SAR EVALUATION REPORT

IEEE Std 1528-2013

For
WCDMA/LTE Tablet with BT and DTS/UNII a/b/g/n/ac

FCC ID: A3LSMT927A
Model Name: SM-T927A

Report Number: 12530276-S1V2
Issue Date: 1/15/2019

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
V1	12/27/2018	Initial Issue	--
V2	1/15/2019	Report revised based on Reviewer's comments: 1. Updated EUT description. 2. Sec. 6.2 : Updated table. 3. Sec. 6.3 : Corrected Frequency range. 4. Sec. 6.4 : Updated table. 5. Sec. 6.5 : Updated tables. 6. Sec. 9.2 : Removed LTE Band 14 3/1.4MHz bandwidth. 7. Sec. 9.1 : Corrected typo. 8. Sec. 9.4 : Corrected typo. 9. Appendixes C Updated.	Art Thammanavarat

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1. Attestation of Test Results

Applicant Name	Samsung Electronics. Co., Ltd.			
FCC ID	A3LSMT927A			
Model Name	SM-T927A			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category	SAR Limits (W/Kg)			
	Peak spatial-average (1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure	1.6		4	
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)			
	PCT	DTS	NII	DSS
Standalone	1.135	0.535	0.981	N/A
Simultaneous TX	1.578	1.532	1.578	1.290
Date Tested	11/27/2018 to 12/7/2018			
Test Results	Pass			

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:	Prepared By:
	
Devin Chang Senior Test Engineer UL Verification Services Inc.	Lloyd-Edward Villanueva Laboratory Technician UL Verification Services Inc.

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 616217 D04 SAR for laptop and tablets v01r02
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
- 941225 D06 Hotspot Mode v02r01

In addition to the above, the following information was used:

- TCB workshop April 2015; RF Exposure Procedures (Overlapping LTE Bands)
- TCB workshop October 2015; RF Exposure Procedures (KDB 941225 D05A)
- TCB workshop April 2016; RF Exposure Procedures (LTE Carrier Aggregation for DL)
- TCB workshop October 2016; RF Exposure Procedures (Bluetooth Duty Factor)
- TCB workshop October 2016; RF Exposure Procedures (DUT Holder Perturbations)
- TCB workshop May 2017; RF Exposure Procedures (Broadband Liquid Above 3 GHz)
- TCB workshop April 2018; RF Exposure Procedures (LTE DL CA SAR Test Exclusion)

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

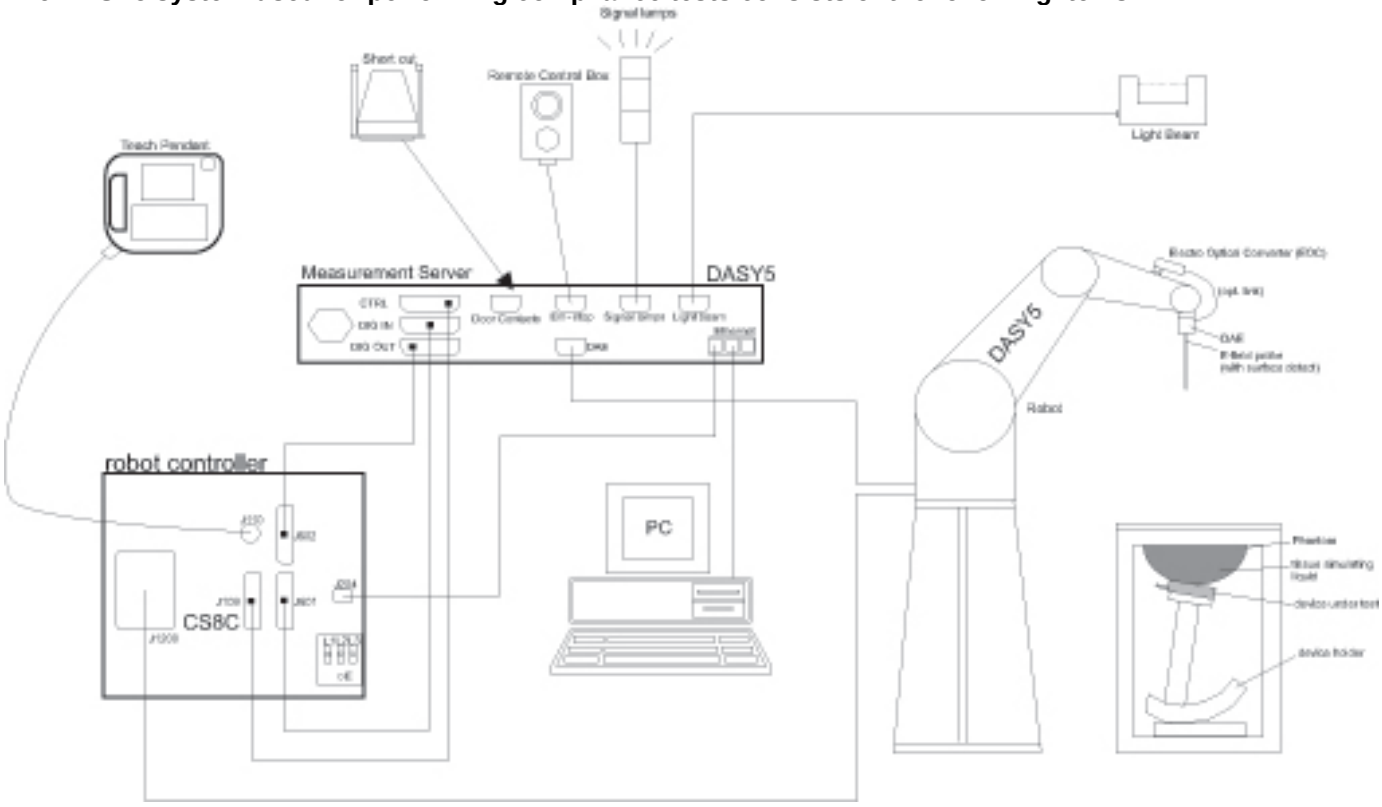
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	SAR Lab 6
SAR Lab G	SAR Lab 7
SAR Lab H	SAR Lab 8

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 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 WinXP or Win7 and the DASY5 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.

4.2. SAR Scan Procedures

Step 1: 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. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: 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 locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) 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 KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

Step 3: Zoom Scan

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

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

<table>
<tr><th colspan="3"></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 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.</td></tr>
</table>

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	ZNLE6	1323	7/16/2019
Dielectric Probe kit	SPEAG	DAK-3.5	1082	9/11/2019
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	9/11/2019
Thermometer	Traceable Calibration Control Co.	4242	122529162	12/8/2018

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	Rohde & Schwarz	SMB 100A	1406.6000K03-180968-gX	7/4/2019
Power Sensor	Rohde & Schwarz	NRP 18A	1424.6815K02-100994-RE	6/19/2019
Synthesized Signal Generator	Rohde & Schwarz	SMB 100A	1406.6000K03-180969-yC	6/27/2019
Power Meter	Rohde & Schwarz	NRP 18A	1424.6815K02-10092-iU	6/19/2019

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR Lab G)	SPEAG	EX3DV4	7463	7/20/2019
Data Acquisition Electronics (SAR Lab G)	SPEAG	DAE4	1359	2/9/2019
System Validation Dipole	SPEAG	D750V3	1024	5/16/2019
System Validation Dipole	SPEAG	D835V2	4d117	5/16/2019
System Validation Dipole	SPEAG	D1750V2	1050	4/10/2019
System Validation Dipole	SPEAG	D1750V2	1077	10/16/2019
System Validation Dipole	SPEAG	D1900V2	5d163	10/16/2019
System Validation Dipole	SPEAG	D1900V2	5d140	4/11/2019
System Validation Dipole	SPEAG	D2300V2	1058	10/2/2019
System Validation Dipole	SPEAG	D2450V2	899	3/16/2019
System Validation Dipole	SPEAG	D5GHzV2	1138	8/21/2019

Other

Name of Equipment	Manufacturer	Type/Model	T Number	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	T 733	MY50001018	10/17/2019
Power Sensor	Agilent	N1921A	T 308	MY52260009	1/8/2019
Base Station Simulator	R & S	CMW500	T1871	165411-Ci	2/19/2019
Base Station Simulator	R & S	CMW500	T 259	124594-HX	2/21/2019

5. Measurement Uncertainty

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

Therefore, the measurement uncertainty is not required.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 263 mm x 417 mm Overall Diagonal: 487 mm Display Diagonal: 438 mm This is a Tablet and/or laptop device (overall diagonal dimension of the keyboard and/or display section of a laptop or tablet is > 20 cm)
Back Cover	Normal Battery Cover
Battery Options	☒ Standard – Lithium-ion battery, Rating 4.35Vdc, 45.6Wh
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☒ Mobile Hotspot (Wi-Fi 5.8GHz Channel 149 only)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☒ Wi-Fi Direct (Wi-Fi 5.2 & 5.8 GHz)
Bluetooth Tethering	BT Tethering mode permits the device to share its cellular data connection with other devices. ☒ BT Tethering (Bluetooth 2.4 GHz)
Test sample information	**S/N** / **IMEI** / **Notes** R32K8001WNV / 359663090028103 / Conducted R32K8001W2D / 359663090027907 / Conducted R32K8001VBH / 359663090027667 / Radiated R32K8001VCY / 359663090027675 / Radiated R32K8001V7F / 359663090027626 / Radiated
Hardware Version	REV1.0
Software Version	T927A.001

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
W-CDMA (UMTS)	Band II Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Cat 14) HSUPA (Cat 6) HSPA+ (Rel. 6)	100%
LTE	FDD Band 2 FDD Band 4 FDD Band 5 FDD Band 12 FDD Band 14 FDD Band 29 (Rx only) FDD Band 30 FDD Band 66	QPSK 16QAM 64AQM Rel. 12 Carrier Aggregation (1 Uplink and 2 Downlinks)	100% (FDD)
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	99.62% (802.11b) [1] 97.54% (802.11g 20MHz BW) [1] 97.38% (802.11n 20MHz BW) [1]
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)	94.76% (802.11a) [1] 94.62% (802.11a/n/ac 20MHz BW) [1] 87.44% (802.11n/ac 40MHz BW) [1] 74.39% (802.11n/ac 80MHz BW) [1]
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No		
	Does this device support Band gap channel? ☒ Yes ☐ No		
Bluetooth	2.4 GHz	Version 5.0 LE	N/A[2]

Notes:

1. Duty cycle for Wi-Fi is referenced from the DTS and UNII report.
2. Measured Duty Cycle is not required due to SAR test exemption.

6.3. General LTE SAR Test and Reporting Considerations

Item	Description						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 - 1910 MHz (BW = 60 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	**18700 /1860**	18675/ 1857.5	18650/ 1855	18625/ 1852.5	18615/ 1851.5	18607/ 1850.7
	Mid	**18900/ 1880**	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880
	High	**19100/ 1900**	19125/ 1902.5	19150/ 1905	19175/ 1907.5	19185/ 1908.5	19193/ 1909.3
	Band 4	Frequency range: 1710 - 1755 MHz (BW = 45 MHz)					
		Channel Bandwidth					
		20 MHz [1]	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	20050/ 1720	20025/ 1717.5	20000/ 1715	19975/ 1712.5	19965/ 1711.5	19957/ 1710.7
	Mid	**20175/ 1732.5**	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5	20385/ 1753.5	20393/ 1754.3
	Band 5	Frequency range: 824 - 849 MHz (BW = 25 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz [1]	5 MHz	3 MHz	1.4 MHz
	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7
	Mid			**20525/ 836.5**	20525/ 836.5	20525/ 836.5	20525/ 836.5
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3
	Band 12	Frequency range: 699 – 716 MHz (BW = 17 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz [1]	5 MHz	3 MHz	1.4 MHz
	Low			23060/ 704	23035/ 701.5	23025/ 700.5	23017/ 699.7
	Mid			**23095/ 707.5**	23095/ 707.5	23095/ 707.5	23095/ 707.5
	High			23130/ 711	23155/ 713.5	23165/ 714.5	23173/ 715.3
	Band 14	Frequency range: 788 - 798 MHz (BW = 10 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz [1]	5 MHz [1]	3 MHz	1.4 MHz
	Low				23305/ 790.5		
	Mid			**23330/ 793**	23330/ 793		
	High				23355/ 795.5		
	Band 30	Frequency range: 2305 - 2315 MHz (BW = 10 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz [1]	5 MHz	3 MHz	1.4 MHz
	Low				27685/ 2307.5		
	Mid			**27710/ 2310**	27710/ 2310		
	High				27735/ 2312.5		

General LTE SAR Test and Reporting Considerations (Continued)

<table>
<tr><td rowspan="5">Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td rowspan="3">Band 66</td><td colspan="6">Frequency range: 1710 - 1780 MHz (BW = 70 MHz)</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td>132072/ 1720</td><td>132047/ 1717.5</td><td>132022/ 1715</td><td>131997/ 1712.5</td><td>131987/ 1711.5</td><td>131979/ 1710.7</td></tr>
<tr><td>Mid</td><td>132322/ 1745</td><td>132322/ 1745</td><td>132322/ 1745</td><td>132322/ 1745</td><td>132322/ 1745</td><td>132322/ 1745</td></tr>
<tr><td>High</td><td>132572/ 1770</td><td>132597/ 1772.5</td><td>132622/ 1775</td><td>132647/ 1777.5</td><td>132657/ 1778.5</td><td>132665/ 1779.3</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td colspan="7">Refer to Appendix A.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td colspan="7">
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr>
</table>
MPR Built-in by design
The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values.
A-MPR (additional MPR) was disabled during SAR testing
</td></tr>
<tr><td>Power reduction</td><td colspan="7">Yes, LTE band 4 and 66 only</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td colspan="7">A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

Notes:

1. Maximum bandwidth does not support at least three non-overlapping channels in certain channel bandwidths. 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 per KDB 941225 D05 SAR for LTE Devices.
2. SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

6.4. LTE Carrier Aggregation

Combination	CA configuration	Bandwidth (MHz)											
		PCC						SCC1					
		20	15	10	5	3	1.4	20	15	10	5	3	1.4
Intra-Band contiguous	5B			√	√					√			
				√							√		
						√					√		
					√							√	
	66B				√				√	√	√		
				√						√	√		
			√								√		
	66C				√			√					
				√				√	√				
			√					√	√	√			
		√						√	√	√	√		
Intra-Band non-contiguous	2A-2A	√	√	√	√			√	√	√	√		
	66A-66A	√	√	√	√			√	√	√	√		
Inter-Band non-contiguous	2A-5A	√	√	√	√					√	√		
				√	√					√	√		
	2A-12A	√	√	√	√					√	√		
		√	√	√	√					√	√	√	
				√	√					√	√		
	2A-14A	√	√	√	√					√	√		
	2A-29A			√	√					√	√	√	
				√	√					√	√		
		√	√	√	√					√	√	√	
	2A-30A	√	√	√	√					√	√		
	2A-66A	√	√	√	√	√	√	√	√	√	√		
				√	√					√	√		
		√	√	√	√			√	√	√	√		
	5A-30A			√	√					√	√		
	5A-66A			√	√			√	√	√	√		
	30A-12A			√	√					√	√		
	66A-12A			√	√	√	√			√	√		
		√	√	√	√	√	√			√	√		
		√	√	√	√					√	√	√	
				√	√					√	√		
		√	√	√	√					√	√		
			√	√	√						√		
	14A-30A			√	√					√	√		
	14A-66A			√	√			√	√	√	√		
	30A-29A			√	√					√	√		
	66A-29A	√	√	√	√					√	√		
	30A-66A			√	√			√	√	√	√		

Note(s):

1. For supported channels, please refer to §6.3
2. LTE Band 12 only supported SCC.

Combination	CA configuration	Bandwidth (MHz)																	
		PCC						SCC1						SCC2					
		20	15	10	5	3	1.4	20	15	10	5	3	1.4	20	15	10	5	3	1.4
Inter-Band non-contiguous	2A-2A-5A	√	√	√	√			√	√	√	√					√	√		
	2A-2A-12A	√	√	√	√			√	√	√	√					√	√		
	2A-2A-14A	√	√	√	√			√	√	√	√					√	√		
	2A-2A-29A	√	√	√	√			√	√	√	√					√	√		
	2A-2A-30A	√	√	√	√			√	√	√	√					√	√		
	2A-2A-66A	√	√	√	√			√	√	√	√			√	√	√	√		
	2A-5A-30A	√	√	√	√					√	√					√	√		
	2A-5A-66A	√	√	√	√					√	√			√	√	√	√		
	2A-12A-30A	√	√	√	√					√	√					√	√		
	2A-12A-66A	√	√	√	√					√	√			√	√	√	√		
				√	√					√	√			√	√	√	√		
	2A-14A-30A	√	√	√	√					√	√					√	√		
	2A-14A-66A	√	√	√	√					√	√			√	√	√	√		
	2A-29A-30A	√	√	√	√					√	√					√	√		
	2A-30A-66A	√	√	√	√					√	√			√	√	√	√		
	2A-66A-66A	√	√	√	√			√	√	√	√			√	√	√	√		
	5A-30A-66A			√	√					√	√			√	√	√	√		
	5A-66A-66A			√	√			√	√	√	√			√	√	√	√		
	30A-12A-66A			√	√					√	√			√	√	√	√		
	66A-12A-66A	√	√	√	√					√	√			√	√	√	√		
	14A-30A-66A			√	√					√	√			√	√	√	√		
	14A-66A-66A			√	√			√	√	√	√			√	√	√	√		
	30A-29A-66A			√	√					√	√			√	√	√	√		
	30A-66A-66A			√	√			√	√	√	√			√	√	√	√		

Note(s):

1. For supported channels, please refer to §6.3
2. LTE Band 12 only supported SCC.

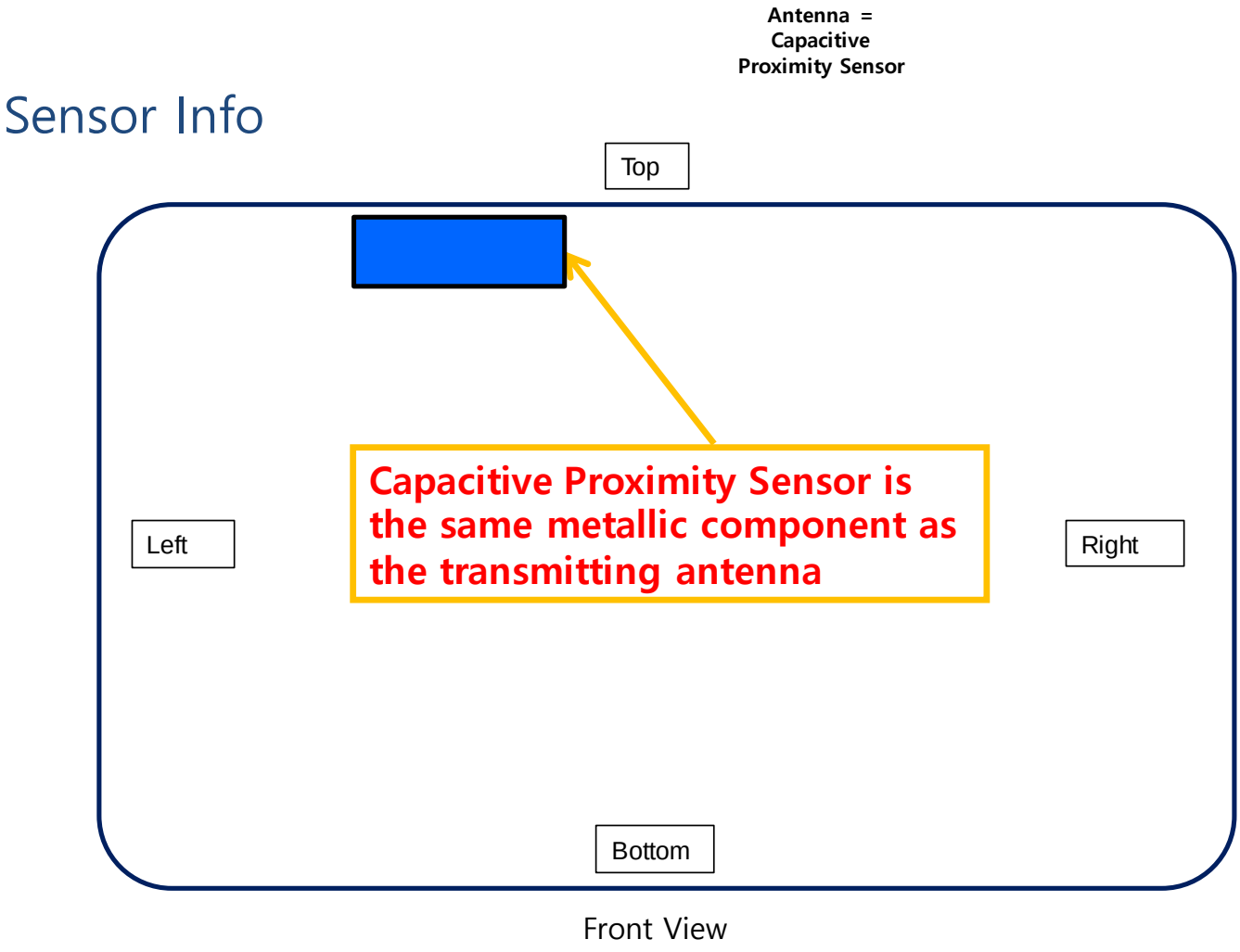
6.5. Power Reduction by Proximity Sensing

According to FCC KDB 616217 6.3, if the proximity sensors are not designed to cover the entire rear surface of the tablet, the sensing regions are limited and are spatially offset from the antenna.

However, this device uses a capacitive proximity sensor that is same metallic component as the transmitting antenna to facilitate triggering in any conditions the user may use the device in proximity of the antenna in the device.

Therefore, no further sensor coverage assessments were required according to KDB 616217 D04.

Please refer to section 7.2 for Required Test Configurations.

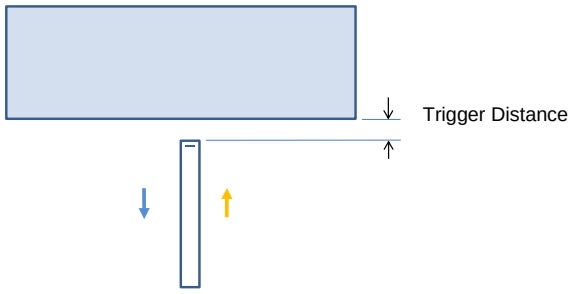


6.5.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Edge 1/Top of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The DUT featured a visual indicator on its display that showed the status of the Grip Sensor (Triggered or not triggered). This was used to determine the status of the sensor during the Grip Sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the Grip Sensor status indication. This was achieved by observing the Grip Sensor status at the same time as monitoring the conducted power. Section 9 contains both the full and reduced conducted power measurements.



Grip Sensor Trigger Distance Assessment

KDB 616217 §6.2, **Edge 1**

LEGEND

Direction of DUT travel for determination of power reduction triggering point

Direction of DUT travel for determination of full power resumption triggering point

Summary of Trigger Distances

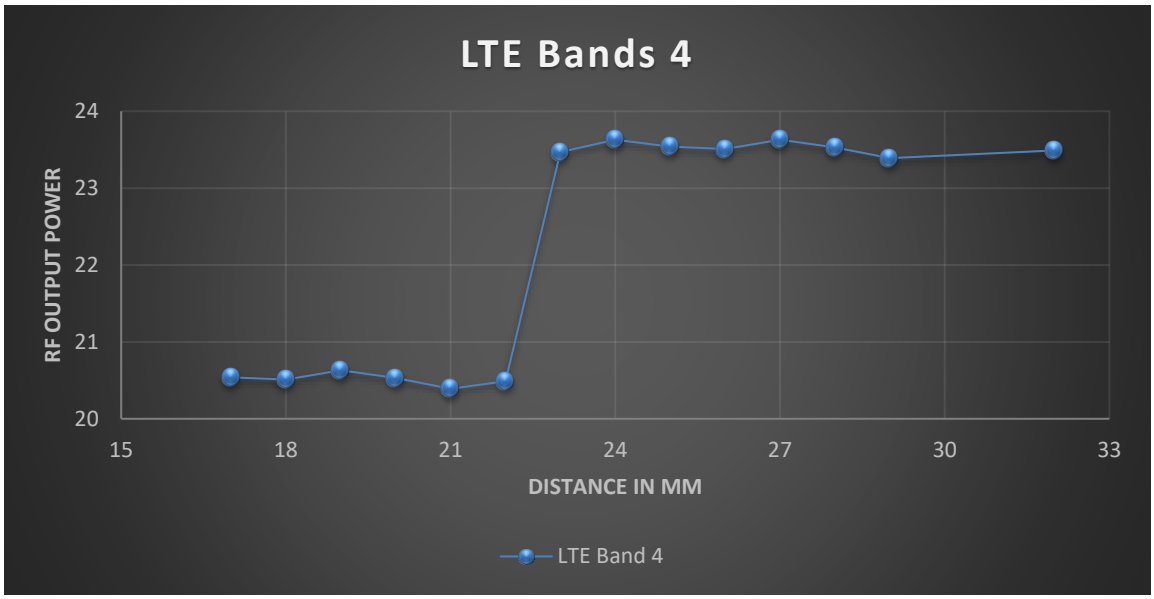
Tissue simulating liquid	Trigger distance – Edge 1	
	Moving toward phantom	Moving from phantom
1750 muscle	22 mm	22 mm

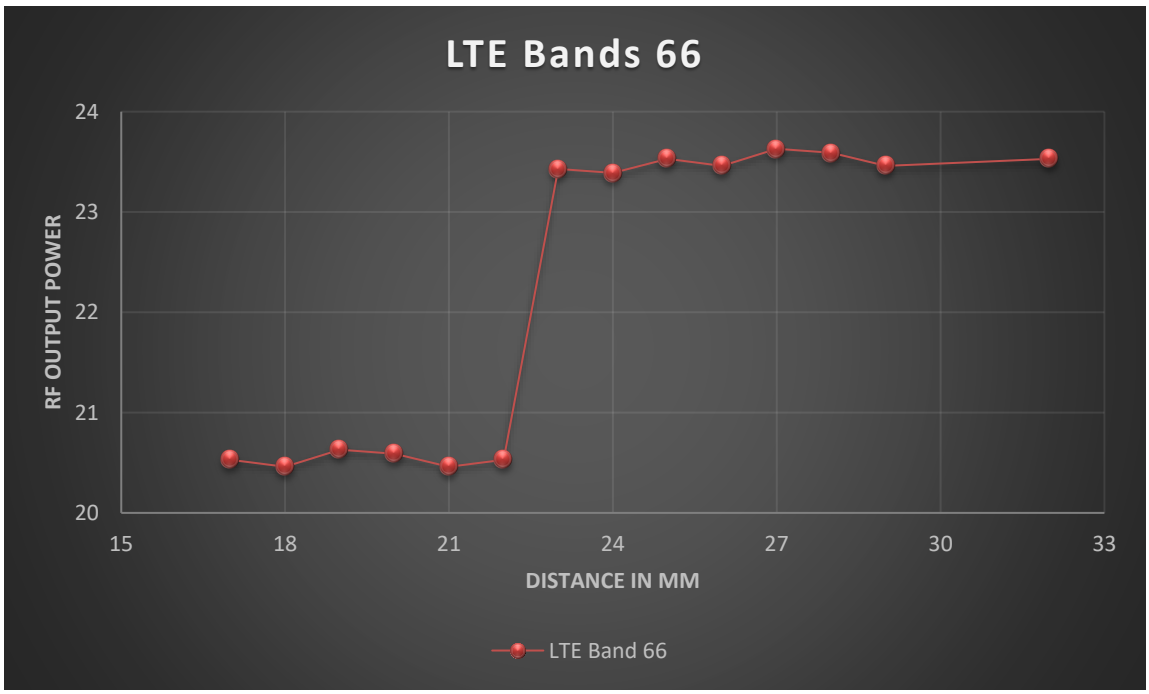
Proximity Sensor Triggering Distance Measurement Results

LTE Bands 4 & 66

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Edge 1 & Edge 1 Slant														
Distance to DUT vs. Output Power in dBm														
Distance	32	29	28	27	26	25	24	23	22	21	20	19	18	17
LTE Band 4	23.49	23.39	23.53	23.63	23.51	23.54	23.63	23.47	20.49	20.39	20.53	20.63	20.51	20.54
LTE Band 66	23.53	23.46	23.59	23.63	23.46	23.53	23.39	23.43	20.53	20.46	20.59	20.63	20.46	20.53





6.5.2. Proximity Sensor Coverage (KDB 616217 §6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

6.5.3. Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor Tilt Angle did not need to be assessed.

6.5.4. Resulting test positions for SAR measurements

Worst case distance SAR testing was performed 1mm closer than the smallest distance according to FCC KDB 616217

Wireless technologies	Position	§6.2 Triggering Distance	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for SAR
1750	Edge 1	22 mm	N/A	N/A	21 mm

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Standalone SAR Test Exclusion Considerations

Since the *Dedicated Host Approach* is applied, the standalone SAR test exclusion procedure in KDB 447498 § 4.3.1 is applied in conjunction with KDB 616217 § 4.3 to determine the minimum test separation distance:

- When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

SAR Test Exclusion Calculations for WWAN

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant
Full Power, Proximity Sensor Off																
Main 1	W-CDMA 2	1907.6	24.00	251	10	8	250	244	111	8	34.7 -MEASURE-	43.3 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	43.3 -MEASURE-
Main 1	W-CDMA 5	846.6	23.50	224	10	8	250	244	111	8	20.6 -MEASURE-	25.8 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	25.8 -MEASURE-
Main 1	LTE Band 2	1900.0	24.00	251	10	8	250	244	111	8	34.6 -MEASURE-	43.2 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	43.2 -MEASURE-
Main 1	LTE Band 4	1754.3	24.50	282	10	8	250	244	111	8	37.4 -MEASURE-	46.7 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	46.7 -MEASURE-
Main 1	LTE Band 5	844.0	23.00	200	10	8	250	244	111	8	18.4 -MEASURE-	23 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	23 -MEASURE-
Main 1	LTE Band 12	711.0	24.50	282	10	8	250	244	111	8	23.8 -MEASURE-	29.7 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	29.7 -MEASURE-
Main 1	LTE Band 14	793.0	24.50	282	10	8	250	244	111	8	25.1 -MEASURE-	314 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	314 -MEASURE-
Main 2	LTE Band 30	2310.0	23.00	200	18	8	241	244	170	8	16.9 -MEASURE-	38 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	38 -MEASURE-
Main 1	LTE Band 66	1770.0	24.50	282	10	8	250	244	111	8	37.5 -MEASURE-	46.9 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	46.9 -MEASURE-
Power Back-off, Proximity Sensor On																
Main 1	LTE Band 4	1754.3	21.50	141	10	8	250	244	111	8	18.7 -MEASURE-	23.3 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	23.3 -MEASURE-
Main 1	LTE Band 66	1770.0	21.50	141	10	8	250	244	111	8	18.8 -MEASURE-	23.4 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	23.4 -MEASURE-

Note(s):

According to KDB 447498,if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant	Rear	Edge 1	Edge 2	Edge 3	Edge 4	dge 1 Slant
Full Power, Proximity Sensor Off																
Main 1	W-CDMA 2	1907.6	24.00	251	10	8	250	244	111	8	< 50 mm	< 50 mm	2108.6 mW -EXEMPT-	2048.6 mW -EXEMPT-	718.6 mW -EXEMPT-	< 50 mm
Main 1	W-CDMA 5	846.6	23.50	224	10	8	250	244	111	8	< 50 mm	< 50 mm	1291.8 mW -EXEMPT-	1258 mW -EXEMPT-	507.3 mW -EXEMPT-	< 50 mm
Main 1	LTE Band 2	1900.0	24.00	251	10	8	250	244	111	8	< 50 mm	< 50 mm	2108.8 mW -EXEMPT-	2048.8 mW -EXEMPT-	718.8 mW -EXEMPT-	< 50 mm
Main 1	LTE Band 4	1754.3	24.50	282	10	8	250	244	111	8	< 50 mm	< 50 mm	2113.3 mW -EXEMPT-	2053.3 mW -EXEMPT-	723.3 mW -EXEMPT-	< 50 mm
Main 1	LTE Band 5	844.0	23.00	200	10	8	250	244	111	8	< 50 mm	< 50 mm	1288.6 mW -EXEMPT-	1254.8 mW -EXEMPT-	506.5 mW -EXEMPT-	< 50 mm
Main 1	LTE Band 12	711.0	24.50	282	10	8	250	244	111	8	< 50 mm	< 50 mm	1125.9 mW -EXEMPT-	1097.5 mW -EXEMPT-	467 mW -EXEMPT-	< 50 mm
Main 1	LTE Band 14	793.0	24.50	282	10	8	250	244	111	8	< 50 mm	< 50 mm	1225.8 mW -EXEMPT-	1194.1mW -EXEMPT-	490.9 mW -EXEMPT-	< 50 mm
Main 2	LTE Band 30	2310.0	23.00	200	18	8	241	244	170	8	< 50 mm	< 50 mm	2008.7 mW -EXEMPT-	2038.7 mW -EXEMPT-	1298.7 mW -EXEMPT-	< 50 mm
Main 1	LTE Band 66	1770.0	24.50	282	10	8	250	244	111	8	< 50 mm	< 50 mm	2112.7 mW -EXEMPT-	2052.7 mW -EXEMPT-	722.7 mW -EXEMPT-	< 50 mm
Power Back-off, Proximity Sensor On																
Main 1	LTE Band 4	1754.3	21.50	141	10	8	250	244	111	8	< 50 mm	< 50 mm	2113.3 mW -EXEMPT-	2053.3 mW -EXEMPT-	723.3 mW -EXEMPT-	< 50 mm
Main 1	LTE Band 66	1770.0	21.50	141	10	8	250	244	111	8	< 50 mm	< 50 mm	2112.7 mW -EXEMPT-	2052.7 mW -EXEMPT-	722.7 mW -EXEMPT-	< 50 mm

Note(s):

According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

SAR Test Exclusion Calculations for WLAN

Antennas < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant
Wi-Fi Main Antenna															
Wi-Fi 2.4 GHz	2462	18.00	63	17	8	115	244	284	8	5.8 -MEASURE-	12.4 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	12.4 -MEASURE-
Wi-Fi 5.2 GHz	5240	13.00	20	17	8	115	244	284	8	2.7 -EXEMPT-	5.7 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	5.7 -MEASURE-
Wi-Fi 5.3 GHz	5320	13.00	20	17	8	115	244	284	8	2.7 -EXEMPT-	5.8 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	5.8 -MEASURE-
Wi-Fi 5.5 GHz	5700	13.00	20	17	8	115	244	284	8	2.8 -EXEMPT-	6 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	6 -MEASURE-
Wi-Fi 5.8 GHz	5825	13.00	20	17	8	115	244	284	8	2.8 -EXEMPT-	6 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	6 -MEASURE-
Bluetooth	2480	9.50	9	17	8	115	244	284	8	0.8 -EXEMPT-	18 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	18 -EXEMPT-

Note(s):

According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant
Wi-Fi Main Antenna															
Wi-Fi 2.4 GHz	2462	18.00	63	17	8	115	244	284	8	< 50 mm	< 50 mm	745.6 mW -EXEMPT-	2035.6 mW -EXEMPT-	2435.6 mW -EXEMPT-	< 50 mm
Wi-Fi 5.2 GHz	5240	13.00	20	17	8	115	244	284	8	< 50 mm	< 50 mm	715.5 mW -EXEMPT-	2005.5 mW -EXEMPT-	2405.5 mW -EXEMPT-	< 50 mm
Wi-Fi 5.3 GHz	5320	13.00	20	17	8	115	244	284	8	< 50 mm	< 50 mm	715 mW -EXEMPT-	2005 mW -EXEMPT-	2405 mW -EXEMPT-	< 50 mm
Wi-Fi 5.5 GHz	5700	13.00	20	17	8	115	244	284	8	< 50 mm	< 50 mm	712.8 mW -EXEMPT-	2002.8 mW -EXEMPT-	2402.8 mW -EXEMPT-	< 50 mm
Wi-Fi 5.8 GHz	5825	13.00	20	17	8	115	244	284	8	< 50 mm	< 50 mm	712.2 mW -EXEMPT-	2002.2 mW -EXEMPT-	2402.2 mW -EXEMPT-	< 50 mm
Bluetooth	2480	9.50	9	17	8	115	244	284	8	< 50 mm	< 50 mm	745.3 mW -EXEMPT-	2035.3 mW -EXEMPT-	2435.3 mW -EXEMPT-	< 50 mm

Note(s):

According to KDB 447498,if the calculated Power threshold is less than the output power then SAR testing is required.

7.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 7.1:

Test Configurations	Rear	Edge 1 (Top Edge)	Edge 2 (Right Edge)	Edge 3 (Bottom Edge)	Edge 4 (Left Edge)	Edge 1 Slant (Top Edge)
W-CDMA Band 2 Full Power	Yes	Yes	No	No	No	Yes
W-CDMA Band 5 Full Power	Yes	Yes	No	No	No	Yes
LTE Band 2 Full Power	Yes	Yes	No	No	No	Yes
LTE Band 4 Full Power	Yes	Yes	No	No	No	Yes
LTE Band 4 w/ Power Reduction	Yes	Yes	No	No	No	Yes
LTE Band 5 Full Power	Yes	Yes	No	No	No	Yes
LTE Band 12 Full Power	Yes	Yes	No	No	No	Yes
LTE Band 14 Full Power	Yes	Yes	No	No	No	Yes
LTE Band 30 Full Power	Yes	Yes	No	No	No	Yes
LTE Band 66 Full Power	Yes	Yes	No	No	No	Yes
LTE Band 66 w/ Power Reduction	Yes	Yes	No	No	No	Yes
Wi-Fi 2.4 GHz (Main Antenna)	Yes	Yes	No	No	No	Yes
Wi-Fi 5 GHz (Main Antenna)	Yes[1]	Yes	No	No	No	Yes
Bluetooth	No	No	No	No	No	No

Note(s):

1. Wi-Fi 5 GHz Rear SAR measurements are for simultaneous Tx purposes.

Yes = Testing is required.

No = Testing is not required.

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.
The dielectric constant (εr) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within ± 5% of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for εr and σ may be relaxed to ± 10%. This is limited to frequencies ≤ 3 GHz.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (εr)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
G	11/27/2018	835	Body	835	53.39	55.20	-3.28	0.98	0.97	1.33
				805	53.36	55.33	-3.57	0.98	0.97	0.91
				850	53.37	55.16	-3.24	0.99	0.99	0.02
G	11/28/2018	1750	Body	1750	51.14	53.44	-4.31	1.50	1.49	0.60
				1710	51.20	53.54	-4.38	1.47	1.46	0.24
				1755	51.12	53.43	-4.32	1.50	1.49	0.59
G	11/30/2018	1900	Body	1900	50.68	53.30	-4.92	1.58	1.52	3.68
				1850	50.72	53.30	-4.84	1.54	1.52	1.38
				1920	50.67	53.30	-4.93	1.59	1.52	4.80
G	12/3/2018	1750	Body	1750	51.30	53.44	-4.01	1.48	1.49	-0.21
				1710	51.35	53.54	-4.10	1.45	1.46	-0.52
				1755	51.27	53.43	-4.04	1.49	1.49	-0.15
G	12/3/2018	750	Body	750	53.09	55.55	-4.42	0.95	0.96	-1.41
				660	54.08	55.89	-3.24	0.91	0.96	-4.80
				800	53.41	55.35	-3.51	0.97	0.97	-0.18
G	12/3/2018	2300	Body	2300	51.28	52.90	-3.07	1.86	1.80	3.24
				2350	51.20	52.84	-3.10	1.90	1.85	2.88
				2400	51.08	52.77	-3.21	1.95	1.90	2.79
G	12/3/2018	2450	Body	2450	51.06	52.70	-3.11	2.00	1.95	2.31
				2400	51.08	52.77	-3.21	1.95	1.90	2.79
				2480	51.02	52.66	-3.12	2.02	1.99	1.15
G	12/4/2018	5250	Body	5250	47.23	48.95	-3.52	5.39	5.35	0.69
				5150	47.42	49.09	-3.40	5.25	5.24	0.26
				5350	47.01	48.82	-3.70	5.54	5.47	1.21
G	12/4/2018	5600	Body	5600	46.55	48.48	-3.98	5.87	5.76	1.94
				5500	46.74	48.61	-3.85	5.73	5.64	1.44
				5725	46.27	48.31	-4.22	6.07	5.91	2.75
G	12/4/2018	5750	Body	5750	46.24	48.27	-4.21	6.11	5.94	2.98
				5700	46.34	48.34	-4.14	6.03	5.88	2.51
				5850	46.06	48.20	-4.44	6.25	6.00	4.17
G	12/6/2018	1750	Body	1750	51.41	53.44	-3.80	1.51	1.49	1.60
				1710	51.44	53.54	-3.93	1.48	1.46	1.47
				1755	51.39	53.43	-3.81	1.51	1.49	1.60
G	12/6/2018	1900	Body	1900	53.14	53.30	-0.30	1.58	1.52	3.88
				1850	53.24	53.30	-0.11	1.55	1.52	1.78
				1920	53.13	53.30	-0.32	1.59	1.52	4.87

8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within ±10% of the manufacturer calibrated dipole SAR target. Refer to Appendix B for the SAR System Check Plots.

SAR Lab	Date	Tissue Type	Dipole Type_Serial #	Dipole Cal. Due Data	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
					Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	
G	11/27/2018	Body	D835V2 SN:4d117	5/16/2019	0.990	9.90	10.31	-3.98	0.654	6.54	6.84	-4.39	1,2
G	11/28/2018	Body	D1750V2 SN:1050	4/10/2019	3.730	37.30	37.18	0.32	1.980	19.80	19.74	0.30	
G	11/30/2018	Body	D1900V2 SN:5d163	10/16/2019	4.300	43.00	42.99	0.02	2.230	22.30	21.97	1.50	3,4
G	12/3/2018	Body	D750V3 SN:1024	5/16/2019	0.904	9.04	9.03	0.11	0.602	6.02	6.05	-0.50	5,6
G	12/3/2018	Body	D1750V2 SN:1077	10/16/2019	3.700	37.00	37.34	-0.91	1.970	19.70	19.98	-1.40	7,8
G	12/3/2018	Body	D2300V2 SN:1058	10/2/2019	4.910	49.10	51.35	-4.38	2.320	23.20	24.44	-5.07	9,10
G	12/3/2018	Body	D2450V2 SN:899	3/16/2019	5.290	52.90	50.55	4.65	2.440	24.40	23.20	5.17	11,12
G	12/4/2018	Body	D5GHzV2 SN:1138 (5.25 GHz)	8/21/2019	7.380	73.80	76.60	-3.66	2.110	21.10	21.40	-1.40	
G	12/4/2018	Body	D5GHzV2 SN:1138 (5.6 GHz)	8/21/2019	8.380	83.80	79.50	5.41	2.390	23.90	22.20	7.66	13,14
G	12/4/2018	Body	D5GHzV2 SN:1138 (5.75 GHz)	8/21/2019	7.720	77.20	74.10	4.18	2.210	22.10	20.60	7.28	
G	12/6/2018	Body	D1750V2 SN:1050	4/10/2019	3.780	37.80	37.18	1.67	2.000	20.00	19.74	1.32	15,16
G	12/6/2018	Body	D1900V2 SN:5d140	4/11/2019	4.350	43.50	41.00	6.10	2.220	22.20	21.05	5.46	17,18

9. Conducted Output Power Measurements

9.1. W-CDMA

Per KDB 941225 D01 3G SAR Procedures for W-CDMA:

Maximum output power is verified on the high, middle and low channels and using the appropriate 12.2 kbps RMC with TPC (transmit power control) set to all "1's"

Release 99 Setup Procedures used to establish the test signals

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1. A summary of these settings is illustrated below:

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to procedures in table C.10.1.4 of 3GPP TS 34.121-1
A summary of these settings is illustrated below:

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

HSUPA Setup Procedures used to establish the test signals

The following 5 Sub-tests were completed according to procedures in table C.11.1.3 of 3GPP TS 34.121-1. A summary of these settings is illustrated below:

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c. For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with β_{hs} = 5/15 * β_c.

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

HSPA+ Setup Procedures used to establish the test signals

The following 1 Sub-test was completed according to procedures in table C.11.1.4 of 3GPP TS34.121. A summary of these settings is illustrated below:

Table C.11.1.4**: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM**

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed}1$: 30/15 $\beta_{ed}2$: 30/15	$\beta_{ed}3$: 24/15 $\beta_{ed}4$: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

Since 16QAM is not used for uplink, RF conducted power measurements are not required for HSPA+

SAR measurement is not required for the HSDPA and HSUPA,. When primary mode and the adjusted SAR is ≤ 1.2 W/kg and secondary mode is ≤ ¼ dB higher than the primary mode

W-CDMA Band II Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.36	N/A	24.00
		9400	1880.0	23.23		
		9538	1907.6	23.30		
HSDPA	Subtest 1	9262	1852.4	23.18	0	23.50
		9400	1880.0	23.10		
		9538	1907.6	23.08		
	Subtest 2	9262	1852.4	23.18	0	23.50
		9400	1880.0	23.00		
		9538	1907.6	23.10		
	Subtest 3	9262	1852.4	21.48	0.5	23.00
		9400	1880.0	21.38		
		9538	1907.6	21.40		
	Subtest 4	9262	1852.4	21.49	0.5	23.00
		9400	1880.0	21.36		
		9538	1907.6	21.38		
HSUPA	Subtest 1	9262	1852.4	19.88	0	21.50
		9400	1880.0	19.77		
		9538	1907.6	19.78		
	Subtest 2	9262	1852.4	17.80	2	19.50
		9400	1880.0	17.69		
		9538	1907.6	17.78		
	Subtest 3	9262	1852.4	19.50	1	20.50
		9400	1880.0	19.50		
		9538	1907.6	19.50		
	Subtest 4	9262	1852.4	17.79	2	19.50
		9400	1880.0	17.70		
		9538	1907.6	17.79		
	Subtest 5	9262	1852.4	20.50	0	21.50
		9400	1880.0	20.50		
		9538	1907.6	20.50		

W-CDMA Band V Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	4132	826.4	22.38	N/A	23.50
		4183	836.6	22.26		
		4233	846.6	22.48		
HSDPA	Subtest 1	4132	826.4	22.36	0	23.50
		4183	836.6	22.27		
		4233	846.6	22.47		
	Subtest 2	4132	826.4	22.39	0	23.50
		4183	836.6	22.29		
		4233	846.6	22.51		
	Subtest 3	4132	826.4	22.44	0.5	23.00
		4183	836.6	22.31		
		4233	846.6	22.51		
	Subtest 4	4132	826.4	22.43	0.5	23.00
		4183	836.6	22.30		
		4233	846.6	22.52		
HSUPA	Subtest 1	4132	826.4	21.30	0	22.50
		4183	836.6	21.22		
		4233	846.6	21.39		
	Subtest 2	4132	826.4	19.71	2	20.50
		4183	836.6	19.50		
		4233	846.6	20.20		
	Subtest 3	4132	826.4	21.32	1	21.50
		4183	836.6	21.18		
		4233	846.6	21.42		
	Subtest 4	4132	826.4	19.73	2	20.50
		4183	836.6	19.64		
		4233	846.6	20.23		
	Subtest 5	4132	826.4	22.40	0	22.50
		4183	836.6	22.23		
		4233	846.6	22.46		

9.2. LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3

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

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of “NS_01”.

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	N/A

According to April 2015 TCB workshop, SAR test exclusion can be applied for testing overlapping LTE bands as follows:

a) The maximum output power, including tolerance, for the smaller band must be ≤ the larger band to qualify for the SAR test exclusion.
b) The channel bandwidth and other operating parameters for the smaller band must be fully supported by the larger band.
   - LTE Band 4 (1710-1755 MHz) is covered by LTE Band 66 (1710-1780 MHz)

LTE QPSK configuration has the highest maximum average output power per 3GPP standard.

SAR measurement is not required for the 16QAM and 64QAM. When the highest maximum output power for 16QAM and 64QAM is ≤ ½ dB higher than the QPSK or when the reported SAR for the QPSK configuration is ≤ 1.45 W/kg.

Please refer to section 6.3. for LTE detail test channels.

LTE Band 2 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18700	18900	19100		
				1860 MHz	1880 MHz	1900 MHz		
20 MHz	QPSK	1	0	23.20	23.10	23.39	0	24
		1	49	23.30	23.13	23.39	0	24
		1	99	23.60	23.50	23.36	0	24
		50	0	22.04	22.21	22.39	1	23
		50	24	22.04	22.22	22.39	1	23
		50	50	22.06	22.65	22.37	1	23
		100	0	22.05	22.22	22.36	1	23
	16QAM	1	0	22.00	22.15	22.43	1	23
		1	49	21.96	22.15	22.43	1	23
		1	99	21.99	22.24	22.43	1	23
		50	0	21.10	21.30	21.45	2	22
		50	24	21.09	21.32	21.46	2	22
		50	50	21.09	21.34	21.45	2	22
		100	0	21.12	21.30	21.44	2	22
	64QAM	1	0	21.33	21.50	21.48	2	22
		1	49	21.28	21.48	21.27	2	22
		1	99	21.24	21.49	21.20	2	22
		50	0	20.40	20.47	20.45	3	21
		50	24	20.39	20.47	20.43	3	21
		50	50	20.37	20.49	20.41	3	21
		100	0	20.33	20.46	20.38	3	21

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18675	18900	19125		
				1857.5 MHz	1880 MHz	1902.5 MHz		
15 MHz	QPSK	1	0	22.96	23.15	23.34	0	24
		1	37	22.93	23.17	23.30	0	24
		1	74	22.95	23.22	23.27	0	24
		36	0	22.03	22.23	22.40	1	23
		36	20	22.03	22.24	22.40	1	23
		36	39	22.03	22.26	22.39	1	23
		75	0	22.03	22.24	22.40	1	23
	16QAM	1	0	22.04	22.15	22.29	1	23
		1	37	22.00	22.17	22.27	1	23
		1	74	22.02	22.21	22.23	1	23
		36	0	21.10	21.27	21.50	2	22
		36	20	21.11	21.28	21.49	2	22
		36	39	21.12	21.29	21.48	2	22
		75	0	21.14	21.28	21.47	2	22
	64QAM	1	0	21.20	21.22	21.41	2	22
		1	37	21.13	21.24	21.37	2	22
		1	74	21.11	21.26	21.34	2	22
		36	0	20.49	20.48	20.44	3	21
		36	20	20.47	20.50	20.49	3	21
		36	39	20.45	20.46	20.48	3	21
		75	0	20.43	20.49	20.47	3	21

LTE Band 2 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18650	18900	19150		
				1855 MHz	1880 MHz	1905 MHz		
10 MHz	QPSK	1	0	23.01	23.15	23.42	0	24
		1	25	23.00	23.17	23.38	0	24
		1	49	23.02	23.21	23.36	0	24
		25	0	22.03	22.18	22.37	1	23
		25	12	22.02	22.19	22.36	1	23
		25	25	22.01	22.20	22.35	1	23
		50	0	22.02	22.19	22.36	1	23
	16QAM	1	0	22.05	22.05	22.20	1	23
		1	25	22.02	22.03	22.16	1	23
		1	49	22.05	22.08	22.15	1	23
		25	0	21.10	21.22	21.45	2	22
		25	12	21.09	21.24	21.44	2	22
		25	25	21.10	21.24	21.45	2	22
		50	0	21.11	21.26	21.42	2	22
	64QAM	1	0	21.01	21.32	21.26	2	22
		1	25	20.97	21.31	21.23	2	22
		1	49	20.98	21.35	21.21	2	22
		25	0	20.43	20.46	20.32	3	21
		25	12	20.42	20.47	20.33	3	21
		25	25	20.42	20.48	20.33	3	21
		50	0	20.42	20.44	20.37	3	21

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18625	18900	19175		
				1852.5 MHz	1880 MHz	1907.5 MHz		
5 MHz	QPSK	1	0	22.99	23.18	23.43	0	24
		1	12	22.96	23.17	23.40	0	24
		1	24	22.98	23.20	23.35	0	24
		12	0	22.04	22.20	22.39	1	23
		12	7	22.04	22.21	22.38	1	23
		12	13	22.05	22.21	22.38	1	23
		25	0	22.04	22.20	22.39	1	23
	16QAM	1	0	21.87	22.08	22.25	1	23
		1	12	21.85	22.05	22.19	1	23
		1	24	21.90	22.10	22.24	1	23
		12	0	21.06	21.22	21.45	2	22
		12	7	21.04	21.24	21.43	2	22
		12	13	21.05	21.24	21.44	2	22
		25	0	21.07	21.21	21.44	2	22
	64QAM	1	0	21.29	21.44	21.21	2	22
		1	12	21.26	21.43	21.42	2	22
		1	24	21.25	21.46	21.44	2	22
		12	0	20.39	20.45	20.47	3	21
		12	7	20.39	20.41	20.43	3	21
		12	13	20.38	20.40	20.43	3	21
		25	0	20.47	20.43	20.46	3	21

LTE Band 2 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18615	18900	19185		
				1851.5 MHz	1880 MHz	1908.5 MHz		
3 MHz	QPSK	1	0	23.05	23.13	23.36	0	24
		1	8	23.08	23.16	23.40	0	24
		1	14	23.02	23.17	23.36	0	24
		8	0	22.06	22.23	22.37	1	23
		8	4	22.07	22.22	22.36	1	23
		8	7	22.06	22.24	22.36	1	23
		15	0	22.09	22.22	22.38	1	23
	16QAM	1	0	22.04	22.18	22.23	1	23
		1	8	22.02	22.15	22.19	1	23
		1	14	22.15	22.27	22.06	1	23
		8	0	21.09	21.26	21.34	2	22
		8	4	21.06	21.27	21.32	2	22
		8	7	21.08	21.28	21.33	2	22
		15	0	21.14	21.29	21.39	2	22
	64QAM	1	0	21.06	21.19	21.47	2	22
		1	8	21.11	21.24	21.36	2	22
		1	14	21.03	21.40	21.41	2	22
		8	0	20.41	20.40	20.39	3	21
		8	4	20.41	20.41	20.39	3	21
		8	7	20.41	20.40	20.38	3	21
		15	0	20.47	20.47	20.40	3	21

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				18607	18900	19193		
				1850.7 MHz	1880 MHz	1909.3 MHz		
1.4 MHz	QPSK	1	0	23.10	23.25	23.47	0	24
		1	3	23.07	23.22	23.48	0	24
		1	5	23.09	23.24	23.47	0	24
		3	0	23.06	23.18	23.37	0	24
		3	1	23.07	23.19	23.37	0	24
		3	3	23.06	23.19	23.37	0	24
		6	0	22.09	22.22	22.39	1	23
	16QAM	1	0	21.86	22.09	22.29	1	23
		1	3	21.85	22.08	22.27	1	23
		1	5	21.84	22.08	22.32	1	23
		3	0	22.09	22.12	22.37	1	23
		3	1	22.06	22.13	22.49	1	23
		3	3	22.03	22.15	22.48	1	23
		6	0	21.05	21.31	21.41	2	22
	64QAM	1	0	21.14	21.46	21.38	2	22
		1	3	21.15	21.37	21.41	2	22
		1	5	21.07	21.42	21.40	2	22
		3	0	21.49	21.46	21.40	2	22
		3	1	21.47	21.46	21.41	2	22
		3	3	21.48	21.46	21.41	2	22
		6	0	20.48	20.48	20.43	3	21

LTE Band 5 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	20525	[redacted]		
					836.5 MHz			
10 MHz	QPSK	1	0		22.56		0	23
		1	25		22.52		0	23
		1	49		22.51		0	23
		25	0		21.62		1	22
		25	12		21.60		1	22
		25	25		21.58		1	22
		50	0		21.62		1	22
	16QAM	1	0		21.41		1	22
		1	25		21.37		1	22
		1	49		21.33		1	22
		25	0		20.67		2	21
		25	12		20.65		2	21
		25	25		20.60		2	21
		50	0		20.59		2	21
	64QAM	1	0		20.42		2	21
		1	25		20.44		2	21
		1	49		20.36		2	21
		25	0		19.58		3	20
		25	12		19.57		3	20
		25	25		19.53		3	20
		50	0		19.60		3	20

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20425	20525	20625		
				826.5 MHz	836.5 MHz	846.5 MHz		
5 MHz	QPSK	1	0	22.43	22.51	22.58	0	23
		1	12	22.44	22.47	22.54	0	23
		1	24	22.45	22.50	22.56	0	23
		12	0	21.62	21.55	21.68	1	22
		12	7	21.61	21.52	21.66	1	22
		12	13	21.60	21.52	21.65	1	22
		25	0	21.61	21.54	21.69	1	22
	16QAM	1	0	21.42	21.33	21.37	1	22
		1	12	21.34	21.27	21.33	1	22
		1	24	21.37	21.31	21.40	1	22
		12	0	20.49	20.49	20.71	2	21
		12	7	20.55	20.51	20.71	2	21
		12	13	20.55	20.54	20.69	2	21
		25	0	20.56	20.56	20.70	2	21
	64QAM	1	0	20.42	20.54	20.29	2	21
		1	12	20.40	20.46	20.28	2	21
		1	24	20.45	20.50	20.34	2	21
		12	0	19.42	19.49	19.61	3	20
		12	7	19.41	19.50	19.61	3	20
		12	13	19.42	19.47	19.61	3	20
		25	0	19.58	19.51	19.63	3	20

LTE Band 5 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20415	20525	20635		
				825.5 MHz	836.5 MHz	847.5 MHz		
3 MHz	QPSK	1	0	22.51	22.53	22.58	0	23
		1	8	22.52	22.49	22.54	0	23
		1	14	22.51	22.55	22.57	0	23
		8	0	21.54	21.55	21.63	1	22
		8	4	21.55	21.50	21.61	1	22
		8	7	21.58	21.53	21.62	1	22
		15	0	21.57	21.57	21.65	1	22
	16QAM	1	0	21.22	21.62	21.59	1	22
		1	8	21.25	21.38	21.66	1	22
		1	14	21.14	21.42	21.71	1	22
		8	0	20.47	20.52	20.55	2	21
		8	4	20.48	20.53	20.59	2	21
		8	7	20.48	20.55	20.62	2	21
		15	0	20.53	20.51	20.67	2	21
	64QAM	1	0	20.44	20.33	20.34	2	21
		1	8	20.56	20.31	20.34	2	21
		1	14	20.38	20.32	20.44	2	21
		8	0	19.44	19.48	19.50	3	20
		8	4	19.44	19.41	19.51	3	20
		8	7	19.43	19.41	19.49	3	20
		15	0	19.61	19.50	19.67	3	20

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20407	20525	20643		
				824.7 MHz	836.5 MHz	848.3 MHz		
1.4 MHz	QPSK	1	0	22.53	22.51	22.60	0	23
		1	3	22.48	22.50	22.61	0	23
		1	5	22.55	22.52	22.66	0	23
		3	0	22.54	22.51	22.61	0	23
		3	1	22.56	22.52	22.63	0	23
		3	3	22.56	22.51	22.62	0	23
		6	0	21.56	21.53	21.67	1	22
	16QAM	1	0	21.33	21.32	21.34	1	22
		1	3	21.32	21.29	21.31	1	22
		1	5	21.34	21.29	21.39	1	22
		3	0	21.47	21.42	21.63	1	22
		3	1	21.44	21.37	21.62	1	22
		3	3	21.47	21.35	21.60	1	22
		6	0	20.51	20.35	20.65	2	21
	64QAM	1	0	20.43	20.56	20.10	2	21
		1	3	20.27	20.58	20.14	2	21
		1	5	20.37	20.48	20.07	2	21
		3	0	20.42	20.49	20.45	2	21
		3	1	20.40	20.49	20.43	2	21
		3	3	20.39	20.48	20.43	2	21
		6	0	19.51	19.45	19.67	3	20

LTE Band 12 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	23095	[redacted]		
					707.5 MHz			
10 MHz	QPSK	1	0		23.51		0	24.5
		1	25		23.48		0	24.5
		1	49		23.43		0	24.5
		25	0		22.51		1	23.5
		25	12		22.50		1	23.5
		25	25		22.49		1	23.5
		50	0		22.47		1	23.5
	16QAM	1	0		22.29		1	23.5
		1	25		22.27		1	23.5
		1	49		22.22		1	23.5
		25	0		21.57		2	22.5
		25	12		21.53		2	22.5
		25	25		21.53		2	22.5
		50	0		21.54		2	22.5
	64QAM	1	0		21.45		2	22.5
		1	25		21.41		2	22.5
		1	49		21.42		2	22.5
		25	0		20.70		3	21.5
		25	12		20.69		3	21.5
		25	25		20.68		3	21.5
		50	0		20.66		3	21.5

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				23035	23095	23155		
				701.5 MHz	707.5 MHz	713.5 MHz		
5 MHz	QPSK	1	0	23.42	23.43	23.61	0	24.5
		1	12	23.36	23.45	23.56	0	24.5
		1	24	23.38	23.45	23.57	0	24.5
		12	0	22.58	22.51	22.69	1	23.5
		12	7	22.57	22.50	22.68	1	23.5
		12	13	22.59	22.45	22.68	1	23.5
		25	0	22.59	22.48	22.66	1	23.5
	16QAM	1	0	22.34	22.23	22.55	1	23.5
		1	12	22.33	22.21	22.47	1	23.5
		1	24	22.34	22.23	22.46	1	23.5
		12	0	21.59	21.54	21.75	2	22.5
		12	7	21.58	21.55	21.76	2	22.5
		12	13	21.58	21.55	21.73	2	22.5
		25	0	21.61	21.56	21.72	2	22.5
	64QAM	1	0	21.37	21.53	21.85	2	22.5
		1	12	21.32	21.48	21.82	2	22.5
		1	24	21.35	21.53	21.78	2	22.5
		12	0	20.73	20.70	20.80	3	21.5
		12	7	20.70	20.66	20.81	3	21.5
		12	13	20.69	20.65	20.79	3	21.5
		25	0	20.72	20.65	20.88	3	21.5

LTE Band 12 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				23025	23095	23165		
				700.5 MHz	707.5 MHz	714.5 MHz		
3 MHz	QPSK	1	0	23.63	22.60	23.80	0	24.5
		1	8	23.65	23.52	23.81	0	24.5
		1	14	23.64	23.55	23.82	0	24.5
		8	0	22.62	22.60	22.80	1	23.5
		8	4	22.67	22.62	22.77	1	23.5
		8	7	22.63	22.60	22.79	1	23.5
		15	0	22.66	22.66	22.82	1	23.5
	16QAM	1	0	22.52	22.75	22.63	1	23.5
		1	8	22.64	22.69	22.73	1	23.5
		1	14	22.65	22.44	22.43	1	23.5
		8	0	21.71	21.61	21.87	2	22.5
		8	4	21.70	21.60	21.88	2	22.5
		8	7	21.70	21.61	21.84	2	22.5
		15	0	21.79	21.69	21.88	2	22.5
	64QAM	1	0	21.42	21.57	21.47	2	22.5
		1	8	21.45	21.50	21.51	2	22.5
		1	14	21.48	21.58	21.46	2	22.5
		8	0	20.64	20.49	20.78	3	21.5
		8	4	20.64	20.48	20.79	3	21.5
		8	7	20.65	20.49	20.78	3	21.5
		15	0	20.68	20.65	20.90	3	21.5

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				23017	23095	23173		
				699.7 MHz	707.5 MHz	715.3 MHz		
1.4 MHz	QPSK	1	0	23.58	23.57	23.65	0	24.5
		1	3	23.51	23.52	23.67	0	24.5
		1	5	23.56	23.57	23.70	0	24.5
		3	0	23.64	23.54	23.72	0	24.5
		3	1	23.62	23.58	23.75	0	24.5
		3	3	23.64	23.56	23.77	0	24.5
		6	0	22.70	22.60	22.75	1	23.5
	16QAM	1	0	22.29	22.28	22.49	1	23.5
		1	3	22.23	22.39	22.50	1	23.5
		1	5	22.31	22.41	22.54	1	23.5
		3	0	22.55	22.47	22.62	1	23.5
		3	1	22.53	22.43	22.60	1	23.5
		3	3	22.52	22.47	22.56	1	23.5
		6	0	21.65	21.58	21.75	2	22.5
	64QAM	1	0	21.06	21.14	21.45	2	22.5
		1	3	21.15	21.31	21.38	2	22.5
		1	5	21.22	21.25	21.46	2	22.5
		3	0	21.64	21.61	21.76	2	22.5
		3	1	21.65	21.56	21.72	2	22.5
		3	3	21.64	21.58	21.72	2	22.5
		6	0	20.66	20.57	20.82	3	21.5

LTE Band 14 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	23330 / 793 MHz	[redacted]		
10 MHz	QPSK	1	0	[redacted]	23.70	[redacted]	0	24.5
		1	25	[redacted]	23.65	[redacted]	0	24.5
		1	49	[redacted]	23.65	[redacted]	0	24.5
		25	0	[redacted]	22.69	[redacted]	1	23.5
		25	12	[redacted]	22.65	[redacted]	1	23.5
		25	25	[redacted]	22.66	[redacted]	1	23.5
		50	0	[redacted]	22.70	[redacted]	1	23.5
	16QAM	1	0	[redacted]	22.52	[redacted]	1	23.5
		1	25	[redacted]	22.45	[redacted]	1	23.5
		1	49	[redacted]	22.47	[redacted]	1	23.5
		25	0	[redacted]	21.65	[redacted]	2	22.5
		25	12	[redacted]	21.64	[redacted]	2	22.5
		25	25	[redacted]	21.63	[redacted]	2	22.5
		50	0	[redacted]	21.66	[redacted]	2	22.5
	64QAM	1	0	[redacted]	21.64	[redacted]	2	22.5
		1	25	[redacted]	21.60	[redacted]	2	22.5
		1	49	[redacted]	21.65	[redacted]	2	22.5
		25	0	[redacted]	20.88	[redacted]	3	21.5
		25	12	[redacted]	20.88	[redacted]	3	21.5
		25	25	[redacted]	20.90	[redacted]	3	21.5
		50	0	[redacted]	20.88	[redacted]	3	21.5

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	23330 / 793 MHz	[redacted]		
5 MHz	QPSK	1	0	[redacted]	23.58	[redacted]	0	24.5
		1	12	[redacted]	23.55	[redacted]	0	24.5
		1	24	[redacted]	23.58	[redacted]	0	24.5
		12	0	[redacted]	22.64	[redacted]	1	23.5
		12	7	[redacted]	22.65	[redacted]	1	23.5
		12	13	[redacted]	22.64	[redacted]	1	23.5
		25	0	[redacted]	22.66	[redacted]	1	23.5
	16QAM	1	0	[redacted]	22.54	[redacted]	1	23.5
		1	12	[redacted]	22.50	[redacted]	1	23.5
		1	24	[redacted]	22.56	[redacted]	1	23.5
		12	0	[redacted]	21.64	[redacted]	2	22.5
		12	7	[redacted]	21.65	[redacted]	2	22.5
		12	13	[redacted]	21.67	[redacted]	2	22.5
		25	0	[redacted]	21.71	[redacted]	2	22.5
	64QAM	1	0	[redacted]	21.67	[redacted]	2	22.5
		1	12	[redacted]	21.67	[redacted]	2	22.5
		1	24	[redacted]	21.07	[redacted]	2	22.5
		12	0	[redacted]	20.91	[redacted]	3	21.5
		12	7	[redacted]	20.83	[redacted]	3	21.5
		12	13	[redacted]	20.82	[redacted]	3	21.5
		25	0	[redacted]	20.78	[redacted]	3	21.5

LTE Band 30 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	27710 / 2310 MHz	[redacted]		
10 MHz	QPSK	1	0		22.44		0	23
		1	25		22.36		0	23
		1	49		22.29		0	23
		25	0		21.36		1	22
		25	12		21.35		1	22
		25	25		21.33		1	22
		50	0		21.33		1	22
	16QAM	1	0		21.43		1	22
		1	25		21.38		1	22
		1	49		21.34		1	22
		25	0		20.35		2	21
		25	12		20.32		2	21
		25	25		20.31		2	21
		50	0		20.31		2	21
	64QAM	1	0		20.46		2	21
		1	25		20.45		2	21
		1	49		20.37		2	21
		25	0		19.35		3	20
		25	12		19.36		3	20
		25	25		19.36		3	20
		50	0		19.35		3	20

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				[redacted]	27710 / 2310 MHz	[redacted]		
5 MHz	QPSK	1	0		22.08		0	23
		1	12		22.04		0	23
		1	24		22.02		0	23
		12	0		21.06		1	22
		12	7		21.06		1	22
		12	13		21.05		1	22
		25	0		21.06		1	22
	16QAM	1	0		20.93		1	22
		1	12		20.87		1	22
		1	24		20.89		1	22
		12	0		19.99		2	21
		12	7		19.97		2	21
		12	13		19.97		2	21
		25	0		20.01		2	21
	64QAM	1	0		20.09		2	21
		1	12		20.07		2	21
		1	24		20.07		2	21
		12	0		19.32		3	20
		12	7		19.26		3	20
		12	13		19.21		3	20
		25	0		19.28		3	20

LTE Band 66 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					Reduced Average Power (dBm)				
				132072	132322	132572	MPR	Tune-up Limit	132072	132322	132572	MPR	Tune-up Limit
				1720 MHz	1745 MHz	1770 MHz			1720 MHz	1745 MHz	1770 MHz		
20 MHz	QPSK	1	0	23.90	23.69	23.61	0	24.5	20.86	20.66	20.57	0	21.5
		1	49	23.90	23.69	23.61	0	24.5	20.75	20.66	20.57	0	21.5
		1	99	23.91	23.70	23.59	0	24.5	20.73	20.65	20.57	0	21.5
		50	0	22.94	22.73	22.68	1	23.5	20.87	20.79	20.70	0	21.5
		50	24	22.95	22.73	22.67	1	23.5	20.88	20.79	20.70	0	21.5
		50	50	22.97	22.74	22.67	1	23.5	20.90	20.80	20.70	0	21.5
		100	0	22.94	22.73	22.66	1	23.5	20.88	20.77	20.68	0	21.5
	16QAM	1	0	22.94	22.51	22.57	1	23.5	20.90	20.64	20.51	0	21.5
		1	49	22.91	22.52	22.56	1	23.5	20.89	20.65	20.51	0	21.5
		1	99	22.93	22.53	22.54	1	23.5	20.88	20.64	20.55	0	21.5
		50	0	21.93	21.74	21.66	2	22.5	20.90	20.77	20.70	0	21.5
		50	24	21.91	21.75	21.65	2	22.5	20.90	20.76	20.70	0	21.5
		50	50	21.91	21.75	21.63	2	22.5	20.88	20.77	20.69	0	21.5
		100	0	21.90	21.77	21.67	2	22.5	20.90	20.80	20.70	0	21.5
	64QAM	1	0	21.87	21.78	21.55	2	22.5	20.73	20.67	20.53	0	21.5
		1	49	21.84	21.75	21.54	2	22.5	20.68	20.62	20.56	0	21.5
		1	99	21.81	21.78	21.50	2	22.5	20.72	20.62	20.50	0	21.5
		50	0	20.99	20.81	20.75	3	21.5	20.95	20.84	20.78	0	21.5
		50	24	20.97	20.82	20.74	3	21.5	20.93	20.82	20.76	0	21.5
		50	50	20.98	20.83	20.73	3	21.5	20.93	20.82	20.75	0	21.5
		100	0	20.94	20.82	20.72	3	21.5	20.93	20.81	20.70	0	21.5
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					Reduced Average Power (dBm)				
				132047	132322	132597	MPR	Tune-up Limit	132047	132322	132597	MPR	Tune-up Limit
				1717.5 MHz	1745 MHz	1772.5 MHz			1717.5 MHz	1745 MHz	1772.5 MHz		
15 MHz	QPSK	1	0	23.92	23.76	23.73	0	24.5	20.78	20.69	20.68	0	21.5
		1	37	23.91	23.76	23.71	0	24.5	20.74	20.72	20.68	0	21.5
		1	74	23.92	23.75	23.68	0	24.5	20.74	20.71	20.68	0	21.5
		36	0	22.94	22.77	22.76	1	23.5	20.90	20.77	20.77	0	21.5
		36	20	22.96	22.76	22.77	1	23.5	20.88	20.77	20.78	0	21.5
		36	39	22.96	22.76	22.76	1	23.5	20.88	20.80	20.78	0	21.5
		75	0	22.96	22.75	22.76	1	23.5	20.88	20.77	20.76	0	21.5
	16QAM	1	0	22.96	22.56	22.83	1	23.5	20.99	20.51	20.50	0	21.5
		1	37	22.95	22.58	22.81	1	23.5	20.98	20.54	20.47	0	21.5
		1	74	22.94	22.57	22.78	1	23.5	20.99	20.55	20.47	0	21.5
		36	0	21.93	21.77	21.76	2	22.5	20.87	20.75	20.81	0	21.5
		36	20	21.91	21.77	21.77	2	22.5	20.90	20.78	20.80	0	21.5
		36	39	21.91	21.79	21.74	2	22.5	20.88	20.76	20.78	0	21.5
		75	0	21.90	21.76	21.80	2	22.5	20.91	20.83	20.82	0	21.5
	64QAM	1	0	21.65	21.71	21.69	2	22.5	20.77	20.73	20.66	0	21.5
		1	37	21.63	21.69	21.69	2	22.5	20.74	20.70	20.63	0	21.5
		1	74	21.61	21.69	21.67	2	22.5	20.74	20.71	20.67	0	21.5
		36	0	20.84	20.84	20.78	3	21.5	20.87	20.78	20.78	0	21.5
		36	20	20.84	20.84	20.78	3	21.5	20.87	20.75	20.78	0	21.5
		36	39	20.84	20.84	20.77	3	21.5	20.87	20.77	20.78	0	21.5
		75	0	20.80	20.83	20.79	3	21.5	20.91	20.80	20.81	0	21.5

LTE Band 66 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit	Reduced Average Power (dBm)			MPR	Tune-up Limit
				132022	132322	132622			132022	132322	132622		
				1715 MHz	1745 MHz	1775 MHz			1715 MHz	1745 MHz	1775 MHz		
10 MHz	QPSK	1	0	23.96	23.74	23.82	0	24.5	20.91	20.82	20.88	0	21.5
		1	25	23.93	23.75	23.81	0	24.5	20.90	20.82	20.83	0	21.5
		1	49	23.93	23.77	23.81	0	24.5	20.93	20.85	20.83	0	21.5
		25	0	22.98	22.73	22.71	1	23.5	20.90	20.80	20.74	0	21.5
		25	12	22.98	22.73	22.71	1	23.5	20.93	20.81	20.74	0	21.5
		25	25	22.99	22.74	22.70	1	23.5	20.92	20.81	20.73	0	21.5
		50	0	22.98	22.73	22.72	1	23.5	20.91	20.81	20.74	0	21.5
	16QAM	1	0	22.99	22.77	22.70	1	23.5	20.63	20.69	20.76	0	21.5
		1	25	22.98	22.76	22.70	1	23.5	20.61	20.69	20.73	0	21.5
		1	49	22.99	22.80	22.68	1	23.5	20.61	20.72	20.72	0	21.5
		25	0	21.94	21.72	21.75	2	22.5	20.90	20.84	20.76	0	21.5
		25	12	21.93	21.73	21.75	2	22.5	20.91	20.83	20.75	0	21.5
		25	25	21.92	21.73	21.75	2	22.5	20.91	20.84	20.75	0	21.5
		50	0	21.93	21.74	21.73	2	22.5	20.91	20.84	20.76	0	21.5
	64QAM	1	0	21.69	21.49	21.59	2	22.5	20.77	20.55	20.54	0	21.5
		1	25	21.68	21.50	21.56	2	22.5	20.74	20.50	20.51	0	21.5
		1	49	21.72	21.52	21.58	2	22.5	20.77	20.56	20.54	0	21.5
		25	0	20.85	20.78	20.74	3	21.5	20.94	20.80	20.81	0	21.5
		25	12	20.85	20.78	20.75	3	21.5	20.93	20.80	20.81	0	21.5
		25	25	20.85	20.80	20.75	3	21.5	20.93	20.80	20.80	0	21.5
		50	0	20.83	20.79	20.80	3	21.5	21.00	20.85	20.80	0	21.5

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit	Reduced Average Power (dBm)			MPR	Tune-up Limit
				131997	132322	132647			131997	132322	132647		
				1712.5 MHz	1745 MHz	1777.5 MHz			1712.5 MHz	1745 MHz	1777.5 MHz		
5 MHz	QPSK	1	0	23.88	23.76	23.64	0	24.5	20.68	20.70	20.64	0	21.5
		1	12	23.94	23.76	23.59	0	24.5	20.66	20.63	20.62	0	21.5
		1	24	23.90	23.80	23.62	0	24.5	20.70	20.67	20.64	0	21.5
		12	0	22.94	22.72	22.73	1	23.5	20.87	20.82	20.74	0	21.5
		12	7	22.93	22.75	22.74	1	23.5	20.85	20.81	20.75	0	21.5
		12	13	22.95	22.73	22.74	1	23.5	20.88	20.83	20.75	0	21.5
		25	0	22.95	22.73	22.73	1	23.5	20.86	20.80	20.75	0	21.5
	16QAM	1	0	22.77	22.53	22.64	1	23.5	20.78	20.74	20.63	0	21.5
		1	12	22.74	22.48	22.62	1	23.5	20.74	20.76	20.61	0	21.5
		1	24	22.79	22.56	22.64	1	23.5	20.79	20.78	20.62	0	21.5
		12	0	21.93	21.68	21.74	2	22.5	20.88	20.67	20.77	0	21.5
		12	7	21.94	21.68	21.69	2	22.5	20.88	20.75	20.76	0	21.5
		12	13	21.93	21.69	21.70	2	22.5	20.88	20.74	20.77	0	21.5
		25	0	21.88	21.73	21.75	2	22.5	20.82	20.78	20.75	0	21.5
	64QAM	1	0	21.89	21.46	21.56	2	22.5	20.70	20.62	20.71	0	21.5
		1	12	21.91	21.42	21.55	2	22.5	20.68	20.57	20.66	0	21.5
		1	24	21.90	21.46	21.59	2	22.5	20.71	20.63	20.71	0	21.5
		12	0	20.92	20.69	20.77	3	21.5	20.95	20.77	20.78	0	21.5
		12	7	20.92	20.74	20.79	3	21.5	20.90	20.84	20.79	0	21.5
		12	13	20.92	20.75	20.79	3	21.5	20.87	20.85	20.77	0	21.5
		25	0	20.96	20.76	20.73	3	21.5	20.86	20.83	20.75	0	21.5

LTE Band 66 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit	Reduced Average Power (dBm)			MPR	Tune-up Limit
				131987	132322	132657			131987	132322	132657		
				1711.5 MHz	1745 MHz	1778.5 MHz			1711.5 MHz	1745 MHz	1778.5 MHz		
3 MHz	QPSK	1	0	24.00	24.00	24.00	0	24.5	20.96	20.96	20.98	0	21.5
		1	8	24.00	24.00	24.00	0	24.5	20.93	20.95	20.92	0	21.5
		1	14	24.00	24.00	24.00	0	24.5	20.96	20.89	21.00	0	21.5
		8	0	23.00	22.96	22.97	1	23.5	20.89	20.96	20.94	0	21.5
		8	4	23.00	22.95	22.97	1	23.5	20.86	20.98	20.96	0	21.5
		8	7	23.00	22.94	22.97	1	23.5	20.87	20.97	20.96	0	21.5
		15	0	23.00	22.96	22.98	1	23.5	20.89	20.96	20.99	0	21.5
	16QAM	1	0	23.00	22.76	22.86	1	23.5	20.87	21.00	20.83	0	21.5
		1	8	23.00	22.86	22.81	1	23.5	20.95	21.00	20.98	0	21.5
		1	14	23.00	22.85	22.89	1	23.5	20.85	21.00	20.92	0	21.5
		8	0	22.00	21.83	21.87	2	22.5	20.83	20.94	20.95	0	21.5
		8	4	22.00	21.83	21.86	2	22.5	20.81	20.94	20.93	0	21.5
		8	7	22.00	21.82	21.87	2	22.5	20.82	20.95	20.94	0	21.5
		15	0	22.00	21.95	21.91	2	22.5	20.85	21.00	20.99	0	21.5
	64QAM	1	0	21.96	21.75	21.83	2	22.5	20.78	20.97	20.90	0	21.5
		1	8	22.00	21.80	21.74	2	22.5	20.91	20.91	20.84	0	21.5
		1	14	21.92	21.78	21.62	2	22.5	20.90	20.74	20.88	0	21.5
		8	0	21.00	20.83	20.96	3	21.5	20.95	20.85	20.88	0	21.5
		8	4	21.00	20.83	20.94	3	21.5	20.95	20.85	20.86	0	21.5
		8	7	21.00	20.83	20.96	3	21.5	20.94	20.85	20.88	0	21.5
		15	0	21.00	20.97	21.00	3	21.5	20.92	21.00	21.00	0	21.5

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit	Reduced Average Power (dBm)			MPR	Tune-up Limit
				131979	132322	132665			131979	132322	132665		
				1710.7 MHz	1745 MHz	1779.3 MHz			1710.7 MHz	1745 MHz	1779.3 MHz		
1.4 MHz	QPSK	1	0	23.85	23.79	22.92	0	24.5	20.91	20.94	20.85	0	21.5
		1	3	23.96	23.78	23.97	0	24.5	20.92	20.93	20.88	0	21.5
		1	5	24.00	23.78	23.98	0	24.5	20.94	20.94	20.91	0	21.5
		3	0	23.67	23.86	23.98	0	24.5	20.89	20.87	20.87	0	21.5
		3	1	23.77	23.94	23.99	0	24.5	20.88	20.87	20.85	0	21.5
		3	3	23.86	23.87	23.98	0	24.5	20.88	20.86	20.87	0	21.5
		6	0	23.00	23.00	23.00	1	23.5	20.92	20.94	20.91	0	21.5
	16QAM	1	0	22.96	22.93	22.89	1	23.5	20.86	20.83	20.70	0	21.5
		1	3	23.00	22.91	22.88	1	23.5	20.82	20.84	20.71	0	21.5
		1	5	23.00	22.92	22.90	1	23.5	20.87	20.84	20.73	0	21.5
		3	0	22.97	22.84	23.00	1	23.5	20.75	20.79	20.86	0	21.5
		3	1	23.00	22.84	23.00	1	23.5	20.76	20.79	20.85	0	21.5
		3	3	23.00	22.84	23.00	1	23.5	20.76	20.80	20.84	0	21.5
		6	0	22.00	22.00	22.00	2	22.5	20.94	20.94	20.93	0	21.5
	64QAM	1	0	22.00	21.81	21.64	2	22.5	20.72	20.90	20.89	0	21.5
		1	3	22.00	21.80	21.67	2	22.5	20.71	20.89	20.99	0	21.5
		1	5	22.00	21.80	21.70	2	22.5	20.73	20.91	20.94	0	21.5
		3	0	21.93	21.67	21.97	2	22.5	20.79	20.79	20.81	0	21.5
		3	1	21.92	21.66	21.96	2	22.5	20.78	20.80	20.80	0	21.5
		3	3	21.91	21.67	21.97	2	22.5	20.77	20.80	20.80	0	21.5
		6	0	21.00	21.00	21.00	3	21.5	20.88	20.87	20.86	0	21.5

9.3. LTE Carrier Aggregation

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

For inter-band carrier aggregation with uplink assigned to one E-UTRA band (Table 5.6A-1), the requirements in subclause 6.2.3 apply.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirements in subclause 6.2.3 apply for each uplink component carrier.

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power applicable to the DUT in table below. In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

Modulation	CA bandwidth Class B and C / Smallest Component Carrier Transmission Bandwidth Configuration				MPR (dB)
	25 RB	50 RB	75 RB	100 RB	
QPSK	> 8 and ≤ 25	> 12 and ≤ 50	> 16 and ≤ 75	> 18 and ≤ 100	≤ 1
QPSK	> 25	> 50	> 75	> 100	≤ 2
16 QAM	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 8 and ≤ 25	> 12 and ≤ 50	> 16 and ≤ 75	> 18 and ≤ 100	≤ 2
16 QAM	> 25	> 50	> 75	> 100	≤ 3
64 QAM	≤ 8 and allocation wholly contained within a single CC	≤ 12 and allocation wholly contained within a single CC	≤ 16 and allocation wholly contained within a single CC	≤ 18 and allocation wholly contained within a single CC	≤ 2
64 QAM	> 8 or allocation extends across two CC's	> 12 or allocation extends across two CC's	> 16 or allocation extends across two CC's	> 18 or allocation extends across two CC's	≤ 3

For PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH WPDK modulation for the corresponding transmission bandwidth.

For intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1 is specified as follows

$$MPR = CEIL \{\min(M_A, M_{IM5}), 0.5\}$$

Where M_A is defined as follows

$$M_A = \begin{cases} 8.2 & ;0 \le A < 0.025 \\ 9.2 - 40A & ;0.025 \le A < 0.05 \\ 8 - 16A & ;0.05 \le A < 0.25 \\ 4.83 - 3.33A & ;0.25 \le A \le 0.4 \\ 3.83 - 0.83A & ;0.4 \le A \le 1 \end{cases}$$

and M_{IM5} is defined as follows

$$M_{IM5} = \begin{cases} 4.5 & ; \Delta_{IM5} < 1.5 * BW_{Channel\_CA} \\ 6.0 & ; 1.5 * BW_{Channel\_CA} \le \Delta_{IM5} < BW_{Channel\_CA}/2 + \Delta f_{ooB} \\ M_A & ; \Delta_{IM5} \ge BW_{Channel\_CA}/2 + \Delta f_{ooB} \end{cases}$$

Where

$A = N_{RB\_alloc} / N_{RB\_agg}$

$\Delta_{IM5} = \max(\left| F_{C\_agg} - (3*F_{agg\_alloc\_low} - 2*F_{agg\_alloc\_high}) \right|, \left| F_{C\_agg} - (3*F_{agg\_alloc\_high} - 2*F_{agg\_alloc\_low}) \right|)$

CEIL{M_A, 0.5} means rounding upwards to closest 0.5dB, i.e. MPR ∈ [3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5]

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the requirements in the subclause 6.2.3 apply. For intra-band non-contiguous aggregation with two uplink carriers the MPR is defined tfor those E-UTRA bands where maximum possible $W_{GAP} \le 42.2$ MHz as follows

$$MPR = CEIL\{M_A, 0.5\}$$

Where M_N is defined as follows

$$M_N = \begin{cases} -0.125N + 18.25 & ; 2 \le N \le 50 \\ -0.0333 N + 13.67 & ; 50 < N \le 200 \end{cases}$$

Where $N = N_{RB\_alloc}$ is the number of allocated resource blocks.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5A apply.

LTE Carrier Aggregation Measured Results

The following power measurements were performed with a single carrier uplink; CA for this particular project is only supported in the downlinks.

Type	LTE CA combinations			PCC (UL)					SCC (DL)			LTE Rel 8 Tx. Power [dBm]	LTE Rel 12 Tx. Power [dBm]	Delta
	PCC	+	SCC	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)			
Intra-Band Contiguous	5B			QPSK	10	20476	831.6	25,0	10	2575	886.5	21.68	21.66	-0.5%
	66B			QPSK	15	132072	1720.0	1,37	5	66886	2155.0	23.76	23.70	-1.4%
	66C			QPSK	20	132072	1720.0	1,99	20	66886	2155.0	24.03	23.98	-1.1%
Intra-Band Non-Contiguous	2A	+	2A	QPSK	20	18700	1860.0	50,0	20	1100	1980.0	22.40	22.41	0.2%
	66A	+	66A	QPSK	20	132072	1720.0	1,99	20	67236	2190.0	24.04	24.04	0.0%
Inter-Band Non-Contiguous	2A	+	5A	QPSK	20	19100	1900.0	50,0	10	2600	889.0	22.46	22.45	-0.2%
	2A	+	12A	QPSK	20	19100	1900.0	50,0	10	5095	737.5	22.47	22.44	-0.7%
	2A	+	14A	QPSK	20	19100	1900.0	1,0	10	5330	763.0	23.46	23.40	-1.4%
	2A	+	29A	QPSK	20	19100	1900.0	50,0	10	9715	722.5	22.47	22.48	0.2%
	2A	+	30A	QPSK	20	19100	1900.0	50,0	10	9820	2355.0	22.45	22.45	0.0%
	2A	+	66A	QPSK	20	19100	1900.0	1,0	20	66886	2155.0	23.55	23.42	-2.9%
	5A	+	30A	QPSK	10	20525	836.5	1,0	10	9820	2355.0	22.69	22.66	-0.7%
	5A	+	66A	QPSK	10	20525	836.5	25,0	20	66886	2155.0	22.66	22.61	-1.1%
	30A	+	12A	QPSK	10	27710	2310.0	1,0	10	5095	737.5	22.79	22.60	-4.3%
	66A	+	12A	QPSK	20	132072	1720.0	1,99	10	5095	737.5	24.00	23.86	-3.2%
	14A	+	30A	QPSK	10	23330	793.0	1,0	10	9820	2355.0	23.98	23.81	-3.8%
	14A	+	66A	QPSK	10	23330	793.0	1,0	20	66886	2155.0	24.02	23.81	-4.7%
	30A	+	29A	QPSK	10	27710	2310.0	1,0	10	9715	722.5	22.80	22.68	-2.7%
	66A	+	29A	QPSK	20	132072	1720.0	1,99	10	9715	722.5	24.03	24.08	1.2%
	30A	+	66A	QPSK	10	27710	2310.0	1,0	20	66886	2155.0	22.78	22.68	-2.3%

Type	LTE CA combinations					PCC (UL)					SCC1 (DL)			SCC2 (DL)			LTE Rel 8 Tx. Power [dBm]	LTE Rel 12 Tx. Power [dBm]	Delta
	PCC	+	SCC1	+	SCC2	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel	Freq. (MHz)			
Inter-Band Non-Contiguous	2A	+	2A	+	5A	QPSK	20	18900	1880.0	1,0	20	1100	1980.0	10	2525	881.5	23.34	23.38	0.9%
	2A	+	2A	+	12A	QPSK	20	18900	1880.0	1,0	20	1100	1980.0	10	5095	737.5	23.42	23.39	-0.7%
	2A	+	2A	+	14A	QPSK	20	18900	1880.0	1,0	20	1100	1980.0	10	5330	763.0	23.46	23.44	-0.5%
	2A	+	2A	+	29A	QPSK	20	18900	1880.0	1,0	20	1100	1980.0	10	9715	722.5	23.46	23.35	-2.5%
	2A	+	2A	+	30A	QPSK	20	18900	1880.0	1,0	20	1100	1980.0	10	9820	2355.0	23.49	23.37	-2.7%
	2A	+	2A	+	66A	QPSK	20	18900	1880.0	1,0	20	1100	1980.0	20	66886	2155.0	23.45	23.39	-1.4%
	2A	+	5A	+	30A	QPSK	20	18900	1880.0	1,0	10	2450	874.0	10	9820	2355.0	23.54	23.46	-1.8%
	2A	+	5A	+	66A	QPSK	20	18900	1880.0	1,0	10	2450	874.0	20	66886	2155.0	23.53	23.42	-2.5%
	2A	+	12A	+	30A	QPSK	20	18900	1880.0	1,0	10	5095	737.5	10	9820	2355.0	23.50	23.40	-2.3%
	2A	+	12A	+	66A	QPSK	20	18900	1880.0	1,0	10	5095	737.5	20	66886	2155.0	23.49	23.42	-1.6%
	2A	+	14A	+	30A	QPSK	20	18900	1880.0	1,0	10	5330	763.0	10	9820	2355.0	23.50	23.42	-1.8%
	2A	+	14A	+	66A	QPSK	20	18900	1880.0	1,0	10	5330	763.0	20	66886	2155.0	23.50	23.43	-1.6%
	2A	+	29A	+	30A	QPSK	20	18900	1880.0	1,0	10	9715	722.5	10	9820	2355.0	23.49	23.42	-1.6%
	2A	+	30A	+	66A	QPSK	20	18900	1880.0	1,0	10	9820	2355.0	20	66886	2155.0	23.60	23.67	1.6%
	2A	+	66A	+	66A	QPSK	20	18900	1880.0	1,0	20	66536	2120.0	20	67236	2190.0	23.50	23.61	2.6%
	5A	+	30A	+	66A	QPSK	10	20525	836.5	1,0	10	9820	2355.0	20	66886	2155.0	22.81	22.73	-1.8%
	5A	+	66A	+	66A	QPSK	10	20525	836.5	1,0	20	66536	2120.0	20	67236	2190.0	22.84	22.76	-1.8%
	30A	+	12A	+	66A	QPSK	10	27710	2310.0	1,0	10	5095	737.5	20	66886	2155.0	22.44	21.79	-2.9%
	66A	+	12A	+	66A	QPSK	20	132322	1745.0	1,0	10	5095	737.5	20	67236	2190.0	23.69	23.60	-2.1%
	14A	+	30A	+	66A	QPSK	10	23330	793.0	1,0	10	9820	2355.0	20	66886	2155.0	24.09	23.94	-3.4%
	14A	+	66A	+	66A	QPSK	10	23330	793.0	1,0	20	66536	2120.0	20	67236	2190.0	24.05	23.96	-2.1%
	30A	+	29A	+	66A	QPSK	10	27710	2310.0	1,0	10	9715	722.5	20	66886	2155.0	22.90	22.77	-2.9%
	30A	+	66A	+	66A	QPSK	10	27710	2310.0	1,0	20	66536	2120.0	20	67236	2190.0	22.92	22.81	-2.5%

Note:

Per KDB 941225 D05A LTE Rel. 12 KDB Inquiry Sheet: SAR is excluded for Carrier Aggregation when measured power does not exceed LTE Release 8 by more than a 1/4 dBm

9.4. Wi-Fi 2.4GHz (DTS Band)

Wi-Fi 2.4GHz Measured Results

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.

SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)
DSSS 2.4 GHz	802.11b	1 Mbps	1	2412	17.10	18.00	Yes
			6	2437	17.12	18.00	
			11	2462	17.00	18.00	
OFDM 2.4 GHz	802.11g	6 Mbps	1	2412	Not Required	15.00	No
			6	2437		15.00	
			11	2462		15.00	
	802.11n (HT20)	6.5 Mbps	1	2412	Not Required	15.00	No
			6	2437		15.00	
			11	2462		15.00	

9.5. Wi-Fi 5GHz (U-NII Bands)

When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

Wi-Fi 5 GHz Measured Results

For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.

When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-1 5.2 GHz	802.11a	6 Mbps	36	5180	Not Required	11.00	No
			40	5200		13.00	
			44	5220		13.00	
			48	5240		13.00	
	802.11n (HT20)	6.5 Mbps	36	5180	Not Required	11.00	No
			40	5200		13.00	
			44	5220		13.00	
			48	5240		13.00	
	802.11ac (VHT20)	6.5 Mbps	36	5180	Not Required	11.00	No
			40	5200		13.00	
			44	5220		13.00	
			48	5240		13.00	
	802.11n (HT40)	13.5 Mbps	38	5190	Not Required	9.00	No
			46	5230		13.00	
	802.11ac (VHT40)	13.5 Mbps	38	5190	Not Required	9.00	No
			46	5230		13.00	
	802.11ac (VHT80)	29.3 Mbps	42	5210	Not Required	6.00	No
Band	Mode	Data Rate	Ch #	Freq. (MHz)	Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2A 5.3 GHz	802.11a	6 Mbps	52	5260	Not Required	13.00	No
			56	5280		13.00	
			60	5300		13.00	
			64	5320		13.00	
	802.11n (HT20)	6.5 Mbps	52	5260	Not Required	13.00	No
			56	5280		13.00	
			60	5300		13.00	
			64	5320		12.50	
	802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	13.00	No
			56	5280		13.00	
			60	5300		13.00	
			64	5320		12.50	
	802.11n (HT40)	13.5 Mbps	54	5270	12.40	13.00	Yes
			62	5310	7.86	9.00	
	802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	13.00	No
			62	5310		9.00	
	802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	5.50	No

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2C 5.5 GHz	802.11a	6 Mbps	100	5500	Not Required	13.00	No
			116	5580		13.00	
			124	5620		13.00	
			144	5720		13.00	
	802.11n (HT20)	6.5 Mbps	100	5500	Not Required	13.00	No
			116	5580		13.00	
			124	5620		13.00	
			144	5720		12.50	
	802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	13.00	No
			116	5580		13.00	
			124	5620		13.00	
			144	5720		12.50	
	802.11n (HT40)	13.5 Mbps	102	5510	7.88	9.00	Yes
			110	5550	12.38	13.00	
			134	5670	12.34	13.00	
			142	5710	12.61	13.00	
	802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	9.00	No
			118	5590		13.00	
			126	5630		13.00	
			142	5710		13.00	
	802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	5.50	No
			122	5610		10.00	
			138	5690		10.00	

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-3 5.8 GHz	802.11a	6 Mbps	149	5745	Not Required	13.00	No
			157	5785		13.00	
			165	5825		13.00	
	802.11n (HT20)	6.5 Mbps	149	5745	Not Required	13.00	No
			157	5785		13.00	
			165	5825		13.00	
	802.11ac (VHT20)	6.5 Mbps	149	5745	Not Required	13.00	No
			157	5785		13.00	
			165	5825		13.00	
	802.11n (HT40)	13.5 Mbps	151	5755	Not Required	13.00	No
			159	5795		13.00	
	802.11ac (VHT40)	13.5 Mbps	151	5755	Not Required	13.00	No
			159	5795		13.00	
	802.11ac (VHT80)	29.3 Mbps	155	5775	12.22	13.00	Yes

9.6. Bluetooth

Maximum tune-up tolerance limit is 9.5 dBm. This power level qualifies for exclusion of SAR testing.

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN = Measured SAR *Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 941225 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. 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; therefore, the requirement for H, M and L channels may not fully apply.

KDB 248227 D01 SAR meas for 802.11:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported* SAR for the *initial test position* is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.

- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the ***initial test position*** to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the ***reported*** SAR is ≤ 0.8 W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the ***initial test position*** and subsequent test positions, when the ***reported*** SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the ***reported*** SAR is ≤ 1.2 W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the ***initial test position***, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the ***initial test position***.

10.1. W-CDMA Band II

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	Rel 99 RMC 12.2 kbps	OFF	0	Rear	9262	1852.4	24.00	23.36	0.650	0.753	
					9400	1880.0	24.00	23.23	0.721	0.861	
					9538	1907.6	24.00	23.30	0.635	0.746	
Standalone	Rel 99 RMC 12.2 kbps	OFF	0	Edge 1	9262	1852.4	24.00	23.36	0.837	0.970	
					9400	1880.0	24.00	23.23	0.833	0.995	
					9538	1907.6	24.00	23.30	0.717	0.842	
				Edge 1 Slant	9262	1852.4	24.00	23.36	0.787	0.912	
					9400	1880.0	24.00	23.23	0.883	1.054	1
					9538	1907.6	24.00	23.30	0.717	0.842	

10.2. W-CDMA Band V

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	Rel 99 RMC	OFF	0	Rear	4183	836.6	23.50	22.26	0.128	0.170	
Standalone	Rel 99 RMC 12.2 kbps	OFF	0	Edge 1	4183	836.6	23.50	22.26	0.371	0.494	2
				Edge 1 Slant	4183	836.6	23.50	22.26	0.170	0.226	

10.3. LTE Band 2 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	QPSK	OFF	0	Rear	18700	1860.0	1	99	24.00	23.60	0.732	0.803	
					18900	1880.0	1	99	24.00	23.50	0.787	0.883	
							50	50	23.00	22.65	0.640	0.694	
					19100	1900.0	1	49	24.00	23.39	0.774	0.890	
Standalone	QPSK	OFF	0	Edge 1	18900	1880.0	1	99	24.00	23.50	0.661	0.742	
							50	50	23.00	22.65	0.549	0.595	
				Edge 1 Slant	18700	1860.0	1	99	24.00	23.60	0.787	0.863	
							50	50	23.00	22.06	0.632	0.785	
					18900	1880.0	1	99	24.00	23.50	0.865	0.971	3
							50	50	23.00	22.65	0.701	0.760	
							100	0	23.00	22.22	0.695	0.832	
					19100	1900.0	1	49	24.00	23.39	0.778	0.895	
							50	0	23.00	22.39	0.651	0.749	

10.4. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	QPSK	OFF	0	Rear	20525	836.5	1	0	23.00	22.56	0.138	0.153	
							25	0	22.00	21.62	0.107	0.117	
Standalone	QPSK	OFF	0	Edge 1	20525	836.5	1	0	23.00	22.56	0.237	0.262	4
							25	0	22.00	21.62	0.186	0.203	
				Edge 1 Slant	20525	836.5	1	0	23.00	22.56	0.120	0.133	
							25	0	22.00	21.62	0.095	0.104	

10.5. LTE Band 12 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	QPSK	OFF	0	Rear	23095	707.5	1	0	24.50	23.51	0.297	0.373	
							25	0	23.50	22.51	0.232	0.291	
Standalone	QPSK	OFF	0	Edge 1	23095	707.5	1	0	24.50	23.51	0.349	0.439	5
							25	0	23.50	22.51	0.260	0.326	
				Edge 1 Slant	23095	707.5	1	0	24.50	23.51	0.195	0.245	
							25	0	23.50	22.51	0.153	0.192	

10.6. LTE Band 14 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	QPSK	OFF	0	Rear	23330	793.0	1	0	24.50	23.70	0.177	0.213	
							25	0	23.50	22.69	0.137	0.165	
Standalone	QPSK	OFF	0	Edge 1	23330	793.0	1	0	24.50	23.70	0.264	0.317	6
							25	0	23.50	22.69	0.201	0.242	
				Edge 1 Slant	23330	793.0	1	0	24.50	23.70	0.139	0.167	
							25	0	23.50	22.69	0.107	0.129	

10.7. LTE Band 30 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	QPSK	OFF	0	Rear	27710	2310.0	1	0	23.00	22.44	0.404	0.460	
							25	0	22.00	21.36	0.323	0.374	
Standalone	QPSK	OFF	0	Edge 1	27710	2310.0	1	0	23.00	22.44	0.524	0.597	7
							25	0	22.00	21.36	0.412	0.478	
				Edge 1 Slant	27710	2310.0	1	0	23.00	22.44	0.495	0.564	
							25	0	22.00	21.36	0.380	0.440	

10.8. LTE Band 66 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB Offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	QPSK	OFF	0	Rear	132072	1720.0	1	99	24.50	23.91	0.963	1.103	
							50	50	23.50	22.97	0.841	0.950	
					132322	1745.0	1	99	24.50	23.70	0.939	1.129	
							50	50	23.50	22.74	0.828	0.986	
							100	0	23.50	22.73	0.846	1.010	
					132572	1770.0	1	49	24.50	23.80	0.966	**1.135**	8
							50	0	23.50	22.68	0.793	0.958	
Standalone	QPSK	OFF	21	Edge 1	132322	1745.0	1	99	24.50	23.70	0.236	0.284	
							50	50	23.50	22.74	0.194	0.231	
				Edge 1 Slant	132322	1745.0	1	99	24.50	23.70	0.271	0.326	
							50	50	23.50	22.74	0.220	0.262	
RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	QPSK	ON	0	Edge 1	132072	1720.0	1	0	21.50	20.86	0.736	0.853	
					132322	1745.0	1	49	21.50	20.66	0.681	0.826	
							50	50	21.50	20.80	0.672	0.789	
					132572	1770.0	1	0	21.50	20.57	0.649	0.803	
				Edge 1 Slant	132072	1720.0	1	0	21.50	20.86	0.887	1.028	9
							50	50	21.50	20.90	0.850	0.976	
							100	0	21.50	20.88	0.868	1.002	
					132322	1745.0	1	49	21.50	20.66	0.782	0.948	
							50	50	21.50	20.80	0.777	0.913	
					132572	1770.0	1	0	21.50	20.57	0.742	0.918	
							50	24	21.50	20.70	0.720	0.865	

10.9. Wi-Fi (DTS Band)

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	802.11b 1 Mbps	OFF	0	Rear	6	2437	0.139	99.6%	18.00	17.12	0.073	0.090	
Standalone	802.11b 1 Mbps	OFF	0	Edge 1	6	2437	0.500	99.6%	18.00	17.12	0.435	**0.535**	10
				Edge 1 Slant	6	2437	0.609	99.6%	18.00	17.12	0.389	0.478	

10.10. Wi-Fi (U-NII Band)

UNII-1 & 2A

When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest *reported* SAR for UNII band 2A is

- ≤ 1.2 W/kg, SAR is not required for UNII band I
- > 1.2 W/kg, both bands should be tested independently for SAR.

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	802.11n HT40	OFF	0	Rear	54	5270	0.212	87.4%	13.00	12.40	0.111	0.146	
Standalone	802.11n HT40	OFF	0	Edge 1	54	5270	1.540	87.4%	13.00	12.40	0.680	0.893	11
					62	5310	0.747	87.4%	9.00	7.86	0.268	0.398	
				Edge 1 Slant	54	5270	0.795	87.4%	13.00	12.40	0.353	0.464	

UNII-2C

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	802.11n HT40	OFF	0	Rear	110	5550	0.163	87.4%	13.00	12.38	0.063	0.083	
Standalone	802.11n HT40	OFF	0	Edge 1	110	5550	1.480	87.4%	13.00	12.38	0.716	0.945	12
					142	5710	0.959	87.4%	13.00	12.61	0.450	0.563	
				Edge 1 Slant	110	5550	0.659	87.4%	13.00	12.38	0.277	0.365	

UNII-3

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Standalone	802.11ac VHT80	OFF	0	Rear	155	5775	0.096	74.4%	13.00	12.22	0.030	0.048	
Standalone	802.11ac VHT80	OFF	0	Edge 1	155	5775	1.420	74.4%	13.00	12.22	0.610	**0.981**	13
				Edge 1 Slant	155	5775	0.405	74.4%	13.00	12.22	0.183	0.294	

11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated	
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio
700	LTE Band 12	Standalone	Edge 1	No	0.349	N/A	N/A
	LTE Band 14	Standalone	Edge 1	No	0.264	N/A	N/A
850	WCDMA Band V	Standalone	Edge 1	No	0.371	N/A	N/A
	LTE Band 5	Standalone	Edge 1	No	0.237	N/A	N/A
1750	LTE Band 66	Standalone	Rear	Yes	0.966	0.932	1.04
1900	WCDMA Band II	Standalone	Edge 1 Slant	Yes	0.883	0.852	1.04
	LTE Band 2	Standalone	Edge 1 Slant	No	0.865	N/A	N/A
2300	LTE Band 30	Standalone	Edge 1	No	0.524	N/A	N/A
2400	Wi-Fi 802.11b/g/n	Standalone	Edge 1	No	0.435	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Standalone	Edge 1	No	0.680	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Standalone	Edge 1	No	0.716	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Standalone	Edge 1	No	0.610	N/A	N/A

Note(s):

Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is < 1.20.

12. Simultaneous Transmission Conditions

RF Exposure Condition	Item	Capable Transmit Configurations		
Standalone	1	W-CDMA	+	DTS
	2	W-CDMA	+	U-NII
	3	W-CDMA	+	BT
	4	LTE	+	DTS
	5	LTE	+	U-NII
	6	LTE	+	BT

Notes:

1. DTS & U-NII (Ch.149) supports Hotspot.
2. W-CDMA and LTE support Hotspot.
3. DTS, U-NII and/or Bluetooth Radio cannot transmit simultaneously .

12.1. Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

SAR to Peak Location Ratio (SPLSR)

KDB 447498 D01 General RF Exposure Guidance explains how to calculate the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

SAR_1 is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of

$$[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$$

In order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri \leq 0.04$$

When an individual antenna transmits at on two bands simultaneously, the sum of the highest *reported* SAR for the frequency bands should be used to determine SAR_1.or SAR_2. When SPLSR is necessary, the smallest distance between the peak SAR locations for the antenna pair with respect to the peaks from each antenna should be used.

The antennas in all antenna pairs that do not qualify for simultaneous transmission SAR test exclusion must be tested for SAR compliance, according to the enlarged zoom scan and volume scan post-processing procedures in KDB Publication 865664 D01

Simultaneous transmission SAR measurement

When simultaneous transmission SAR measurements are required in different frequency bands not covered by a single probe calibration point then separate tests for each frequency band are performed. The tests are performed using enlarged zoom scans which are processed, by means of superposition, using the DASY5 volume scan post-processing procedures to determine the 1-g SAR for the aggregate SAR distribution.

The spatial resolution used for all enlarged zoom scans is the same as used for the most stringent zoom scans. I.E. the scan parameters required for the highest frequency assessed are used for all enlarged zoom scans. The scans cover the complete area of the device to ensure all transmitting antennas and radiating structures are assessed.

DASY5 provides the ability to perform Multiband Evaluations according to the latest standards using the Volume Scan job as well as appropriate routines for the Post-processing.

In order to extract and process measurements within different frequency bands, the SEMCAD X Post-processor performs the combination and subsequent superposition of these measurement data via DASY5= Combined MultiBand Averaged SAR.

Combined Multi Band Averaged SAR allows - in addition to the data extraction - an evaluation of the 1 g, 10 g and/or arbitrary averaged mass SAR.
Power Scaling Factor is used to allow the volume scans to be scaled by a value other than "1", this is important when the results need to be scaled to different maximum power levels. The Power Scaling Factor is applied to each individual point of the scan. When power scaling is used in multi-band combinations the scaling factor is applied to each individual point of the first scan, the second factor is then applied to each individual point of the second scan and so on. The scans are then combined.

12.2. Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

1. When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
2. Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
   - When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
   - When the separation distance from the antenna to an adjacent edge is > 5 mm but ≤ 50 mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
   - When the minimum test separation distance is > 50 mm, the estimated SAR value is 0.4 W/kg
3. Please refer to Estimated SAR Tables to see which test positions are inherently compliant as they consist of only estimated SAR values for all applicable transmitters and consequently will always have sum of SAR values < 1.2 W/kg. Simultaneous transmission SAR analysis was therefore not performed for these test positions.

Estimated SAR for WWAN

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant
Full Power, Proximity Sensor Off																
Main 1	W-CDMA 2	1907.6	24.00	251	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 1	W-CDMA 5	846.6	23.50	224	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 1	LTE Band 2	1900.0	24.00	251	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 1	LTE Band 4	1754.3	24.50	282	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 1	LTE Band 5	844.0	23.00	200	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 1	LTE Band 12	711.0	24.50	282	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 1	LTE Band 14	793.0	24.50	282	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 2	LTE Band 30	2310.0	23.00	200	18	8	241	244	170	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 1	LTE Band 66	1770.0	24.50	282	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Power Back-off, Proximity Sensor On																
Main 1	LTE Band 4	1754.3	21.50	141	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Main 1	LTE Band 66	1770.0	21.50	141	10	8	250	244	111	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-

Estimated SAR for WLAN

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Edge 1 Slant
Wi-Fi Main Antenna															
Wi-Fi 2.4 GHz	2462	18.00	63	17	8	115	244	284	8	-MEASURE-	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Wi-Fi 5.2 GHz	5240	13.00	20	17	8	115	244	284	8	0.359	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Wi-Fi 5.3 GHz	5320	13.00	20	17	8	115	244	284	8	0.362	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Wi-Fi 5.5 GHz	5700	13.00	20	17	8	115	244	284	8	0.375	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Wi-Fi 5.8 GHz	5825	13.00	20	17	8	115	244	284	8	0.379	-MEASURE-	0.400	0.400	0.400	-MEASURE-
Bluetooth	2480	9.50	9	17	8	115	244	284	8	0.111	0.236	0.400	0.400	0.400	0.236

12.3. Sum of the SAR for WWAN & Wi-Fi & BT

Test Position	Standalone SAR (W/kg)					∑ 1-g SAR (W/kg)		
	WWAN ①		DTS ②	U-NII ③	BT ④	WWAN + DTS ① + ②	WWAN + U-NII ① + ③	WWAN + BT ① + ④
Rear	LTE B66	1.135	0.090	0.146	0.111	1.225	1.281	1.246
Edge 1	W-CDMA B2	0.995	0.535	0.981	0.236	1.530	***1.976***	1.231
	W-CDMA B5	0.494	0.535	0.981	0.236	1.029	1.475	0.730
	LTE B2	0.742	0.535	0.981	0.236	1.277	***1.723***	0.978
	LTE B5	0.262	0.535	0.981	0.236	0.797	1.243	0.498
	LTE B12	0.439	0.535	0.981	0.236	0.974	1.420	0.675
	LTE B14	0.317	0.535	0.981	0.236	0.852	1.298	0.553
	LTE B30	0.597	0.535	0.981	0.236	1.132	**1.578**	0.833
	LTE B66	0.853	0.535	0.981	0.236	1.388	***1.834***	1.089
Edge 1 Slant	W-CDMA B2	1.054	0.478	0.464	0.236	**1.532**	1.518	1.290

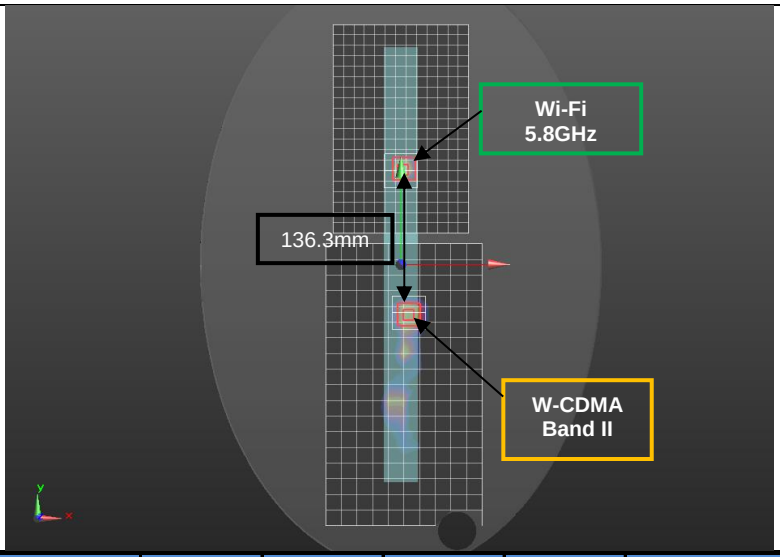
SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)			∑ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN		③ U-NII						
Edge 1	W-CDMA B2	0.995	0.981	① + ③	1.976	136.3	0.02	No	1
	LTE B2	0.742	0.981	① + ③	1.723	137.4	0.02	No	2
	LTE B66	0.853	0.981	① + ③	1.834	141.1	0.02	No	3

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

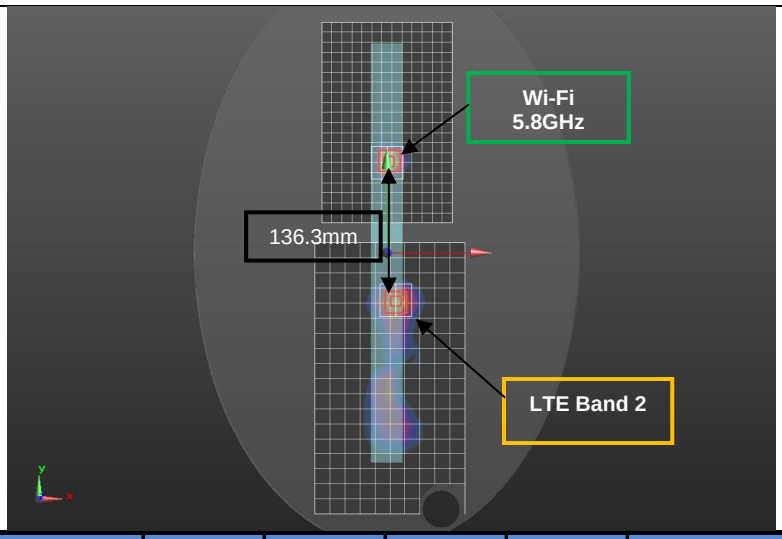
Figure (1)



Mode		Peak SAR W/kg	X m	Y m	Z m	d: Calculated distance (mm)	
W-CDMA Band II	①	1.17	0.0075	-0.046	-0.18	① + ③	136.3
Wi-Fi 5GHz	③	1.53	8.74E-11	0.09	-0.185		

The Peak Location Separation Distance is computed by using the
SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

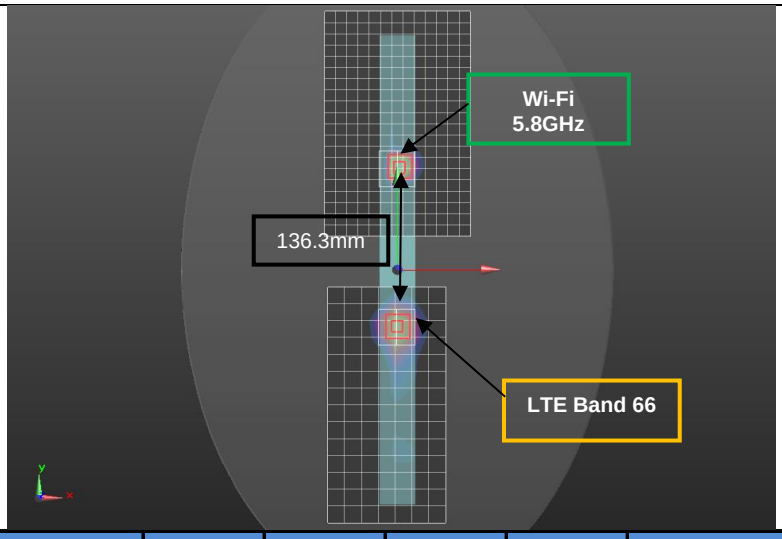
Figure (2)



Mode		Peak SAR W/kg	X m	Y m	Z m	d: Calculated distance (mm)	
LTE Band 2	①	0.936	0.009	-0.047	-0.18	① + ③	137.4
Wi-Fi 5GHz	③	1.53	8.74E-11	0.09	-0.185		

The Peak Location Separation Distance is computed by using the
SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

Figure (3)



Mode		Peak SAR W/kg	X m	Y m	Z m	d: Calculated distance (mm)	
LTE Band 66	①	1.02	-0.0005	-0.051	-0.18	① + ③	141.1
Wi-Fi 5GHz	③	1.53	8.74E-11	0.09	-0.185		

The Peak Location Separation Distance is computed by using the
SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

Appendixes

Refer to separated files for the following appendixes.

Appendix A: SAR Setup Photos

Appendix B: SAR System Check Plots

Appendix C: Highest SAR Test Plots

Appendix D: SAR Liquid Tissue Ingredients

Appendix E: SAR Probe Calibration Certificates

Appendix F: SAR Dipole Calibration Certificates

END OF REPORT