FCC 47 CFR Parts 1 & 2
Published RF Exposure KDB Procedures
IEEE Standard 1528-2013

(Class II Permissive Change)

SAR EVALUATION REPORT

For
GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n and NFC

Model: LG-D631, D631, LGD631
FCC ID: ZNFD631

Report Number: 14U17500-S7
Issue Date: 7/7/2014

Prepared for
LG ELECTRONICS MOBILECOMM U.S.A., INC.
1000 SYLVAN AVE.
ENGLEWOOD CLIFFS, NJ 07632

Prepared by
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	7/7/2014	Initial Issue	--

Table of Contents

1. Attestation of Test Results

Applicant	LG ELECTRONICS MOBILECOMM U.S.A., INC.			
DUT description	GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n and NFC			
Model	LG-D631, D631, LGD631			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	6/2/2014 – 6/10/2014			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	0.324 W/kg	0.178 W/kg	0.172 W/kg
	Body-worn Accessory	0.957 W/kg	0.251 W/kg	0.257 W/kg
	Wireless Router (Hotspot)	0.957 W/kg	0.251 W/kg	N/A
	Simultaneous Transmission	1.214 W/kg	1.208 W/kg	1.214 W/kg
Applicable Standards	FCC 47 CFR Parts 1 & 2 Published RF Exposure KDB Procedures, and TCB workshop updates IEEE Standard 1528-2013			
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:

Devin Chang
Senior Engineer
UL Verification Services Inc.

Prepared By:

Nathan Sousa
Laboratory Engineer
UL Verification Services Inc.

2. Test Methodology

The tests documented in this report were performed in accordance with FCC 47 CFR Parts 1 & 2, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D04 Handset SAR v01r02
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 HSPA and 1x Advanced v02r02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01
- 941225 D06 Hotspot Mode SAR v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r03

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 G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

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.

Tissue Dielectric Properties

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071B	MY42100131	2/24/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1087	11/13/2014
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	4242	122529163	9/19/2014
Thermometer	EXTECH	445703	CCS-200	3/24/2015

System Performance Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3438A00633	6/13/2014
Power Meter	HP	438A	2822A05684	10/10/2014
Power Sensor	HP	8481A	2237A31744	10/2/2014
Power Sensor	HP	8481A	2349A36506	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Directional coupler	Werlatone	C8060-102	2710	N/A
DC Power Supply	AMETEK	XT15-4	1319A02778	N/A
E-Field Probe	SPEAG	EX3DV4	3936	7/22/2014
E-Field Probe	SPEAG	EX3DV3	3531	11/21/2014
E-Field Probe	SPEAG	EX3DV4	3773	4/22/2015
E-Field Probe	SPEAG	EX3DV4	3871	12/11/2014
Data Acquisition Electronics	SPEAG	DAE4	1377	7/15/2014
Data Acquisition Electronics	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics	SPEAG	DAE4	1380	7/15/2014
System Validation Dipole	SPEAG	D750V3	1071	11/15/2014
System Validation Dipole	SPEAG	D835V2	4d002	11/15/2014
System Validation Dipole	SPEAG	D1750V2	1077	9/12/2014
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2014
System Validation Dipole	SPEAG	D2450V2	899	9/10/2014
System Validation Dipole	SPEAG	D5GHzV2	1138	11/19/2014
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015
Thermometer (SAR Lab 2)	EXTECH	445703	CCS-203	3/28/2015
Thermometer (SAR Lab 3)	EXTECH	445703	CCS-237	6/3/2015
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/3/2015

Others

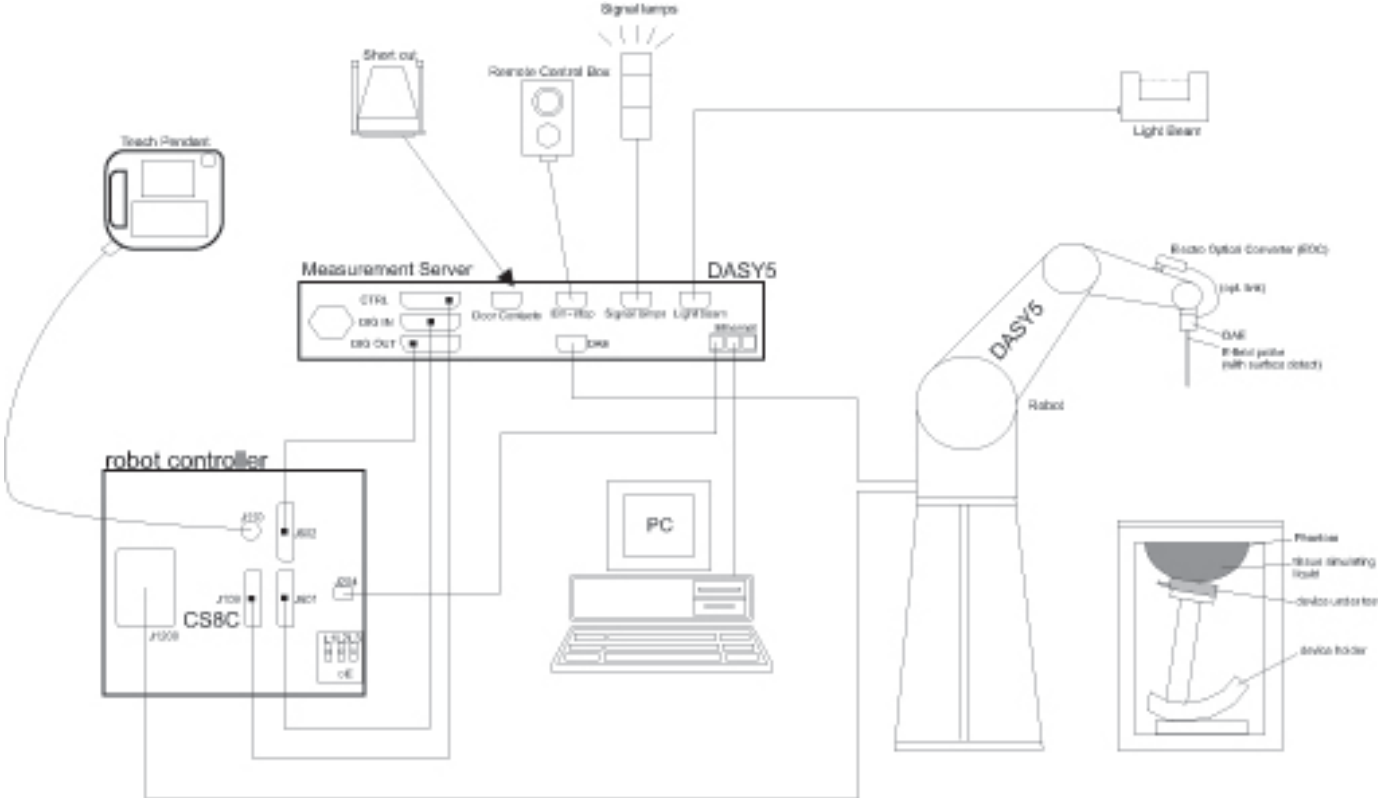
Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	103764-dn	8/16/2014
Base Station Simulator	R & S	CMW500	103766-ly	8/19/2014
Base Station Simulator	R & S	CMW500	107513-be	7/26/2014
Power Meter	Agilent	N1912A	MY50001018	8/23/2014
Power Sensor	Agilent	N1921A	MY52020011	5/13/2014
Power Sensor	Agilent	N1921A	MY52200012	9/25/2014

4.2. 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, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

5. Measurement System Description and Setup

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.

6. SAR Measurement Procedure

6.1. Normal SAR Measurement Procedure

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

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

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

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

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.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

6.2. Volume Scan Procedures

Step 1: Repeat Step 1-4 in Section 6.1

Step 2: Volume Scan
Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 3: 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.

7. Device Under Test

7.1. General Information

Operating Configuration(s)	Held to head, Body-worn (Voice call)
Mobile 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 5.8 GHz 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 5.8 GHz only)
Device dimension	Overall (Length x Width): 151.95 mm x 78.98mm Overall Diagonal: 163mm Display Diagonal: 145.22mm
Back Cover	☐ Normal Battery Cover ☒ Normal Battery Cover with NFC
Accessory	☒ Headset
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc, 12.2Wh ☐ Extended (large capacity)

7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 850 / 1900 W-CDMA Band: V / II LTE Band 2 / 4 / 5 / 17 Wi-Fi : 2.4 / 5 GHz Bluetooth: 2.4 GHz.
Mode	GSM - ☒ Voice (GMSK) - ☒ GPRS (GMSK) - ☒ EGPRS (8PSK) W-CDMA - ☒ UMTS Rel. 99 (Voice & Data) - ☒ HSDPA - ☒ HSUPA - ☒ HSPA+ LTE - ☒ QPSK - ☒ 16QAM - ☒ Rel. 10 Carrier Aggregation (1 Uplink and 2 Downlinks) Wi-Fi 2.4GHz (802.11b/g/n) - ☒ 802.11b - ☒ 802.11g - ☒ 802.11n (HT20) Wi-Fi 5GHz - ☒ 802.11a - ☒ 802.11n (HT20) - ☒ 802.11n (HT40) Bluetooth Ver. 4.0 (LE)
Duty Cycle	GSM Voice: 12.5%; GPRS 1 Slot: 12.5%; 2 Slots: 25%, 3 Slots: 37.5%,4 Slots: 50%, W-CDMA: 100% LTE: 100% Wi-Fi 802.11a/b/g/n: 100% Bluetooth: 32.25% (DH1), 66.68% (DH3), 77.52% (DH5)
GPRS Multi-Slot Class	☐ Class 8 - One Up ☒ Class 10 - Two Up ☐ Class 12 - Four Up ☐ Class 33 - Four Up
DTM (Dual Transfer Mode)	☐ Supported
VoIP (GPRS)	☒ Supported
SV-LTE & SV-DO	☐ Supported

7.3. RF Output Power Tolerance

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
GSM850	Voice	33.2	**33.7**
	GPRS 1 slot	33.2	**33.7**
	GPRS 2 slots	31.2	**31.7**
	EGPRS 1 slot	27.2	**27.7**
	EGPRS 2 slots	27.2	**27.7**
GSM1900	Voice	30.2	**30.7**
	GPRS 1 slot	30.2	**30.7**
	GPRS 2 slots	28.2	**28.7**
	EGPRS 1 slot	26.2	**26.7**
	EGPRS 2 slots	26.2	**26.7**
W-CDMA Band V	R99	23.2	**23.7**
	HSDPA	23.2	**23.7**
	HSUPA	23.2	**23.7**
W-CDMA Band II	R99	23.2	**23.7**
	HSDPA	23.2	**23.7**
	HSUPA	23.2	**23.7**
LTE Band 2	QPSK	23.7	**24.2**
LTE Band 4	QPSK	23.7	**24.2**
LTE Band 5	QPSK	23.7	**24.2**
LTE Band 17	QPSK	23.2	**23.7**

Upper limit (dB): 1.0		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	16.0	**17.0**
	802.11g	14.0	**15.0**
	802.11n HT20	12.0	**13.0**
WiFi 5 GHz	802.11a	11.0	**12.0**
	802.11n HT20	10.1	**11.1**
	802.11n HT40	10.1	**11.1**
Bluetooth		10.5	**11.5**
Bluetooth LE		4.0	**5.0**

7.4. Simultaneous Transmission Condition

Item	Capable Transmit Configurations	RF Exposure Condition			Notes
		Head	Body-worn Accessory	Wireless Router (Hotspot) & Wi-Fi Direct	
1	GSM 850/1900 Voice + Wi-Fi 2.4/5GHz	✓	✓	✓	
2	GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4/5GHz (VoIP)	✓	✓	✓	
3	WCDMA Band V/II + Wi-Fi 2.4/5GHz	✓	✓	✓	
4	LTE B2/B5/B17 + Wi-Fi 2.4/5GHz	✓	✓	✓	
5	GSM 850/1900 Voice + BT		✓		
6	GSM 850/1900 (GPRS/EDGE) + BT(VoIP)		✓		
7	WCDMA Band V/II + BT		✓		
8	LTE B2/B5/B17 + BT		✓		

Notes:
1. Wi-Fi 2.4GHz and 5.8 GHz support Hotspot and Wi-Fi Direct.
2. GPRS/EDGE, WCDMA and LTE support Hotspot.
3. VoIP is support in GPRS/EDGE, WCDMA and LTE.
4. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.
5. Wi-Fi 5 GHz Radio can transmit simultaneously with Bluetooth Radio.

7.5. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td>
<table>
<tr><td rowspan="3">Band 2</td><td colspan="6">Frequency range: 1850 - 1910 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></td><td></td><td>18650/ 1855</td><td>18625/ 1852.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>18900/ 1880</td><td>18900/ 1880</td><td></td><td></td></tr>
<tr><td>High</td><td></td><td></td><td>19150/ 1905</td><td>19175/ 1907.5</td><td></td><td></td></tr>
<tr><td rowspan="3">Band 4</td><td colspan="6">Frequency range: 1710 - 1755 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></td><td></td><td>20000/ 1715</td><td>19975/ 1712.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td></td><td></td></tr>
<tr><td>High</td><td></td><td></td><td>20350/ 1750</td><td>20375/ 1752.5</td><td></td><td></td></tr>
<tr><td rowspan="3">Band 5</td><td colspan="6">Frequency range: 824 - 849 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></td><td></td><td>20450/ 829</td><td>20425/ 826.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>20525/ 836.5</td><td>20525/ 836.5</td><td></td><td></td></tr>
<tr><td>High</td><td></td><td></td><td>20600/ 844</td><td>20625/ 846.5</td><td></td><td></td></tr>
<tr><td rowspan="3">Band 17</td><td colspan="6">Frequency range: 704 - 716 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></td><td></td><td></td><td>23755/ 706.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>23790/ 710</td><td>23790/ 710</td><td></td><td></td></tr>
<tr><td>High</td><td></td><td></td><td></td><td>23825/ 713.5</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Carrier Aggregation Combinations</td><td>
<table>
<tr><td rowspan="2">Band 2 Primary</td><td colspan="2">Channel Bandwidth</td><td rowspan="2">Band 17 Secondary</td><td colspan="2">Channel Bandwidth</td></tr>
<tr><td>10 MHz</td><td>5 MHz</td><td>10 MHz</td><td>5 MHz</td></tr>
<tr><td>Low</td><td>18650/ 1855</td><td>18625/ 1852.5</td><td colspan="3" rowspan="3">Secondary Cell is Downlink only</td></tr>
<tr><td>Mid</td><td>18900/ 1880</td><td>18900/ 1880</td></tr>
<tr><td>High</td><td>19150/ 1905</td><td>19175/ 1907.5</td></tr>
<tr><td rowspan="2">Band 4 Primary</td><td colspan="2">Channel Bandwidth</td><td rowspan="2">Band 17 Secondary</td><td colspan="2">Channel Bandwidth</td></tr>
<tr><td>10 MHz</td><td>5 MHz</td><td>10 MHz</td><td>5 MHz</td></tr>
<tr><td>Low</td><td>20000/ 1715</td><td>19975/ 1712.5</td><td colspan="3" rowspan="3">Secondary Cell is Downlink only</td></tr>
<tr><td>Mid</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td></tr>
<tr><td>High</td><td>20350/ 1750</td><td>20375/ 1752.5</td></tr>
<tr><td rowspan="2">Band 17 Primary</td><td colspan="2">Channel Bandwidth</td><td rowspan="2">Band 2 Secondary</td><td colspan="2">Channel Bandwidth</td></tr>
<tr><td>10 MHz</td><td>5 MHz</td><td>10 MHz</td><td>5 MHz</td></tr>
<tr><td>Low</td><td>23780/ 709</td><td>23755/ 706.5</td><td colspan="3" rowspan="3">Secondary Cell is Downlink only</td></tr>
<tr><td>Mid</td><td>23790/ 710</td><td>23790/ 710</td></tr>
<tr><td>High</td><td>23800/ 711</td><td>23825/ 713.5</td></tr>
</table>
</td></tr>
</table>

General LTE SAR Test and Reporting Considerations (continued)

<table>
<tr><td rowspan="4">Carrier Aggregation Combinations (cont.)</td><td>Band 17
Primary</td><td colspan="2">Channel Bandwidth</td><td>Band 4
Secondary</td><td colspan="2">Channel Bandwidth</td></tr>
<tr><td></td><td>10 MHz</td><td>5 MHz</td><td></td><td>10 MHz</td><td>5 MHz</td></tr>
<tr><td>Low</td><td>23780/
709</td><td>23755/
706.5</td><td rowspan="3">Secondary Cell is Downlink only</td><td colspan="2" rowspan="3"></td></tr>
<tr><td>Mid</td><td>23790/
710</td><td>23790/
710</td></tr>
<tr><td>High</td><td>23800/
711</td><td>23825/
713.5</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td colspan="7">LTE has two (2) TX/RX antennas and two (2) RX antennas
TX/RX Antenna 1: LTE Band 17 RX Antenna 4: LTE Bands 2, 4, 5
TX/RX Antenna 2: LTE Bands 2, 4, 5 RX Antenna 6: LTE Band 17
Refer to Appendix 15.1. Photos and Antenna Locations.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td colspan="7">
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (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>
</table>
MPR Built-in by design
A-MPR (additional MPR) was disabled during SAR testing
</td></tr>
<tr><td>Power reduction</td><td colspan="7">No</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>

8. RF Exposure Conditions

Refer to Appendix "Antenna Locations and Separation Distances" for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

8.1. Head Exposure Conditions

For WWAN, LTE and Wi-Fi

Test Configurations	SAR Required	Note
Left Touch	Yes	
Left Tilt (15°)	Yes	
Right Touch	Yes	
Right Tilt (15°)	Yes	

8.2. Body-worn Accessory Exposure Conditions

For WWAN and LTE

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	

For Wi-Fi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	

8.3. Hotspot Exposure Conditions and Wi-Fi Direct

For WWAN and LTE Band 2/4/5(②)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	128.95 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 2 (Right)	53.39 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 3 (Bottom)	2 mm	Yes	
Edge 4 (Left)	1.85 mm	Yes	

For LTE Band 17 (①)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	130.49 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 2 (Right)	1.85 mm	Yes	
Edge 3 (Bottom)	2 mm	Yes	
Edge 4 (Left)	45.75 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR

For Wi-Fi (⑤)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	2.50 mm	Yes	
Edge 2 (Right)	14.40 mm	Yes	
Edge 3 (Bottom)	140.29 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR
Edge 4 (Left)	34.34 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR

9. RF Output Power Measurement

9.1. GSM

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)
850	GSM (Voice)	CS1	1	128	824.2	33.3	24.3
				190	836.6	33.2	24.2
				251	848.8	33.2	24.2
	GPRS (GMSK)	CS1	1	128	824.2	33.3	24.3
				190	836.6	33.2	24.2
				251	848.8	33.2	24.2
			2	**128**	**824.2**	**31.5**	**25.5**
				190	**836.6**	**31.4**	**25.4**
				251	**848.8**	**31.4**	**25.4**
	EGPRS (8PSK)	MCS5	1	128	824.2	27.3	18.3
				190	836.6	27.3	18.3
				251	848.8	27.2	18.2
			2	128	824.2	27.2	21.2
				190	836.6	27.1	21.1
				251	848.8	27.1	21.1

Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)
1900	GSM (Voice)	CS1	1	512	1850.2	30.4	21.4
				661	1880.0	30.5	21.5
				810	1909.8	30.5	21.5
	GPRS (GMSK)	CS1	1	512	1850.2	30.4	21.4
				661	1880.0	30.5	21.5
				810	1909.8	30.5	21.5
			2	**512**	**1850.2**	**28.4**	**22.4**
				661	**1880.0**	**28.5**	**22.5**
				810	**1909.8**	**28.5**	**22.5**
	EGPRS (8PSK)	MCS5	1	512	1850.2	26.5	17.5
				661	1880.0	26.5	17.5
				810	1909.8	26.5	17.5
			2	512	1850.2	26.3	20.3
				661	1880.0	26.4	20.4
				810	1909.8	26.4	20.4

Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

9.2. W-CDMA

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel. 99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm 2
	βc/βd	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.6
		4183	836.6	23.6
		4233	846.6	23.5
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.5
		9400	1880.0	23.6
		9538	1907.6	23.5

HSDPA

The following 4 Sub-tests were completed according to Release 5 / 6 procedures in section 5.2 of 3GPP TS34.121-1. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs=βhs/βc	30/15			

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	23.6
		4183	836.6	23.6
		4233	846.6	23.5
	Subtest 2	4132	826.4	23.3
		4183	836.6	23.3
		4233	846.6	23.2
	Subtest 3	4132	826.4	23.2
		4183	836.6	23.2
		4233	846.6	23.1
	Subtest 4	4132	826.4	23.2
		4183	836.6	23.2
		4233	846.6	23.1
W-CDMA Band II	Subtest 1	9262	1852.4	23.5
		9400	1880.0	23.6
		9538	1907.6	23.5
	Subtest 2	9262	1852.4	23.2
		9400	1880.0	23.3
		9538	1907.6	23.2
	Subtest 3	9262	1852.4	23.1
		9400	1880.0	23.2
		9538	1907.6	23.1
	Subtest 4	9262	1852.4	23.1
		9400	1880.0	23.2
		9538	1907.6	23.1

Maximum output power levels that are possible for all subtests reported.

HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 7 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	11/15	15/9	2/15	15/0
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	1309/225	94/75	47/15 47/15	56/75	47/15
	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	Ahs = βhs/βc	30/15				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
	Reference E-TFCI PO	27	27	27	27	27
	Maximum Channelisation Codes	2xSF2				SF4

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.5
		4183	836.6	22.5
		4233	846.6	22.6
	Subtest 2	4132	826.4	21.6
		4183	836.6	22.0
		4233	846.6	22.0
	Subtest 3	4132	826.4	22.3
		4183	836.6	22.5
		4233	846.6	22.0
	Subtest 4	4132	826.4	21.8
		4183	836.6	22.0
		4233	846.6	22.0
	Subtest 5	4132	826.4	22.8
		4183	836.6	23.0
		4233	846.6	22.4
W-CDMA Band II	Subtest 1	9262	1852.4	22.6
		9400	1880.0	23.2
		9538	1907.6	23.3
	Subtest 2	9262	1852.4	21.6
		9400	1880.0	21.9
		9538	1907.6	22.0
	Subtest 3	9262	1852.4	22.4
		9400	1880.0	22.2
		9538	1907.6	22.2
	Subtest 4	9262	1852.4	22.5
		9400	1880.0	22.2
		9538	1907.6	22.4
	Subtest 5	9262	1852.4	23.0
		9400	1880.0	22.6
		9538	1907.6	23.1

9.3. LTE Band

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 3

Modulation	Channel bandwidth / Transmission bandwidth (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

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 Signalling Value of “NS_01”.

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

Network Signalling value	Requirements (sub-clause)	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	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-
Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.					

LTE Band 2 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	0	23.8	23.8	23.9
			1	25	0	0	23.7	23.9	23.9
			1	49	0	0	23.8	23.9	23.9
			25	0	1	1	23.0	23.0	22.9
			25	12	1	1	22.9	22.9	23.0
			25	25	1	1	22.9	22.9	22.9
			50	0	1	1	22.9	22.9	23.0
		16QAM	1	0	1	1	22.8	22.8	22.9
			1	25	1	1	22.7	22.7	22.8
			1	49	1	1	22.7	22.7	22.8
			25	0	2	2	22.0	22.1	21.9
			25	12	2	2	21.9	22.0	22.0
			25	25	2	2	21.9	22.0	21.9
			50	0	2	2	22.0	22.0	22.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	0	23.8	23.8	23.8
			1	12	0	0	23.7	23.8	23.8
			1	24	0	0	23.7	23.6	23.9
			12	0	1	1	22.9	22.9	22.9
			12	7	1	1	22.9	22.8	22.9
			12	13	1	1	23.0	22.9	22.9
			25	0	1	1	22.9	22.9	22.8
		16QAM	1	0	1	1	22.7	22.7	22.8
			1	12	1	1	22.7	22.7	22.8
			1	24	1	1	22.7	22.6	22.8
			12	0	2	2	22.0	21.9	21.8
			12	7	2	2	21.8	21.9	21.8
			12	13	2	2	21.8	21.9	21.9
			25	0	2	2	21.9	21.9	21.9

LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	0	23.9	24.0	24.0
			1	25	0	0	24.0	24.0	23.9
			1	49	0	0	24.0	24.1	23.8
			25	0	1	1	23.1	23.1	23.1
			25	12	1	1	23.1	23.1	23.1
			25	25	1	1	23.1	23.1	23.0
			50	0	1	1	23.2	23.1	23.1
		16QAM	1	0	1	1	23.0	22.9	22.9
			1	25	1	1	23.0	22.9	22.8
			1	49	1	1	23.0	22.9	22.8
			25	0	2	2	22.1	22.1	22.1
			25	12	2	2	22.1	22.1	22.1
			25	25	2	2	22.0	22.1	22.0
			50	0	2	2	22.2	22.2	22.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1715 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	0	23.9	23.9	23.9
			1	12	0	0	23.9	23.9	23.8
			1	24	0	0	23.9	24.0	23.8
			12	0	1	1	23.1	23.1	23.0
			12	7	1	1	23.0	23.1	23.0
			12	13	1	1	23.1	23.1	22.9
			25	0	1	1	23.1	23.1	23.0
		16QAM	1	0	1	1	22.9	22.9	22.9
			1	12	1	1	22.8	22.9	22.7
			1	24	1	1	22.9	22.8	22.7
			12	0	2	2	22.0	22.1	22.0
			12	7	2	2	22.0	22.1	22.0
			12	13	2	2	22.0	22.1	22.0
			25	0	2	2	22.1	22.1	22.0

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	0	23.9	24.0	23.9
			1	25	0	0	23.9	23.9	23.9
			1	49	0	0	23.9	24.0	23.8
			25	0	1	1	23.0	23.0	22.9
			25	12	1	1	23.0	22.9	22.9
			25	25	1	1	23.0	23.0	22.9
			50	0	1	1	23.0	23.0	23.0
		16QAM	1	0	1	1	22.9	22.8	22.8
			1	25	1	1	22.8	22.7	22.8
			1	49	1	1	22.8	22.9	22.7
			25	0	2	2	22.0	21.9	22.0
			25	12	2	2	21.9	22.0	22.0
			25	25	2	2	21.9	21.9	22.0
			50	0	2	2	22.0	22.1	22.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	0	23.9	23.9	23.8
			1	12	0	0	23.9	23.9	23.8
			1	24	0	0	23.9	23.9	23.7
			12	0	1	1	22.9	22.9	22.8
			12	7	1	1	22.9	22.9	22.8
			12	13	1	1	22.9	23.0	22.9
			25	0	1	1	23.0	22.9	22.9
		16QAM	1	0	1	1	22.8	22.8	22.7
			1	12	1	1	22.7	22.7	22.7
			1	24	1	1	22.7	22.9	22.6
			12	0	2	2	22.0	21.9	21.9
			12	7	2	2	21.9	21.9	21.9
			12	13	2	2	21.8	21.8	21.8
			25	0	2	2	22.0	21.9	21.8

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm) 710 MHz
LTE Band 17	10	QPSK	1	0	0	0	23.5
			1	25	0	0	23.4
			1	49	0	0	23.5
			25	0	1	1	22.5
			25	12	1	1	22.5
			25	25	1	1	22.5
			50	0	1	1	22.6
		16QAM	1	0	1	1	22.4
			1	25	1	1	22.3
			1	49	1	1	22.4
			25	0	2	2	21.5
			25	12	2	2	21.5
			25	25	2	2	21.5
			50	0	2	2	21.5
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm) 710 MHz
LTE Band 17	5	QPSK	1	0	0	0	23.4
			1	12	0	0	23.4
			1	24	0	0	23.4
			12	0	1	1	22.5
			12	7	1	1	22.5
			12	13	1	1	22.4
			25	0	1	1	22.5
		16QAM	1	0	1	1	22.3
			1	12	1	1	22.3
			1	24	1	1	22.3
			12	0	2	2	21.5
			12	7	2	2	21.5
			12	13	2	2	21.5
			25	0	2	2	21.6

Note(s):

10/5 MHz Bandwidths 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

9.3.1. LTE Rel. 10 Carrier Aggregation

The following power measurements were performed with a single carrier uplink; CA for this particular project only supports one (1) uplink and two (2) downlinks.

CA: LTE Band 2 (PCC) + LTE Band 17 (SCC)

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 2 (Primary Cell)			LTE Band 17 (Secondary Cell)		
						1855 MHz	1880 MHz	1905 MHz	709 MHz	710 MHz	711 MHz
10	QPSK	1	0	0	0	23.9	24.0	24.1	Downlink Only		
		1	25	0	0	23.9	24.0	24.0			
		1	49	0	0	23.9	24.0	24.1			
		25	0	1	1	22.8	23.0	23.0			
		25	12	1	1	22.8	23.0	23.1			
		25	25	1	1	22.8	23.0	23.1			
		50	0	1	1	22.9	23.0	23.1			
	16QAM	1	0	1	1	22.9	23.1	23.1			
		1	25	1	1	22.9	23.1	23.0			
		1	49	1	1	22.9	23.0	23.1			
		25	0	2	2	21.8	22.0	22.0			
		25	12	2	2	21.9	22.0	22.0			
		25	25	2	2	21.8	22.0	22.0			
		50	0	2	2	21.9	22.0	22.0			

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 2 (Primary Cell)			LTE Band 17 (Secondary Cell)		
						1852.5 MHz	1880 MHz	1907.5 MHz	706.5 MHz	710 MHz	713.5 MHz
5	QPSK	1	0	0	0	23.8	24.0	24.0	Downlink Only		
		1	12	0	0	23.8	24.0	24.0			
		1	24	0	0	23.8	23.9	24.1			
		12	0	1	1	22.8	22.9	23.1			
		12	6	1	1	22.8	22.9	23.1			
		12	11	1	1	22.7	22.9	23.1			
		25	0	1	1	22.8	23.0	23.1			
	16QAM	1	0	1	1	22.7	22.9	23.0			
		1	12	1	1	22.7	22.9	23.0			
		1	24	1	1	22.8	22.8	23.1			
		12	0	2	2	21.8	22.0	22.1			
		12	6	2	2	21.9	22.0	22.1			
		12	11	2	2	21.9	22.0	22.0			
		25	0	2	2	21.8	22.0	22.1			

CA: LTE Band 4 (PCC) + LTE Band 17 (SCC)

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 4 (Primary Cell)			LTE Band 17 (Secondary Cell)		
						1715 MHz	1735.5 MHz	1750 MHz	709 MHz	710 MHz	711 MHz
10	QPSK	1	0	0	0	24.1	24.2	24.0	Downlink Only		
		1	25	0	0	24.0	24.2	24.1			
		1	49	0	0	24.1	24.2	24.0			
		25	0	1	1	23.1	23.2	23.1			
		25	12	1	1	23.1	23.2	23.1			
		25	25	1	1	23.1	23.2	23.1			
		50	0	1	1	23.1	23.2	23.1			
	16QAM	1	0	1	1	23.1	23.2	23.1			
		1	25	1	1	23.0	23.2	23.1			
		1	49	1	1	23.0	23.2	23.1			
		25	0	2	2	22.1	22.2	22.1			
		25	12	2	2	22.1	22.2	22.1			
		25	25	2	2	22.1	22.2	22.0			
		50	0	2	2	22.1	22.2	22.0			

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 4 (Primary Cell)			LTE Band 17 (Secondary Cell)		
						1712.5 MHz	1732.5 MHz	1752.5 MHz	706.5 MHz	710 MHz	713.5 MHz
5	QPSK	1	0	0	0	24.1	24.1	24.2	Downlink Only		
		1	12	0	0	24.0	24.1	24.0			
		1	24	0	0	24.0	24.2	24.1			
		12	0	1	1	23.1	23.1	23.1			
		12	6	1	1	23.0	23.1	23.1			
		12	11	1	1	23.1	23.1	23.1			
		25	0	1	1	23.1	23.1	23.1			
	16QAM	1	0	1	1	23.1	23.1	23.0			
		1	12	1	1	23.0	23.1	23.0			
		1	24	1	1	23.0	23.1	23.0			
		12	0	2	2	22.2	22.2	22.0			
		12	6	2	2	22.0	22.3	22.0			
		12	11	2	2	22.0	22.3	22.0			
		25	0	2	2	22.2	22.2	22.0			

CA: LTE Band 17 (PCC) + LTE Band 2 (SCC)

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 17 (Primary Cell)			LTE Band 2 (Secondary Cell)		
						709 MHz	710 MHz	711 MHz	1855 MHz	1880 MHz	1905 MHz
10	QPSK	1	0	0	0	23.7	23.7	22.5	Downlink Only		
		1	25	0	0	23.6	23.6	22.5			
		1	49	0	0	23.6	23.6	22.6			
		25	0	1	1	22.6	22.6	21.5			
		25	12	1	1	22.5	22.5	21.5			
		25	25	1	1	22.5	22.5	21.6			
		50	0	1	1	22.6	22.5	21.6			
	16QAM	1	0	1	1	22.7	22.7	22.5			
		1	25	1	1	22.7	22.6	22.5			
		1	49	1	1	22.6	22.5	22.6			
		25	0	2	2	21.6	21.6	21.5			
		25	12	2	2	21.6	21.5	21.6			
		25	25	2	2	21.5	21.5	21.5			
		50	0	2	2	21.5	21.6	21.5			

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 17 (Primary Cell)			LTE Band 2 (Secondary Cell)		
						706.5 MHz	710 MHz	713.5 MHz	1852.5 MHz	1880 MHz	1907.5 MHz
5	QPSK	1	0	0	0	23.5	23.5	23.5	Downlink Only		
		1	12	0	0	23.5	23.5	23.5			
		1	24	0	0	23.5	23.5	23.5			
		12	0	1	1	22.6	22.5	22.5			
		12	6	1	1	22.6	22.5	22.5			
		12	11	1	1	22.5	22.5	22.5			
		25	0	1	1	22.6	22.5	22.5			
	16QAM	1	0	1	1	22.5	22.5	22.4			
		1	12	1	1	22.5	22.4	22.3			
		1	24	1	1	22.5	22.5	22.3			
		12	0	2	2	21.6	21.6	21.5			
		12	6	2	2	21.6	21.6	21.5			
		12	11	2	2	21.6	21.5	21.5			
		25	0	2	2	21.6	21.5	21.5			

CA: LTE Band 17 (PCC) + LTE Band 4 (SCC)

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 17 (Primary Cell)			LTE Band 4 (Secondary Cell)		
						709 MHz	710 MHz	711 MHz	1715 MHz	1735.5 MHz	1750 MHz
10	QPSK	1	0	0	0	23.6	23.6	23.6	Downlink Only		
		1	25	0	0	23.5	23.5	23.6			
		1	49	0	0	23.5	23.5	23.5			
		25	0	1	1	22.6	22.5	22.5			
		25	12	1	1	22.5	22.5	22.5			
		25	25	1	1	22.5	22.5	22.5			
		50	0	1	1	22.5	22.5	22.5			
	16QAM	1	0	1	1	22.6	22.5	22.6			
		1	25	1	1	22.5	22.4	22.5			
		1	49	1	1	22.5	22.4	22.5			
		25	0	2	2	21.5	21.6	21.5			
		25	12	2	2	21.5	21.6	21.5			
		25	25	2	2	21.5	21.5	21.5			
		50	0	2	2	21.6	21.6	21.6			

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 17 (Primary Cell)			LTE Band 4 (Secondary Cell)		
						706.5 MHz	710 MHz	713.5 MHz	1712.5 MHz	1732.5 MHz	1752.5 MHz
5	QPSK	1	0	0	0	23.5	23.6	23.5	Downlink Only		
		1	12	0	0	23.6	23.5	23.5			
		1	24	0	0	23.5	23.5	23.5			
		12	0	1	1	22.6	22.5	22.5			
		12	6	1	1	22.6	22.5	22.5			
		12	11	1	1	22.6	22.5	22.5			
		25	0	1	1	22.5	22.5	22.5			
	16QAM	1	0	1	1	22.5	22.5	22.4			
		1	12	1	1	22.5	22.4	22.4			
		1	24	1	1	22.5	22.4	22.4			
		12	0	2	2	21.6	21.6	21.5			
		12	6	2	2	21.6	21.6	21.5			
		12	11	2	2	21.6	21.6	21.5			
		25	0	2	2	21.6	21.6	21.6			

9.4. Wi-Fi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	**2.412**	1#	√	∇
		2.437	6	√	∇
		2.462	11#	√	∇

Notes:
√ = "default test channels"
∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"
= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1 Mbps	1	2412	15.7	Yes
			6	2437	15.9	
			11	2462	16.2	
	802.11g	6 Mbps	1	2412	13.7	No
			6	2437	14.2	
			11	2462	14.5	
	802.11n (HT20)	MCS0	1	2412	11.8	No
			6	2437	12.2	
			11	2462	12.5	

Note(s):

Per KDB 248227 D01, SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
802.11b	6	2437	1 Mbps	15.9	Yes
			2 Mbps	15.9	No
			5.5 Mbps	15.9	No
			11 Mbps	14.2	No

9.5. Wi-Fi (5 GHz Bands)

Required Test Channels per KDB 248227 D01

Mode		Band	GHz	Channel	"Default Test Channels"	
					802.11a	
802.11a	UNII (15.407)	5.2 GHz	5.180	36	√	
			5.200	40		*
			2.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
			5.580	116	√	
			5.600	120		*
			5.620	124	√	
			5.640	128		*
			5.660	132		*
			5.680	136	√	
			5.700	140		*
	DTS (15.247)	5.8 GHz	5.745	149	√	
			5.765	153		*
			5.785	157	√	
			5.805	161		*
			5.825	165	√	

√ = "default test channels"

* = possible 802.11a channels with maximum average output > the "default test channels"

= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (UNII)	802.11a	6 Mbps	36	5180	10.0	Yes
			40	5200	9.9	
			44	5220	9.9	
			48	5240	10.0	
	802.11n (HT20)	MCS0	36	5180	9.6	No
			40	5200	9.7	
			44	5220	9.7	
			48	5240	9.8	
	802.11n (HT40)	MCS0	38	5190	8.9	No
			46	5230	8.9	
5.3 (UNII)	802.11a	6 Mbps	52	5260	10.0	Yes
			56	5280	10.0	
			60	5300	10.1	
			64	5320	10.2	
	802.11n (HT20)	MCS0	52	5260	9.9	Yes
			56	5280	10.0	
			60	5300	9.9	
			64	5320	10.0	
	802.11n (HT40)	MCS0	54	5270	9.0	No
			62	5310	9.1	
5.5 (UNII)	802.11a	6 Mbps	100	5500	10.3	Yes
			104	5520	10.4	
			108	5540	10.3	
			112	5560	10.3	
			116	5580	10.2	
			120	5600	Not Supported	
			124	5620	Not Supported	
			128	5640	Not Supported	
			132	5660	10.2	
			136	5680	10.2	
			140	5700	10.1	
	802.11n (HT20)	MCS0	100	5500	10.2	Yes
			104	5520	10.2	
			108	5540	10.2	
			112	5560	10.2	
			116	5580	10.1	
			120	5600	Not Supported	
			124	5620	Not Supported	
			128	5640	Not Supported	
			132	5660	10.2	
			136	5680	10.0	
			140	5700	10.0	
	802.11n (HT40)	MCS0	102	5510	9.9	No
			110	5550	9.8	
			134	5670	9.5	

Wi-Fi (5 GHz Bands) Measured Results (continued)

Band (GHz)	Mode	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.8 (DTS)	802.11a	6 Mbps	149	5745	9.9	Yes
			153	5765	9.7	
			157	5785	9.7	
			161	5805	9.7	
			165	5825	9.7	
	802.11n (HT20)	MCS0	149	5745	9.8	no
			153	5765	9.7	
			157	5785	9.6	
			161	5805	9.6	
			165	5825	9.5	
	802.11n (HT40)	MCS0	151	5755	9.2	No
			159	5795	9.2	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

Power measurements to determine worst-case data rates

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
5.2 GHz (UNII)	802.11a	44	5220	6 Mbps	10.0	Yes
				9 Mbps	10.0	No
				12 Mbps	10.0	No
				18 Mbps	9.9	No
				24 Mbps	10.0	No
				36 Mbps	10.0	No
				48 Mbps	9.9	No
				54 Mbps	9.9	No
5.3 GHz (UNII)	802.11a	64	5320	6 Mbps	10.2	Yes
				9 Mbps	10.3	No
				12 Mbps	10.3	No
				18 Mbps	10.3	No
				24 Mbps	10.3	No
				36 Mbps	10.3	No
				48 Mbps	10.2	No
				54 Mbps	10.3	No
5.5 GHz (UNII)	802.11a	104	5520	6 Mbps	10.5	Yes
				9 Mbps	10.5	No
				12 Mbps	10.5	No
				18 Mbps	10.5	No
				24 Mbps	10.5	No
				36 Mbps	10.5	No
				48 Mbps	10.5	No
				54 Mbps	10.4	No
5.8 GHz (DTS)	802.11a	149	5745	6 Mbps	9.8	Yes
				9 Mbps	9.8	No
				12 Mbps	9.8	No
				18 Mbps	9.8	No
				24 Mbps	9.8	No
				36 Mbps	9.8	No
				48 Mbps	9.7	No
				54 Mbps	9.7	No

9.6. Bluetooth

Maximum tune-up tolerance limit is 11.5 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

Refer to Standalone SAR Test Exclusion Considerations Section.

10. Tissue Dielectric Properties

IEEE Standard 1528-2013

Target Frequency (MHz)	Head	
	ε_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
750	*41.9*	*0.89*
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1500	*40.4*	*1.23*
1640	*40.2*	*1.31*
1750	*40.1*	*1.37*
1800	40.0	1.40
1900	40.0	1.40
2000	40.0	1.40
2100	*39.8*	*1.49*
2300	*39.5*	*1.67*
2450	39.2	1.80
2600	*39.0*	*1.96*
3000	38.5	2.40
3500	*37.9*	*2.91*
4000	*37.4*	*3.43*
4500	*36.8*	*3.94*
5000	*36.2*	*4.45*
5200	*36.0*	*4.66*
5400	*35.8*	*4.86*
5600	*35.5*	*5.07*
5800	35.3	5.27
6000	*35.1*	*5.48*

NOTE—For convenience, permittivity and conductivity values at some frequencies that are not part of the original data from Drossos et al. [B60] or the extension to 5800 MHz are provided (i.e., the values shown in italics). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6000 MHz that were linearly extrapolated from the values at 3000 MHz and 5800 MHz.

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

10.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests

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

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

MSL/HSL750 (Body and Head liquids for 700 – 800 MHz)

Item	Head Tissue Simulation Liquids HSL750 Muscle (body) Tissue Simulation Liquids MSL750
Type No	SL AAH 075
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H^2O	Water, 35 – 58%
Sucrese	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethel-cellulsoe	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1-0.7%

MSL/HSL1750 (Body and Head liquids for 1700 – 1800 MHz)

Item	Head Tissue Simulation Liquids HSL1750 Muscle (body) Tissue Simulation Liquids MSL1750
Type No	SL AAM 175
Manufacturer	SPEAG
-The item is composed of the following ingredients:	
H_2O	Water, 52 – 75%
$C_8H_{18}O_3$	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

10.2. Tissue Dielectric Parameter Check Results

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.

SAR Lab 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/2/2014	Body 5180	e'	46.9100	Relative Permittivity (ϵ_r):	46.91	49.05	-4.36	5
		e''	18.3900	Conductivity (σ):	5.30	5.27	0.48	5
	Body 5200	e'	46.8800	Relative Permittivity (ϵ_r):	46.88	49.02	-4.36	5
		e''	18.4100	Conductivity (σ):	5.32	5.29	0.53	5
	Body 5600	e'	46.2300	Relative Permittivity (ϵ_r):	46.23	48.48	-4.64	5
		e''	18.7000	Conductivity (σ):	5.82	5.76	1.07	5
	Body 5800	e'	45.9300	Relative Permittivity (ϵ_r):	45.93	48.20	-4.71	5
		e''	18.8600	Conductivity (σ):	6.08	6.00	1.37	5
	Body 5825	e'	45.8800	Relative Permittivity (ϵ_r):	45.88	48.20	-4.81	5
		e''	18.8800	Conductivity (σ):	6.12	6.00	1.92	5
6/4/2014	Head 5180	e'	37.7000	Relative Permittivity (ϵ_r):	37.70	36.01	4.68	5
		e''	15.4200	Conductivity (σ):	4.44	4.63	-4.09	5
	Head 5200	e'	37.6700	Relative Permittivity (ϵ_r):	37.67	35.99	4.67	5
		e''	15.4500	Conductivity (σ):	4.47	4.65	-3.95	5
	Head 5600	e'	37.1600	Relative Permittivity (ϵ_r):	37.16	35.53	4.58	5
		e''	15.6100	Conductivity (σ):	4.86	5.06	-3.95	5
	Head 5800	e'	36.9000	Relative Permittivity (ϵ_r):	36.90	35.30	4.53	5
		e''	15.7200	Conductivity (σ):	5.07	5.27	-3.80	5
	Head 5825	e'	36.8900	Relative Permittivity (ϵ_r):	36.89	35.30	4.50	5
		e''	15.7400	Conductivity (σ):	5.10	5.27	-3.26	5
6/6/2014	Head 1750	e'	38.2400	Relative Permittivity (ϵ_r):	38.24	40.08	-4.60	5
		e''	14.3200	Conductivity (σ):	1.39	1.37	1.79	5
	Head 1710	e'	38.4300	Relative Permittivity (ϵ_r):	38.43	40.15	-4.27	5
		e''	14.2100	Conductivity (σ):	1.35	1.35	0.35	5
	Head 1755	e'	38.2100	Relative Permittivity (ϵ_r):	38.21	40.08	-4.66	5
		e''	14.3400	Conductivity (σ):	1.40	1.37	2.01	5
6/5/2014	Body 1750	e'	53.3400	Relative Permittivity (ϵ_r):	53.34	53.44	-0.19	5
		e''	15.8700	Conductivity (σ):	1.54	1.49	3.91	5
	Body 1710	e'	53.4800	Relative Permittivity (ϵ_r):	53.48	53.54	-0.12	5
		e''	15.7400	Conductivity (σ):	1.50	1.46	2.40	5
	Body 1755	e'	53.3200	Relative Permittivity (ϵ_r):	53.32	53.43	-0.20	5
		e''	15.8800	Conductivity (σ):	1.55	1.49	4.06	5
6/9/2014	Head 1900	e'	38.1500	Relative Permittivity (ϵ_r):	38.15	40.00	-4.63	5
		e''	13.3800	Conductivity (σ):	1.41	1.40	0.97	5
	Head 1850	e'	38.3900	Relative Permittivity (ϵ_r):	38.39	40.00	-4.03	5
		e''	13.3000	Conductivity (σ):	1.37	1.40	-2.28	5
	Head 1910	e'	38.1100	Relative Permittivity (ϵ_r):	38.11	40.00	-4.73	5
		e''	13.3900	Conductivity (σ):	1.42	1.40	1.57	5

SAR Lab 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/2/2014	Head 835	e'	42.4800	Relative Permittivity (ϵ_r):	42.48	41.50	2.36	5
		e''	20.2300	Conductivity (σ):	0.94	0.90	4.36	5
	Head 820	e'	42.6400	Relative Permittivity (ϵ_r):	42.64	41.60	2.49	5
		e''	20.3300	Conductivity (σ):	0.93	0.90	3.17	5
	Head 850	e'	42.3900	Relative Permittivity (ϵ_r):	42.39	41.50	2.14	5
		e''	20.1700	Conductivity (σ):	0.95	0.92	4.18	5
6/3/2014	Body 835	e'	54.9400	Relative Permittivity (ϵ_r):	54.94	55.20	-0.47	5
		e''	21.9000	Conductivity (σ):	1.02	0.97	4.82	5
	Body 820	e'	55.0300	Relative Permittivity (ϵ_r):	55.03	55.28	-0.45	5
		e''	21.9900	Conductivity (σ):	1.00	0.97	3.53	5
	Body 850	e'	54.8300	Relative Permittivity (ϵ_r):	54.83	55.16	-0.59	5
		e''	21.8800	Conductivity (σ):	1.03	0.99	4.76	5
6/6/2014	Head 835	e'	40.3300	Relative Permittivity (ϵ_r):	40.33	41.50	-2.82	5
		e''	19.9000	Conductivity (σ):	0.92	0.90	2.66	5
	Head 820	e'	40.5300	Relative Permittivity (ϵ_r):	40.53	41.60	-2.58	5
		e''	19.9100	Conductivity (σ):	0.91	0.90	1.04	5
	Head 850	e'	40.1200	Relative Permittivity (ϵ_r):	40.12	41.50	-3.33	5
		e''	19.8500	Conductivity (σ):	0.94	0.92	2.53	5

SAR Lab 3

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/4/2014	Head 2450	e'	38.0900	Relative Permittivity (ϵ_r):	38.09	39.20	-2.83	5
		e''	13.8400	Conductivity (σ):	1.89	1.80	4.74	5
	Head 2410	e'	38.2600	Relative Permittivity (ϵ_r):	38.26	39.28	-2.59	5
		e''	13.7300	Conductivity (σ):	1.84	1.76	4.51	5
	Head 2475	e'	37.9800	Relative Permittivity (ϵ_r):	37.98	39.17	-3.03	5
		e''	13.9100	Conductivity (σ):	1.91	1.83	4.77	5
6/4/2014	Body 2450	e'	50.4700	Relative Permittivity (ϵ_r):	50.47	52.70	-4.23	5
		e''	14.6500	Conductivity (σ):	2.00	1.95	2.35	5
	Body 2410	e'	50.6300	Relative Permittivity (ϵ_r):	50.63	52.76	-4.04	5
		e''	14.4900	Conductivity (σ):	1.94	1.91	1.79	5
	Body 2475	e'	50.3800	Relative Permittivity (ϵ_r):	50.38	52.67	-4.35	5
		e''	14.7500	Conductivity (σ):	2.03	1.99	2.25	5

SAR Lab 4

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/2/2014	Body 1900	e'	50.6800	Relative Permittivity (ϵ_r):	50.68	53.30	-4.92	5
		e''	14.6000	Conductivity (σ):	1.54	1.52	1.48	5
	Body 1850	e'	50.9300	Relative Permittivity (ϵ_r):	50.93	53.30	-4.45	5
		e''	14.4600	Conductivity (σ):	1.49	1.52	-2.14	5
	Body 1910	e'	50.6700	Relative Permittivity (ϵ_r):	50.67	53.30	-4.93	5
		e''	14.6200	Conductivity (σ):	1.55	1.52	2.15	5
6/2/2014	Head 1900	e'	38.1300	Relative Permittivity (ϵ_r):	38.13	40.00	-4.67	5
		e''	13.3800	Conductivity (σ):	1.41	1.40	0.97	5
	Head 1850	e'	38.3800	Relative Permittivity (ϵ_r):	38.38	40.00	-4.05	5
		e''	13.2600	Conductivity (σ):	1.36	1.40	-2.57	5
	Head 1910	e'	38.0800	Relative Permittivity (ϵ_r):	38.08	40.00	-4.80	5
		e''	13.4100	Conductivity (σ):	1.42	1.40	1.73	5
6/4/2014	Body 750	e'	53.3100	Relative Permittivity (ϵ_r):	53.31	55.55	-4.03	5
		e''	23.2400	Conductivity (σ):	0.97	0.96	0.63	5
	Body 700	e'	53.9800	Relative Permittivity (ϵ_r):	53.98	55.74	-3.15	5
		e''	23.5500	Conductivity (σ):	0.92	0.96	-4.44	5
	Body 725	e'	53.6400	Relative Permittivity (ϵ_r):	53.64	55.64	-3.60	5
		e''	23.3800	Conductivity (σ):	0.94	0.96	-1.94	5
6/4/2014	Head 750	e'	40.2700	Relative Permittivity (ϵ_r):	40.27	41.96	-4.03	5
		e''	21.7600	Conductivity (σ):	0.91	0.89	1.61	5
	Head 700	e'	41.0000	Relative Permittivity (ϵ_r):	41.00	42.22	-2.88	5
		e''	22.1300	Conductivity (σ):	0.86	0.89	-3.14	5
	Head 725	e'	40.6300	Relative Permittivity (ϵ_r):	40.63	42.09	-3.47	5
		e''	21.9500	Conductivity (σ):	0.88	0.89	-0.71	5

11. System Performance 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.

11.1. 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.

11.2. Reference SAR Values for System Performance Check

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D750V3	1071	11/15/2013	750	1g	8.46	8.64
				10g	5.51	5.72
D835V2	4d002	11/15/2013	835	1g	9.49	9.43
				10g	6.18	6.21
D1750V2	1077	9/12/2013	1750	1g	37.6	37.7
				10g	20.0	20.3
D1900V2	5d043	11/12/2013	1900	1g	40.1	39.0
				10g	21.1	20.8
D2450V2	899	9/10/2013	2450	1g	51.3	49.7
				10g	23.9	23.3
D5GHzV2	1138	11/19/2013	5200	1g	78.5	72.9
				10g	22.5	20.4
			5600	1g	82.7	78.3
				10g	23.5	21.7
			5800	1g	78.3	72.8
				10g	22.4	20.1

11.3. System Performance 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.

SAR Lab 1

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
6/2/2014	D5GHzV2 5.2GHz	1138	Body	1g	6.35	6.89	68.9	72.9	-5.49	-8.50	
				10g	1.80	1.94	19.4	20.4	-4.90		
	D5GHzV2 5.6GHz			1g	7.38	7.85	78.5	78.3	0.26	-6.37	
				10g	2.05	2.18	21.8	21.7	0.46		
	D5GHzV2 5.8GHz			1g	6.26	6.77	67.70	72.80	-7.01	-8.15	
				10g	1.75	1.88	18.80	20.10	-6.47		
6/4/2014	D5GHzV2 5.2GHz	1138	Head	1g	6.92	7.38	73.80	78.50	-5.99	-6.65	
				10g	1.90	2.09	20.90	22.50	-7.11		
	D5GHzV2 5.6GHz			1g	7.06	7.45	74.50	82.7	**-9.92**	-5.52	1, 2
				10g	1.92	2.12	21.20	23.5	-9.79		
	D5GHzV2 5.8GHz			1g	6.60	7.08	70.80	78.3	-9.58	-7.27	
				10g	1.80	2.02	20.20	22.4	-9.82		
6/6/2014	D1750V2	1077	Head	1g	3.83	3.74	37.40	37.6	-0.53	2.35	
				10g	2.04	1.97	19.70	20.0	-1.50		
6/6/2014	D1750V2	1077	Body	1g	3.96	3.87	38.70	37.70	**2.65**	2.27	3, 4
				10g	2.07	2.07	20.70	20.30	1.97		
6/9/2014	D1900V2	5do43	Head	1g	4.03	3.94	39.40	37.6	**4.79**	2.23	5, 6
				10g	2.05	2.03	20.30	20.0	1.50		

SAR Lab 2

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
6/2/2014	D835V2	4d002	Head	1g	1.00	0.98	9.81	9.49	3.37	1.90	
				10g	0.679	0.647	6.47	6.18	4.69		
6/3/2014	D835V2	4d002	Body	1g	1.02	1.00	10.00	9.43	**6.04**	1.96	7, 8
				10g	0.685	0.663	6.63	6.21	6.76		
6/6/2014	D835V2	4d002	Head	1g	0.978	0.956	9.56	9.49	0.74	2.25	
				10g	0.661	0.632	6.32	6.18	2.27		

SAR Lab 3

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
6/4/2014	D2450V2	899	Head	1g	5.00	5.00	50.00	51.30	**-2.53**	0.00	9, 10
				10g	2.20	2.27	22.70	23.90	-5.02		
6/4/2014	D2450V2	899	Body	1g	4.88	4.93	49.30	49.70	-0.80	-1.02	
				10g	2.120	2.280	22.80	23.30	-2.15		

SAR Lab 4

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
6/2/2014	D1900V2	5d043	Body	1g	3.94	3.91	39.1	39.0	0.26	0.76	
				10g	1.98	2.05	20.5	20.8	-1.44		
6/2/2014	D1900V2	5d043	Head	1g	4.03	3.94	39.4	40.1	**-1.75**	2.23	11, 12
				10g	2.08	2.04	20.4	21.1	-3.32		
6/4/2014	D750V3	1071	Body	1g	0.945	0.922	9.22	8.64	**6.71**	2.43	13, 14
				10g	0.640	0.612	6.12	5.72	6.99		
6/4/2014	D750V3	1071	Head	1g	0.863	0.839	8.39	8.50	-1.29	2.78	
				10g	0.586	0.547	5.47	5.50	-0.55		

12. SAR Test Results

SAR Test Reduction criteria are as follows:

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 648474 D04 Handset SAR:

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

KDB 941225 D01 SAR test for 3G devices:

Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2.

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.

12.1. GSM850

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	190	836.6	33.7	33.2	0.124	**0.139**	1
			Left Tilt	190	836.6	33.7	33.2	0.062	0.070	
			Right Touch	190	836.6	33.7	33.2	0.114	0.128	
			Rightt Tilt	190	836.6	33.7	33.2	0.063	0.070	
Head VoIP	GPRS 2 Slots	0	Left Touch	190	836.6	31.7	31.4	0.259	**0.278**	2
			Left Tilt	190	836.6	31.7	31.4	0.144	0.154	
			Right Touch	190	836.6	31.7	31.4	0.244	0.261	
			Rightt Tilt	190	836.6	31.7	31.4	0.148	0.159	
Body-worn	Voice	10	Rear	190	836.6	33.7	33.2	0.396	**0.444**	3
			Front	190	836.6	33.7	33.2	0.197	0.221	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	190	836.6	31.7	31.4	0.479	**0.513**	4
			Front	190	836.6	31.7	31.4	0.242	0.259	
			Edge 3	190	836.6	31.7	31.4	0.178	0.191	
			Edge 4	190	836.6	31.7	31.4	0.283	0.303	

12.2. GSM1900

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	661	1880.0	30.7	30.5	0.121	**0.127**	5
			Left Tilt	661	1880.0	30.7	30.5	0.066	0.069	
			Right Touch	661	1880.0	30.7	30.5	0.117	0.123	
			Rightt Tilt	661	1880.0	30.7	30.5	0.068	0.072	
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	28.7	28.5	0.158	**0.165**	6
			Left Tilt	661	1880.0	28.7	28.5	0.086	0.090	
			Right Touch	661	1880.0	28.7	28.5	0.155	0.162	
			Rightt Tilt	661	1880.0	28.7	28.5	0.090	0.094	
Body-worn	Voice	10	Rear	661	1880.0	30.7	30.5	0.499	**0.523**	7
			Front	661	1880.0	30.7	30.5	0.356	0.373	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	661	1880.0	28.7	28.5	0.569	**0.596**	8
			Front	661	1880.0	28.7	28.5	0.375	0.393	
			Edge 3	661	1880.0	28.7	28.5	0.416	0.436	
			Edge 4	661	1880.0	28.7	28.5	0.261	0.273	

12.3. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	23.7	23.6	0.217	**0.222**	9
			Left Tilt	4183	836.6	23.7	23.6	0.123	0.126	
			Right Touch	4183	836.6	23.7	23.6	0.211	0.216	
			Rightt Tilt	4183	836.6	23.7	23.6	0.122	0.125	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	4183	836.6	23.7	23.6	0.434	**0.444**	10
			Front	4183	836.6	23.7	23.6	0.230	0.235	
Hotspot	Rel 99 RMC	10	Edge 3	4183	836.6	23.7	23.6	0.147	0.150	
			Edge 4	4183	836.6	23.7	23.6	0.194	0.199	

12.4. W-CDMA Band II

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	9400	1880.0	23.7	23.6	0.242	**0.248**	11
			Left Tilt	9400	1880.0	23.7	23.6	0.128	0.131	
			Right Touch	9400	1880.0	23.7	23.6	0.207	0.212	
			Rightt Tilt	9400	1880.0	23.7	23.6	0.112	0.115	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	9400	1880.0	23.7	23.6	0.672	**0.688**	12
			Front	9400	1880.0	23.7	23.6	0.531	0.543	
Hotspot	Rel 99 RMC	10	Edge 3	9400	1880.0	23.7	23.6	0.519	0.531	
			Edge 4	9400	1880.0	23.7	23.6	0.392	0.401	

12.5. LTE Band 2 (10MHz Bandwidth)

RF Exposure Conditions	Mode	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	
Head	QPSK	0	Left Touch	18900	1880.0	1	49	24.2	23.9	0.206	**0.221**	13
						25	0	23.2	23.0	0.170	0.178	
			Left Tilt	18900	1880.0	1	49	24.2	23.9	0.127	0.136	
						25	0	23.2	23.0	0.107	0.112	
			Right Touch	18900	1880.0	1	49	24.2	23.9	0.184	0.197	
						25	0	23.2	23.0	0.150	0.157	
			Rightt Tilt	18900	1880.0	1	49	24.2	23.9	0.148	0.159	
						25	0	23.2	23.0	0.098	0.102	
Body-worn & Hotspot	QPSK	10	Rear	18650	1855.0	1	0	24.2	23.8	0.754	0.827	
				18900	1880.0	1	49	24.2	23.9	0.837	0.897	
						25	0	23.2	23.0	0.664	0.695	
				19150	1905.0	1	0	24.2	23.9	0.893	**0.957**	14
			Front	18900	1880.0	1	49	24.2	23.9	0.488	0.523	
						25	0	23.2	23.0	0.399	0.418	
Hotspot	QPSK	10	Edge 3	18900	1880.0	1	49	24.2	23.9	0.682	0.731	
						25	0	23.2	23.0	0.536	0.561	
			Edge 4	18900	1880.0	1	49	24.2	23.9	0.465	0.498	
						25	0	23.2	23.0	0.367	0.384	

12.6. LTE Band 4 (10MHz Bandwidth)

RF Exposure Conditions	Mode	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	
Head	QPSK	0	Left Touch	20175	1732.5	1	49	24.2	24.1	0.317	**0.324**	15
						25	0	23.2	23.1	0.222	0.227	
			Left Tilt	20175	1732.5	1	49	24.2	24.1	0.152	0.156	
						25	0	23.2	23.1	0.113	0.116	
			Right Touch	20175	1732.5	1	49	24.2	24.1	0.204	0.209	
						25	0	23.2	23.1	0.142	0.145	
			Rightt Tilt	20175	1732.5	1	49	24.2	24.1	0.146	0.149	
						25	0	23.2	23.1	0.113	0.116	
Body-worn & Hotspot	QPSK	10	Rear	20175	1732.5	1	49	24.2	24.1	0.708	**0.724**	16
						25	0	23.2	23.1	0.544	0.557	
			Front	20175	1732.5	1	49	24.2	24.1	0.545	0.558	
						25	0	23.2	23.1	0.439	0.449	
Hotspot	QPSK	10	Edge 3	20175	1732.5	1	49	24.2	24.1	0.559	0.572	
						25	0	23.2	23.1	0.408	0.418	
			Edge 4	20175	1732.5	1	49	24.2	24.1	0.375	0.384	
						25	0	23.2	23.1	0.275	0.281	

12.7. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	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	
Head	QPSK	0	Left Touch	20525	836.6	1	0	24.2	24.0	0.225	**0.236**	17
						25	0	23.2	23.0	0.181	0.190	
			Left Tilt	20525	836.6	1	0	24.2	24.0	0.127	0.133	
						25	0	23.2	23.0	0.099	0.104	
			Right Touch	20525	836.6	1	0	24.2	24.0	0.194	0.203	
						25	0	23.2	23.0	0.162	0.170	
			Rightt Tilt	20525	836.6	1	0	24.2	24.0	0.125	0.131	
						25	0	23.2	23.0	0.104	0.109	
Body-worn & Hotspot	QPSK	10	Rear	20525	836.6	1	0	24.2	24.0	0.391	**0.409**	18
						25	0	23.2	23.0	0.361	0.378	
			Front	20525	836.6	1	0	24.2	24.0	0.250	0.262	
						25	0	23.2	23.0	0.203	0.213	
Hotspot	QPSK	10	Edge 3	20525	836.6	1	0	24.2	24.0	0.179	0.187	
						25	0	23.2	23.0	0.150	0.157	
			Edge 4	20525	836.6	1	0	24.2	24.0	0.213	0.223	
						25	0	23.2	23.0	0.168	0.176	

12.8. LTE Band 17 (10MHz Bandwidth)

RF Exposure Conditions	Mode	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	
Head	QPSK	0	Left Touch	23790	710.0	1	0	23.7	23.5	0.232	0.243	
						25	0	22.7	22.5	0.185	0.194	
			Left Tilt	23790	710.0	1	0	23.7	23.5	0.122	0.128	
						25	0	22.7	22.5	0.100	0.105	
			Right Touch	23790	710.0	1	0	23.7	23.5	0.283	**0.296**	19
						25	0	22.7	22.5	0.230	0.241	
			Rightt Tilt	23790	710.0	1	0	23.7	23.5	0.145	0.152	
						25	0	22.7	22.5	0.120	0.126	
Body-worn & Hotspot	QPSK	10	Rear	23790	710.0	1	0	23.7	23.5	0.513	**0.537**	20
						25	0	22.7	22.5	0.404	0.423	
			Front	23790	710.0	1	0	23.7	23.5	0.336	0.352	
						25	0	22.7	22.5	0.270	0.283	
Hotspot	QPSK	10	Edge 2	23790	710.0	1	0	23.7	23.5	0.437	0.458	
						25	0	22.7	22.5	0.336	0.352	
			Edge 3	23790	710.0	1	0	23.7	23.5	0.172	0.180	
						25	0	22.7	22.5	0.139	0.146	

12.9. Wi-Fi (DTS Band)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11b 1 Mbps	0	Left Touch	6	2437.0	17.0	15.9	0.111	0.143	
			Left Tilt	6	2437.0	17.0	15.9	0.138	**0.178**	21
			Right Touch	6	2437.0	17.0	15.9	0.084	0.108	
			Rightt Tilt	6	2437.0	17.0	15.9	0.096	0.124	
Body-worn & Hotspot	802.11b 1 Mbps	10	Rear	6	2437.0	17.0	15.9	0.195	**0.251**	22
			Front	6	2437.0	17.0	15.9	0.034	0.044	
Hotspot	802.11b 1 Mbps	10	Edge 1	6	2437.0	17.0	15.9	0.110	0.142	
			Edge 2	6	2437.0	17.0	15.9	0.024	0.031	
			Edge 4	6	2437.0	17.0	15.9	0.003	0.004	

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11a 6 Mbps	0	Left Touch	149	5745.0	12.0	9.9	0.101	**0.164**	23
			Left Tilt	149	5745.0	12.0	9.9	0.098	0.159	
			Right Touch	149	5745.0	12.0	9.9	0.066	0.106	
			Rightt Tilt	149	5745.0	12.0	9.9	0.091	0.148	
Body-worn & Hotspot	802.11a 6 Mbps	10	Rear	149	5745.0	12.0	9.9	0.100	**0.162**	24
			Front	149	5745.0	12.0	9.9	0.000	0.000	
Hotspot	802.11a 6 Mbps	10	Edge 1	149	5745.0	12.0	9.9	0.090	0.145	
			Edge 2	149	5745.0	12.0	9.9	0.000	0.000	
			Edge 4	149	5745.0	12.0	9.9	0.000	0.000	

12.10. Wi-Fi (UNII Band)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11a 6 Mbps	0	Left Touch	48	5240.0	12.0	10.0	0.052	0.082	
				64	5320.0	12.0	10.2	0.075	0.114	
				104	5520.0	12.0	10.4	0.096	0.139	
			Left Tilt	48	5240.0	12.0	10.0	0.068	0.108	
				64	5320.0	12.0	10.2	0.092	0.139	
				104	5520.0	12.0	10.4	0.119	**0.172**	25
			Right Touch	48	5240.0	12.0	10.0	0.050	0.079	
				64	5320.0	12.0	10.2	0.084	0.127	
				104	5520.0	12.0	10.4	0.081	0.117	
			Rightt Tilt	48	5240.0	12.0	10.0	0.059	0.094	
				64	5320.0	12.0	10.2	0.076	0.115	
				104	5520.0	12.0	10.4	0.102	0.147	
Body-worn	802.11a 6 Mbps	10	Rear	48	5240.0	12.0	10.0	0.092	0.146	
				64	5320.0	12.0	10.2	0.132	0.200	
				104	5520.0	12.0	10.4	0.178	**0.257**	26
			Front	48	5240.0	12.0	10.0	0.006	0.010	
				64	5320.0	12.0	10.2	0.000	0.000	
				104	5520.0	12.0	10.4	0.018	0.026	

12.11. Bluetooth

12.11.1. Standalone SAR Test Exclusion Considerations

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
11.5	14	10	2.480	2.2

Conclusion:

The computed value is < 3; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

12.11.2. Estimated SAR

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- *(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√$f_{(GHz)}$/x]* W/kg for test separation distances ≤ 50 mm;
  where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Estimated SAR Result for Body-worn Accessory Conditions:

Test Configuration	Max. tune-up tolerance limit (mW)	Min. test separation distance (mm)	Frequency (GHz)	Estimated 1-g SAR (W/kg)
Rear/Front	14	10	2.480	0.294

13. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 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 < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, 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 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

13.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn Accessory (W/kg)	Hotspot/Wi-Fi Direct (W/kg)	Repeated SAR (Yes/No)
750	LTE Band 17		0.513	0.513	No
850	GSM 850		0.479	0.479	No
	WCDMA Band V				No
	LTE Band 5				No
1750	LTE Band 4		0.682	0.682	No
1900	GSM 1900				No
	WCDMA Band II				No
	LTE Band 2		0.893	0.893	Yes
2400	Wi-Fi 802.11b/g/n		0.195	0.195	No
5200	Wi-Fi 802.11a/n		0.128		No
5300	Wi-Fi 802.11a/n		0.210		No
5500	Wi-Fi 802.11a/n		0.281		No
5800	Wi-Fi 802.11a/n		0.178	0.178	No

13.2. Repeated Measurement Results

Head Exposure Condition

Not Applicable.

Body-worn Accessory and Hotspot Mode Exposure Conditions

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
LTE Band 2	Rear	QPSK	19150	1905.0	0.893	0.875	1.02	1

Note(s):

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

14. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance introduces a new formula for calculating 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:

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

A new threshold of 0.04 is also introduced in the KDB 447498. Thus, in order for a pair of simultaneously 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:

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

14.1. Sum of the SAR for GSM850 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 850	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.278	0.164			0.442	No
		WWAN + Wi-Fi(UNII)	0.278		0.139		0.417	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.154	0.178			0.332	No
		WWAN + Wi-Fi(UNII)	0.154		0.172		0.326	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.261	0.108			0.369	No
		WWAN + Wi-Fi(UNII)	0.261		0.127		0.388	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.159	0.148			0.307	No
		WWAN + Wi-Fi(UNII)	0.159		0.147		0.306	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.513	0.251			0.764	No
		WWAN + Wi-Fi(UNII)	0.513		0.257		0.770	No
		WWAN + BT	0.513			0.294	0.807	No
	Front	WWAN + Wi-Fi(DTS)	0.259	0.044			0.303	No
		WWAN + Wi-Fi(UNII)	0.259		0.026		0.285	No
		WWAN + BT	0.259			0.294	0.553	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.145			0.145	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.031			0.031	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.191				0.191	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.303	0.004			0.307	No

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

14.2. Sum of the SAR for GSM1900 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 1900	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.165	0.164			0.329	No
		WWAN + Wi-Fi(UNII)	0.165		0.139		0.304	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.090	0.178			0.268	No
		WWAN + Wi-Fi(UNII)	0.090		0.172		0.262	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.162	0.108			0.270	No
		WWAN + Wi-Fi(UNII)	0.162		0.127		0.289	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.094	0.148			0.242	No
		WWAN + Wi-Fi(UNII)	0.094		0.147		0.241	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.596	0.251			0.847	No
		WWAN + Wi-Fi(UNII)	0.596		0.257		0.853	No
		WWAN + BT	0.596			0.294	0.890	No
	Front	WWAN + Wi-Fi(DTS)	0.393	0.044			0.437	No
		WWAN + Wi-Fi(UNII)	0.393		0.026		0.419	No
		WWAN + BT	0.393			0.294	0.687	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.145			0.145	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.031			0.031	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.436				0.436	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.273	0.004			0.277	No

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

14.3. Sum of the SAR for WCDMA Band V & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band V	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.222	0.164			0.386	No
		WWAN + Wi-Fi(UNII)	0.222		0.139		0.361	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.126	0.178			0.304	No
		WWAN + Wi-Fi(UNII)	0.126		0.172		0.298	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.216	0.108			0.324	No
		WWAN + Wi-Fi(UNII)	0.216		0.127		0.343	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.125	0.148			0.273	No
		WWAN + Wi-Fi(UNII)	0.125		0.147		0.272	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.444	0.251			0.695	No
		WWAN + Wi-Fi(UNII)	0.444		0.257		0.701	No
		WWAN + BT	0.444			0.294	0.738	No
	Front	WWAN + Wi-Fi(DTS)	0.235	0.044			0.279	No
		WWAN + Wi-Fi(UNII)	0.235		0.026		0.261	No
		WWAN + BT	0.235			0.294	0.529	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.145			0.145	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.031			0.031	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.150				0.150	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.199	0.004			0.203	No

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

14.4. Sum of the SAR for WCDMA Band II & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band II	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.248	0.164			0.412	No
		WWAN + Wi-Fi(UNII)	0.248		0.139		0.387	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.131	0.178			0.309	No
		WWAN + Wi-Fi(UNII)	0.131		0.172		0.303	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.212	0.108			0.320	No
		WWAN + Wi-Fi(UNII)	0.212		0.127		0.339	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.115	0.148			0.263	No
		WWAN + Wi-Fi(UNII)	0.115		0.147		0.262	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.688	0.251			0.939	No
		WWAN + Wi-Fi(UNII)	0.688		0.257		0.945	No
		WWAN + BT	0.688			0.294	0.982	No
	Front	WWAN + Wi-Fi(DTS)	0.543	0.044			0.587	No
		WWAN + Wi-Fi(UNII)	0.543		0.026		0.569	No
		WWAN + BT	0.543			0.294	0.837	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.145			0.145	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.031			0.031	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.531				0.531	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.401	0.004			0.405	No

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

14.5. Sum of the SAR for LTE Band 2 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 2	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.221	0.164			0.385	No
		WWAN + Wi-Fi(UNII)	0.221		0.139		0.360	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.136	0.178			0.314	No
		WWAN + Wi-Fi(UNII)	0.136		0.172		0.308	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.197	0.108			0.305	No
		WWAN + Wi-Fi(UNII)	0.197		0.127		0.324	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.159	0.148			0.307	No
		WWAN + Wi-Fi(UNII)	0.159		0.147		0.306	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.957	0.251			**1.208**	No
		WWAN + Wi-Fi(UNII)	0.957		0.257		**1.214**	No
		WWAN + BT	0.957			0.294	1.251	No
	Front	WWAN + Wi-Fi(DTS)	0.523	0.044			0.567	No
		WWAN + Wi-Fi(UNII)	0.523		0.026		0.549	No
		WWAN + BT	0.523			0.294	0.817	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.145			0.145	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.031			0.031	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.731				0.731	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.498	0.004			0.502	No

14.6. Sum of the SAR for LTE Band 4 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 4	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.324	0.164			0.488	No
		WWAN + Wi-Fi(UNII)	0.324		0.139		0.463	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.156	0.178			0.334	No
		WWAN + Wi-Fi(UNII)	0.156		0.172		0.328	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.209	0.108			0.317	No
		WWAN + Wi-Fi(UNII)	0.209		0.127		0.336	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.149	0.148			0.297	No
		WWAN + Wi-Fi(UNII)	0.149		0.147		0.296	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.724	0.251			0.975	No
		WWAN + Wi-Fi(UNII)	0.724		0.257		0.981	No
		WWAN + BT	0.724			0.294	1.018	No
	Front	WWAN + Wi-Fi(DTS)	0.558	0.044			0.602	No
		WWAN + Wi-Fi(UNII)	0.558		0.026		0.584	No
		WWAN + BT	0.558			0.294	0.852	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.145			0.145	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.031			0.031	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.572				0.572	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.384	0.004			0.388	No

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

14.7. Sum of the SAR for LTE Band 5 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 5	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.236	0.164			0.400	No
		WWAN + Wi-Fi(UNII)	0.236		0.139		0.375	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.133	0.178			0.311	No
		WWAN + Wi-Fi(UNII)	0.133		0.172		0.305	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.203	0.108			0.311	No
		WWAN + Wi-Fi(UNII)	0.203		0.127		0.330	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.131	0.148			0.279	No
		WWAN + Wi-Fi(UNII)	0.131		0.147		0.278	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.409	0.251			0.660	No
		WWAN + Wi-Fi(UNII)	0.409		0.257		0.666	No
		WWAN + BT	0.409			0.294	0.703	No
	Front	WWAN + Wi-Fi(DTS)	0.262	0.044			0.306	No
		WWAN + Wi-Fi(UNII)	0.262		0.026		0.288	No
		WWAN + BT	0.262			0.294	0.556	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.145			0.145	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.031			0.031	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.187				0.187	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.223	0.004			0.227	No

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

14.8. Sum of the SAR for LTE Band 17 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 17	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.243	0.164			0.407	No
		WWAN + Wi-Fi(UNII)	0.243		0.139		0.382	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.128	0.178			0.306	No
		WWAN + Wi-Fi(UNII)	0.128		0.172		0.300	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.296	0.108			0.404	No
		WWAN + Wi-Fi(UNII)	0.296		0.127		0.423	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.152	0.148			0.300	No
		WWAN + Wi-Fi(UNII)	0.152		0.147		0.299	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.537	0.251			0.788	No
		WWAN + Wi-Fi(UNII)	0.537		0.257		0.794	No
		WWAN + BT	0.537			0.294	0.831	No
	Front	WWAN + Wi-Fi(DTS)	0.352	0.044			0.396	No
		WWAN + Wi-Fi(UNII)	0.352		0.026		0.378	No
		WWAN + BT	0.352			0.294	0.646	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.145			0.145	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.458	0.031			0.489	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.180				0.180	No
	Edge 4	WWAN + Wi-Fi(DTS)		0.004			0.004	No

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

15. Appendixes

Refer to separated files for the following appendixes.

15.1. Photos and Antenna Locations

15.2. System Performance Check Plots

15.3. Highest SAR Test Plots

15.4. Calibration Certificate for E-Field Probe EX3DV3 - SN 3936

15.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3531

15.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3773

15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3871

15.8. Calibration Certificate for D750V3 - SN 1071

15.9. Calibration Certificate for D835V2 - SN 4d002

15.10. Calibration Certificate for D1750V2 - SN 1077

15.11. Calibration Certificate for D1900V2- SN 5d043

15.12. Calibration Certificate for D2450V2 - SN 899

15.13. Calibration Certificate for D5GHzV2 - SN 1138

END OF REPORT