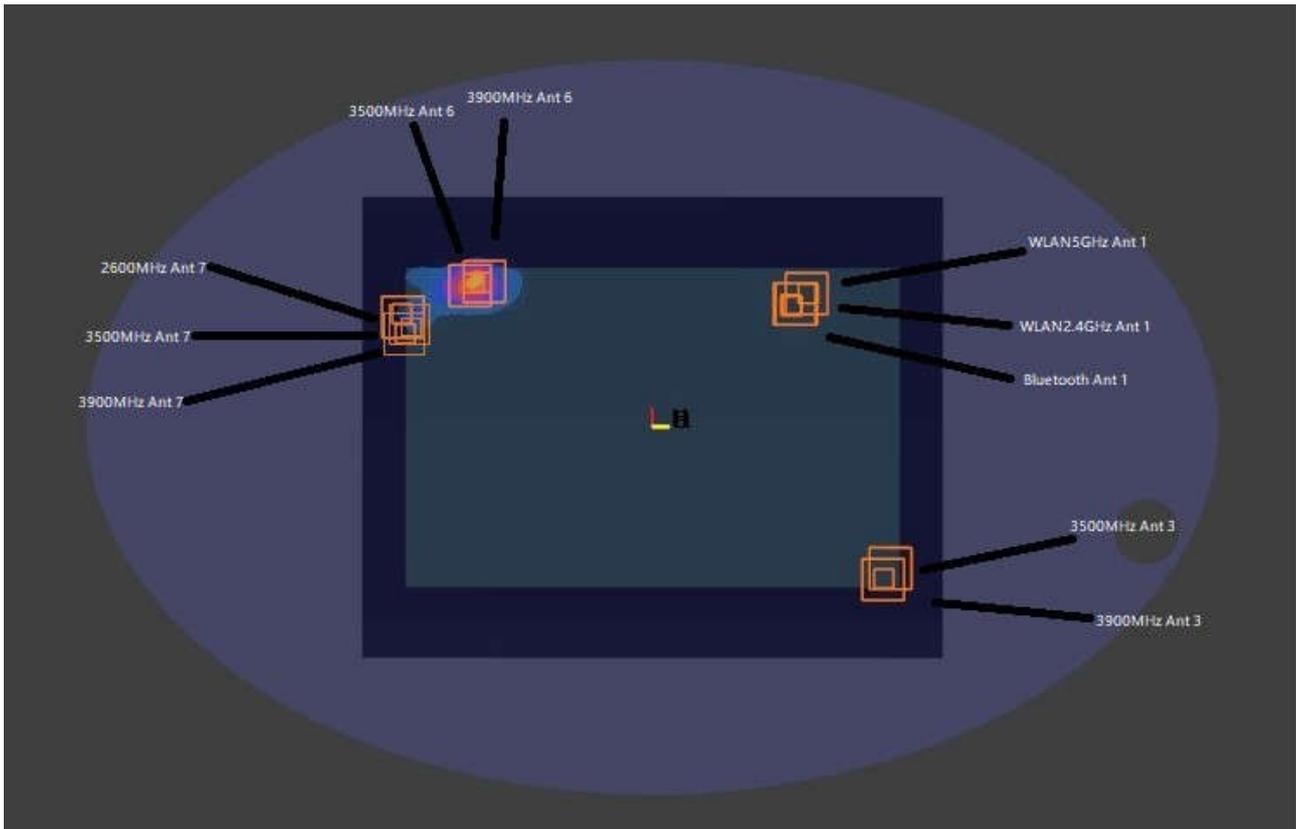
<Sensor Off>

WWAN Band	Exposure Position	1	2	3	4	1+2	1+3	1+4
		WWAN	WLAN2.4GHz Ant 1	WLAN5GHz Ant 1	Bluetooth Ant 1	Summed	Summed	Summed
		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)
WCDMA V Ant 4	Bottom Face	0.500	0.257	0.801		0.76	1.30	0.50
	Edge 1	0.316				0.32	0.32	0.32
	Edge 2					0.00	0.00	0.00
	Edge 3					0.00	0.00	0.00
	Edge 4					0.00	0.00	0.00
LTE Band 5 Ant 4	Bottom Face	0.386	0.257	0.801		0.64	1.19	0.39
	Edge 1	0.257				0.26	0.26	0.26
	Edge 2					0.00	0.00	0.00
	Edge 3					0.00	0.00	0.00
	Edge 4					0.00	0.00	0.00
LTE Band 26 Ant 4	Bottom Face	0.440	0.257	0.801		0.70	1.24	0.44
	Edge 1	0.288				0.29	0.29	0.29
	Edge 2					0.00	0.00	0.00
	Edge 3					0.00	0.00	0.00
	Edge 4					0.00	0.00	0.00
LTE Band 41 Ant 4	Bottom Face	0.161	0.257	0.801		0.42	0.96	0.16
	Edge 1	0.082				0.08	0.08	0.08
	Edge 2					0.00	0.00	0.00
	Edge 3					0.00	0.00	0.00
	Edge 4					0.00	0.00	0.00
LTE Band 41 Ant 7	Bottom Face	0.152	0.257	0.801		0.41	0.95	0.15
	Edge 1	0.103				0.10	0.10	0.10
	Edge 2	0.359				0.36	0.36	0.36
	Edge 3					0.00	0.00	0.00
	Edge 4					0.00	0.00	0.00
FR1 n77(78) Ant 6	Bottom Face	0.311	0.257	0.801		0.57	1.11	0.31
	Edge 1	0.264				0.26	0.26	0.26
	Edge 2	0.102				0.10	0.10	0.10
	Edge 3					0.00	0.00	0.00
	Edge 4					0.00	0.00	0.00
FR1 n77 Ant 7	Bottom Face	0.529	0.257	0.801		0.79	1.33	0.53
	Edge 1	0.132				0.13	0.13	0.13
	Edge 2	0.450				0.45	0.45	0.45
	Edge 3					0.00	0.00	0.00
	Edge 4					0.00	0.00	0.00

17.2 SPLSR Evaluation and Analysis

General Note:

1. When standalone SAR is measured for both antennas in the pair, the peak location separation distance is computed by the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where $(x1, y1, z1)$ and $(x2, y2, z2)$ are the coordinates in the area scans or extrapolated peak SAR locations in the zoom scans, as appropriate.
2. $SPLSR = (SAR1 + SAR2)1.5 / (\text{min. separation distance, mm})$. If $SPLSR \leq 0.04$ for 1g SAR, simultaneously transmission SAR measurement is not necessary.
3. Per April 2022 TCB Workshop Notes, WWAN Ant4 was summed algebraically with WLAN Ant1 for the purposes of hybrid SPLSR combination and they are located at the side of the device.
4. Per April 2022 TCB Workshop, instead of doing a small volume scan over a co-located antenna pair, used summing the SAR values of the co-located pair and using that value in SPLSR calculation. In the calculation used the minimum distance between the spatially separated antenna and the closest antenna of the co-located antenna pair to be conservative.



WWAN+WLAN+BT Bottom Face 0mm



Case No	Band	Position	SAR 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR				
						X	Y	Z								
Case 1	FR1 n77 Part 27Q HPUE Ant 6	Bottom Face	1.046	1.046	0mm	-73.3	-95	-177	170.2	1.78	0.01	Not required				
	WLAN2.4GHz Ant 1	Bottom Face	0.733	0.733	0mm	-65.6	75	-177								
Case 2	FR1 n77 Part 27Q HPUE Ant 6	Bottom Face	1.046	1.046	0mm	-73.3	-95	-177	172.5	1.76	0.01	Not required				
	WLAN5GHz Ant 1	Bottom Face	0.716	0.716	0mm	-67.4	77.4	-177								
Case 3	FR1 n77 Part 27Q HPUE Ant 6	Bottom Face	1.046	1.046	0mm	-73.3	-95	-177	167.1	1.64	0.01	Not required				
	Bluetooth Ant 1	Bottom Face	0.595	0.593	0mm	-66.6	72	-177								
Case 52	LTE Band 41(38) Ant7	Bottom Face	1.116	1.116	0mm	-53	-128	-177	228.2	1.90	0.01	Not required				
	FR1(N77.N78) Ant3		0.052	0.785	0mm	-62.4	100	-177								
	WLAN2.4GHz Ant 1		0.733		0mm											
	LTE Band 41(38) Ant7	Bottom Face	1.116	1.116	0mm	-53	-128	-177					203.4	1.90	0.01	Not required
	FR1(N77.N78) Ant3		0.052	0.785	0mm											
	WLAN2.4GHz Ant 1		0.733		0mm	-65.6	75	-177								
Case 53	LTE Band 41(38) Ant7	Bottom Face	1.116	1.116	0mm	-53	-128	-177	228.2	1.88	0.01	Not required				
	FR1 N77(78) Ant3		0.052	0.768	0mm	-62.4	100	-177								
	WLAN5GHz Ant 1		0.716		0mm											
	LTE Band 41(38) Ant7	Bottom Face	1.116	1.116	0mm	-53	-128	-177					205.9	1.88	0.01	Not required
	FR1 N77(78) Ant3		0.052	0.768	0mm											
	WLAN5GHz Ant 1		0.716		0mm	-67.4	77.4	-177								
Case 54	LTE Band 41(38) Ant7	Bottom Face	1.116	1.116	0mm	-53	-128	-177	228.2	1.76	0.01	Not required				
	FR1 N77(78) Ant3		0.052	0.647	0mm	-62.4	100	-177								
	Bluetooth Ant 1		0.595		0mm											
	LTE Band 41(38) Ant7	Bottom Face	1.116	1.116	0mm	-53	-128	-177					200.5	1.76	0.01	Not required
	FR1 N77(78) Ant3		0.052	0.647	0mm											
	Bluetooth Ant 1		0.595		0mm	-66.6	72	-177								
Case 25	LTE Band 41 Ant 7	Bottom Face	1.116	1.116	0mm	-53	-128	-177	203.4	1.85	0.01	Not required				
	WLAN2.4GHz Ant 1	Bottom Face	0.733	0.733	0mm	-65.6	75	-177								
Case 26	LTE Band 41 Ant 7	Bottom Face	1.116	1.116	0mm	-53	-128	-177	205.9	1.83	0.01	Not required				
	WLAN5GHz Ant 1	Bottom Face	0.716	0.716	0mm	-67.4	77.4	-177								
Case 27	LTE Band 41 Ant 7	Bottom Face	1.116	1.116	0mm	-53	-128	-177	200.5	1.71	0.01	Not required				
	Bluetooth Ant 1	Bottom Face	0.595	0.595	0mm	-66.6	72	-177								
Case 31	FR1 n77 Ant 7	Bottom Face	1.155	1.155	0mm	-53.2	-128.2	-177	203.6	1.89	0.01	Not required				
	WLAN2.4GHz Ant 1	Bottom Face	0.733	0.733	0mm	-65.6	75	-177								
Case 32	FR1 n77 Ant 7	Bottom Face	1.155	1.155	0mm	-53.2	-128.2	-177	206.1	1.87	0.01	Not required				
	WLAN5GHz Ant 1	Bottom Face	0.716	0.716	0mm	-67.4	77.4	-177								
Case 33	FR1 n77 Ant 7	Bottom Face	1.155	1.155	0mm	-53.2	-128.2	-177	200.6	1.75	0.01	Not required				
	Bluetooth Ant 1	Bottom Face	0.595	0.595	0mm	-66.6	72	-177								

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18. 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 and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

19. References

- [1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”
- [2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992
- [3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.
- [6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015
- [7] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015
- [8] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015
- [9] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015
- [10] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [11] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.
- [12] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015
- [13] FCC KDB 484596 D01 v02r03, “Test Reductions Via Data Referencing”, Mar. 2024



Appendixes

Please refer to separated files for the following appendixes

Appendix A. Plots of System Performance Check

Appendix B. Plots of High SAR Measurement

Appendix C. DASY Calibration Certificate

Appendix D. Test Setup Photos

Appendix E. Conducted RF Output Power Table

Appendix F. Power measurement connection diagram and CA Conducted RF Output Power Table

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