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

SAR EVALUATION REPORT

For

GSM/WCDMA/LTE Phablet + Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC

Model: SM-T365
FCC ID: A3LSMT365

Report Number: 14U18519-S1A
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Prepared for

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1. Attestation of Test Results

Applicant	Samsung Electronics Co., Ltd.			
DUT description	GSM/WCDMA/LTE Phablet + Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC			
Model	SM-T365			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	08/07/2014 – 08/21/2014			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	0.105 W/kg	0.539 W/kg	0.090 W/kg
	Body	0.779 W/kg	0.704 W/kg	0.420 W/kg
	Simultaneous Transmission	1.483 W/kg		1.199 W/kg
Applicable Standards	FCC 47 CFR Parts 1 & 2 Published RF Exposure KDB Procedures, and TCB workshop updates IEEE Std 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:	Prepared By:
Dave Weaver WiSE Program Manager UL Verification Services Inc.	Richard Jankovics WiSE Engineer UL Verification Services Inc.

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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
- 616217 D04 SAR for Laptop and Tablets v01r01
- 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 D05 SAR for LTE Devices v02r03
- 941225 D06 Hot Spot 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 v01r02

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://ts.nist.gov/standards/scopes/2000650.htm

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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

System Performance Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3744A01155	5/12/2015
Power Meter	HP	438A	3513U04320	10/2/2014
Power Sensor	Agilent	8481A	2702A66876	9/30/2014
Power Sensor	Agilent	8481A	3318A95392	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe	SPEAG	EX3DV4	3773	4/22/2015
E-Field Probe	SPEAG	EX3DV3	3531	11/21/2014
E-Field Probe	SPEAG	EX3DV4	3902	5/19/2015
E-Field Probe	SPEAG	EX3DV4	3991	5/16/2015
Data Acquisition Electronics	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics	SPEAG	DAE4	1257	7/16/2015
Data Acquisition Electronics	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D835V2	4d002	11/15/2014
System Validation Dipole	SPEAG	D835V2	4d142	9/17/2014
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 5)	EXTECH	445703	CCS-239	6/3/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	127733-cy	6/2/2015
Power Meter	Agilent	N1912A	MY53040015	7/10/2015
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015

4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03 Section 2.8.1., 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 1528-2003 is not required in SAR reports submitted for equipment approval.

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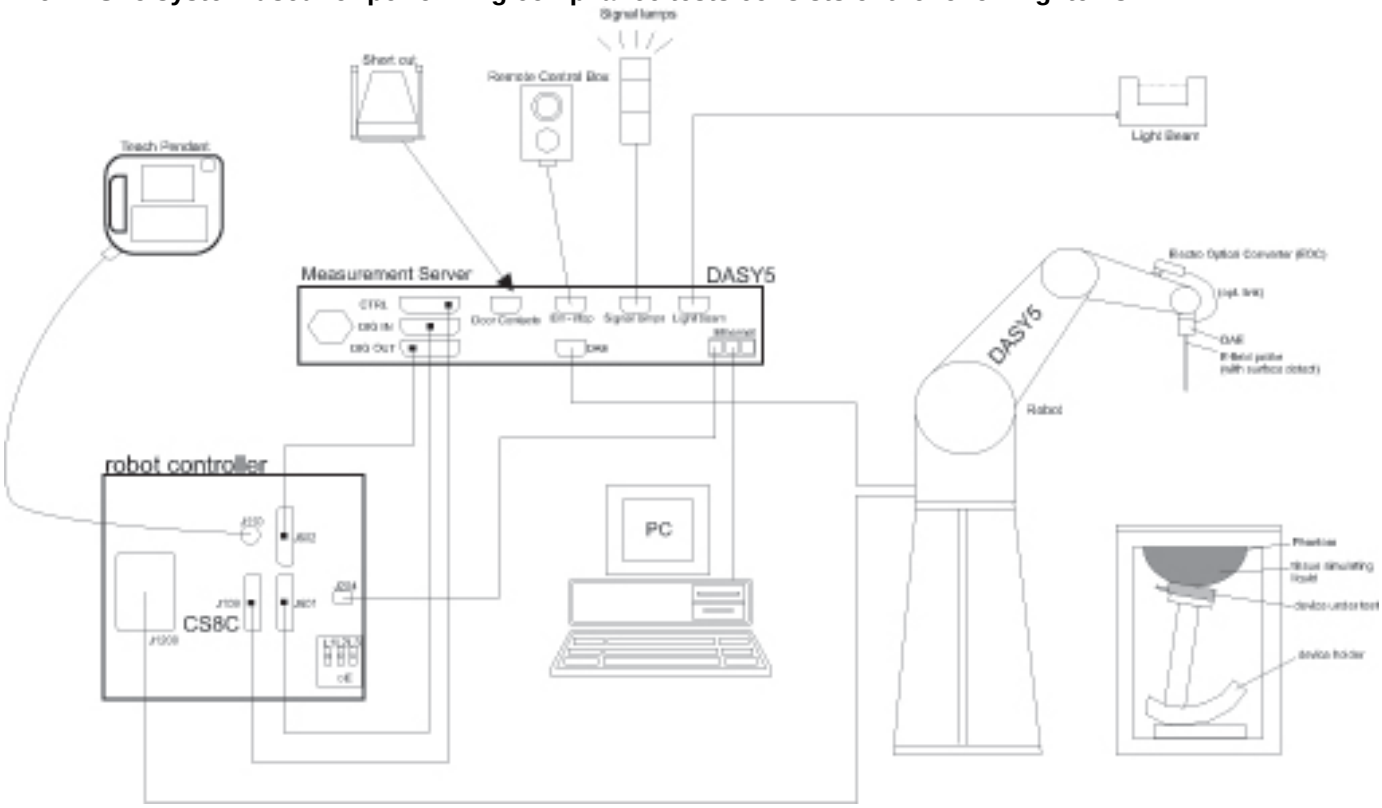
5. Measurement System Description and Setup

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.

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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 v01r03

	≤ 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.	

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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 v01r03

			≤ 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	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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

* When zoom scan is required and the *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.

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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.

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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 GHz)
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 GHz) – GO (Group Owner) only for UNII Band 4 5.8GHz band
RF Exposure Condition(s)	Stand-alone
Device dimension	Overall (Length x Width): 212.95mm x 126.1mm Overall Diagonal: 239mm Display Diagonal: 203.1mm
Back Cover	☒ Normal Battery Cover ☐ Wireless Charger Battery Cover ☐ Normal Battery Cover with NFC
Accessory	☒ Headset
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc, 16.91Wh ☐ Extended (large capacity)

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7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 850 / 1900 W-CDMA Band: V / II LTE Band 5 Wi-Fi: 2.4 / 5 GHz Bluetooth: 2.4 GHz.
Mode	GSM - ☒ Voice (GMSK) - ☒ GPRS (GMSK) - ☒ EGPRS (8PSK) W-CDMA - ☒ UMTS Rel. 99 - ☒ HSDPA - ☒ HSUPA - ☒ DC-HSDPA - ☒ HSPA+ LTE - ☒ QPSK - ☒ 16QAM Wi-Fi 2.4GHz (802.11b/g/n) - ☒ 802.11b - ☒ 802.11g - ☒ 802.11n (20MHz) Wi-Fi 5GHz - ☒ 802.11a - ☒ 802.11n (HT20) - ☒ 802.11n (HT40) Bluetooth Ver. 4.0 (LE)
Duty Cycle	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%
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

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7.3. RF Output Power Tolerance

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (MAX) (dBm)							
		Target				Max. tune-up tolerance limit			
RF Air interface	Mode	1 Slot	2 Slot	3 Slot	4 Slot	1 Slot	2 Slot	3 Slot	4 Slot
GSM850	Voice	32.5				**33.0**			
	GPRS	32.5	30.5	29.0	27.5	**33.0**	**31.0**	**29.5**	**28.0**
	EGPRS	27.0	26.0	25.0	24.0	**27.5**	**26.5**	**25.5**	**24.5**
GSM1900	Voice	29.5				**30.0**			
	GPRS	29.5	28.5	26.5	25.5	**30.0**	**29.0**	**27.0**	**26.0**
	EGPRS	26.0	25.0	24.0	23.0	**26.5**	**25.5**	**24.5**	**23.5**

Upper limit (dB): 0.5 ~ -1.5		RF Output Power with Power Reduction (dBm)							
		Target				Max. tune-up tolerance limit			
RF Air interface	Mode	1 Slot	2 Slot	3 Slot	4 Slot	1 Slot	2 Slot	3 Slot	4 Slot
GSM850	Voice	27.5				**28.0**			
	GPRS	27.5	25.5	24.0	22.5	**28.0**	**26.0**	**24.5**	**23.0**
	EGPRS	22.0	21.0	20.0	19.0	**22.5**	**21.5**	**20.5**	**19.5**
GSM1900	Voice	19.5				**20.0**			
	GPRS	19.5	18.5	16.5	15.5	**20.0**	**19.0**	**17.0**	**16.0**
	EGPRS	16.0	15.0	14.0	13.0	**16.5**	**15.5**	**14.5**	**13.5**

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (MAX) (dBm)		RF Output Power with Power Reduction (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
W-CDMA Band V	R99	22.5	**23.0**	17.5	**18.0**
	HSDPA	21.0	**21.5**	17.5	**18.0**
	HSUPA	22.0	**22.5**	17.5	**18.0**
	DC-HSPA	21.0	**21.5**	17.5	**18.0**
W-CDMA Band II	R99	22.5	**23.0**	12.5	**13.0**
	HSDPA	21.5	**22.0**	12.0	**12.5**
	HSUPA	22.5	**23.0**	12.0	**12.5**
	DC-HSPA	21.5	**22.0**	12.0	**12.5**

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (MAX) (dBm)		RF Output Power with Power Reduction (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
LTE Band 5	QPSK	23.3	**23.8**	18.0	**18.5**

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	13.0	**13.5**
	802.11g	12.0	**12.5**
	802.11n HT20	11.0	**11.5**

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 5 GHz	802.11a	10.0	**10.5**
	802.11n HT20	10.0	**10.5**
	802.11n HT40	10.0	**10.5**

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
Bluetooth		7.0	**7.5**
Bluetooth LE		0.0	**0.5**

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7.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	1. GSM 1900 Voice + Wi-Fi 2.4/5GHz 2. GSM 1900 GPRS + Wi-Fi 2.4/5GHz (VoIP) 3. WCDMA Band V/II + Wi-Fi 2.4/5GHz 4. LTE B5 + Wi-Fi 2.4/5GHz
Body	5. GSM 1900 Voice + Wi-Fi 2.4/5GHz 6. GSM 1900 Voice + BT 7. GSM 1900 GPRS + Wi-Fi 2.4/5GHz (VoIP) 8. GSM 1900 GPRS + BT(VoIP) 9. WCDMA Band V/II + Wi-Fi 2.4/5GHz 10. WCDMA Band V/II + BT 11. LTE B5 + Wi-Fi 2.4/5GHz 12. LTE B5 + BT

Notes:
1. Wi-Fi 2.4GHz supports 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.

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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 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>20415/ 825.5</td><td>20407/ 824.7</td></tr>
<tr><td>Mid</td><td></td><td></td><td>20525/ 836.5</td><td>20525/ 836.5</td><td>20525/ 836.5</td><td>20525/ 836.5</td></tr>
<tr><td>High</td><td></td><td></td><td>20600/ 844</td><td>20625/ 846.5</td><td>20635/ 847.5</td><td>20643/ 848.3</td></tr>
</table>
</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td>LTE has one (1) TX/RX antenna and one (1) RX antenna
TX/RX Antenna : LTE Bands 5 RX Antenna : LTE Bands 5
Refer to Appendix 15.1. Photos and Antenna Locations.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td>
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>Yes, a Proximity Sensor is used to determine Power Reduction</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td>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>

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7.6. Power Reduction by Proximity Sensing

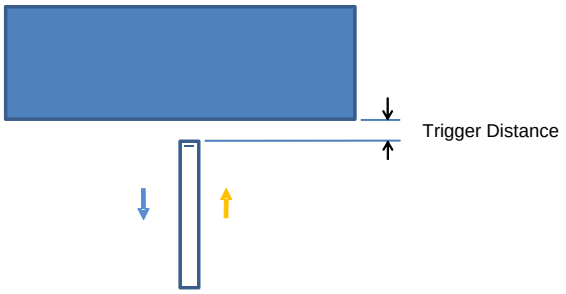
7.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

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

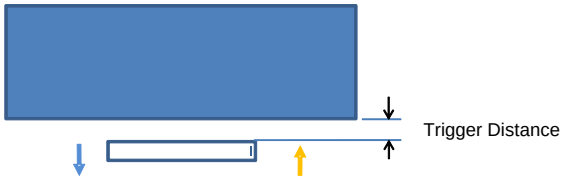
The measurement was then repeated for the Rear surface.

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

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



Proximity Sensor Trigger Distance Assessment
KDB 616217 §6.2 , **Edge**



Proximity Sensor Trigger Distance Assessment
KDB 616217 §6.2, **Rear**

LEGEND

→ Direction of DUT travel for determination of power reduction triggering point

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

Summary of Trigger Distances

Tissue simulating liquid	Trigger distance - Edge 3		Trigger distance - Edge 4		Trigger distance - Rear	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
850 muscle	10 mm	10 mm	0 mm	0 mm	12 mm	12 mm
1900 muscle	10 mm	10 mm	0 mm	0 mm	12 mm	12 mm

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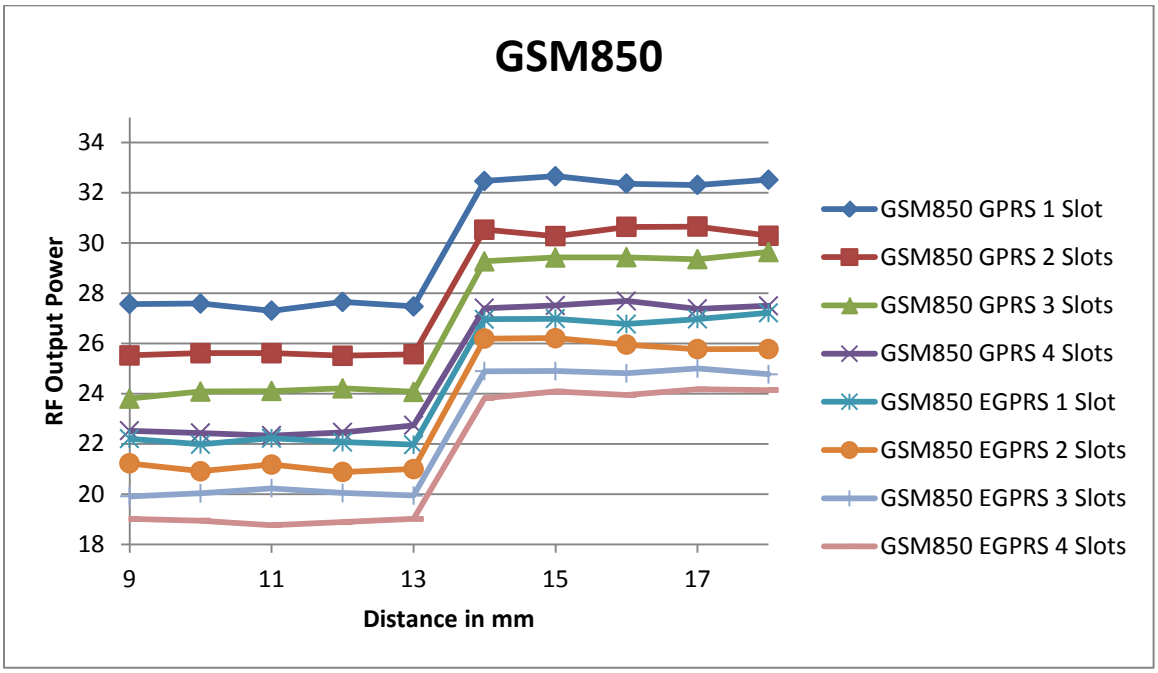
7.6.2. Proximity Sensor Triggering Distance Measurement Results

GSM850

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

Distance to DUT vs. Output Power in dBm										
Distance	18	17	16	15	14	13	12	11	10	9
GSM850 GPRS 1 Slot	32.52	32.31	32.36	32.66	32.47	27.47	27.65	27.30	27.59	27.57
GSM850 GPRS 2 Slots	30.29	30.65	30.64	30.27	30.53	25.57	25.51	25.61	25.61	25.52
GSM850 GPRS 3 Slots	29.64	29.35	29.43	29.42	29.27	24.07	24.21	24.10	24.08	23.80
GSM850 GPRS 4 Slots	27.50	27.38	27.69	27.51	27.40	22.74	22.46	22.33	22.43	22.52
GSM850 EGPRS 1 Slot	27.22	26.97	26.77	26.98	26.96	21.97	22.07	22.22	21.98	22.20
GSM850 EGPRS 2 Slots	25.78	25.77	25.95	26.21	26.19	21.00	20.88	21.18	20.91	21.22
GSM850 EGPRS 3 Slots	24.77	25.00	24.81	24.90	24.89	19.94	20.04	20.23	20.03	19.91
GSM850 EGPRS 4 Slots	24.14	24.17	23.94	24.08	23.82	19.01	18.88	18.76	18.94	19.01



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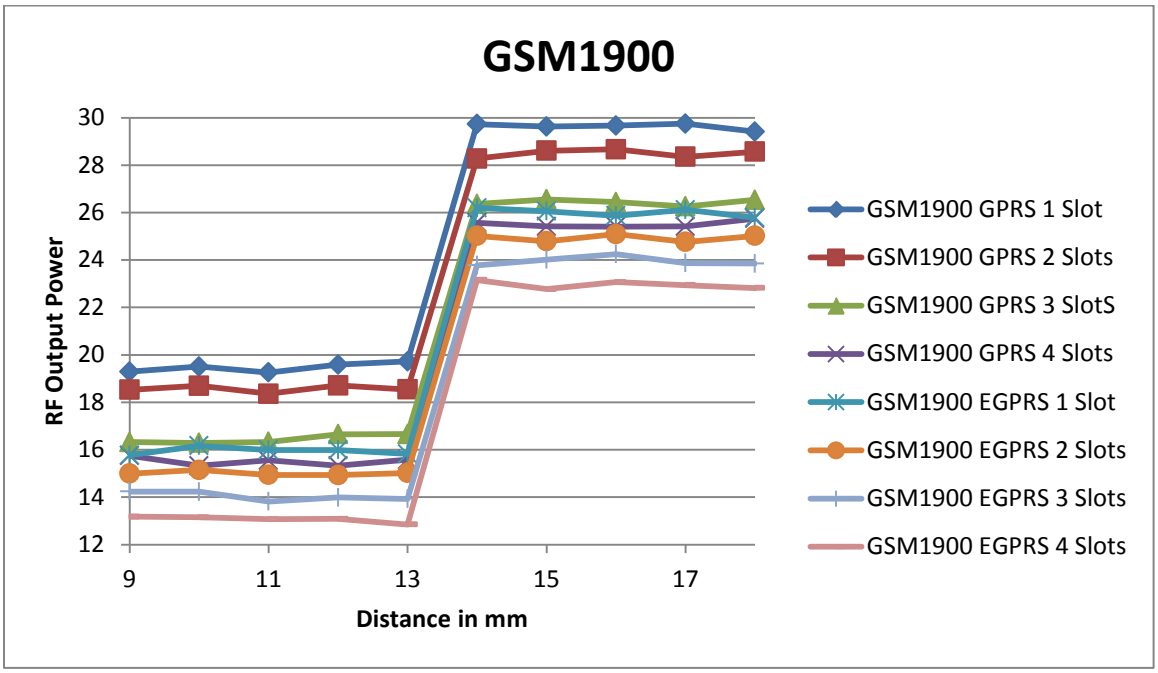
GSM1900

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

Distance to DUT vs. Output Power in dBm										
Distance	18	17	16	15	14	13	12	11	10	9
GSM1900 GPRS 1 Slot	29.41	29.75	29.67	29.63	29.73	19.72	19.59	19.26	19.51	19.29
GSM1900 GPRS 2 Slots	28.57	28.35	28.67	28.61	28.28	18.54	18.71	18.36	18.7	18.53
GSM1900 GPRS 3 SlotS	26.54	26.26	26.44	26.56	26.36	16.66	16.65	16.33	16.29	16.32
GSM1900 GPRS 4 Slots	25.75	25.42	25.41	25.42	25.57	15.58	15.32	15.55	15.32	15.75
GSM1900 EGPRS 1 Slot	25.79	26.12	25.87	26.06	26.2	15.82	15.99	15.99	16.17	15.77
GSM1900 EGPRS 2 Slots	25.02	24.76	25.09	24.79	25.02	15.02	14.93	14.94	15.15	14.99
GSM1900 EGPRS 3 Slots	23.85	23.87	24.25	24.02	23.78	13.93	13.99	13.82	14.23	14.24
GSM1900 EGPRS 4 Slots	22.82	22.94	23.07	22.77	23.16	12.85	13.08	13.07	13.15	13.18



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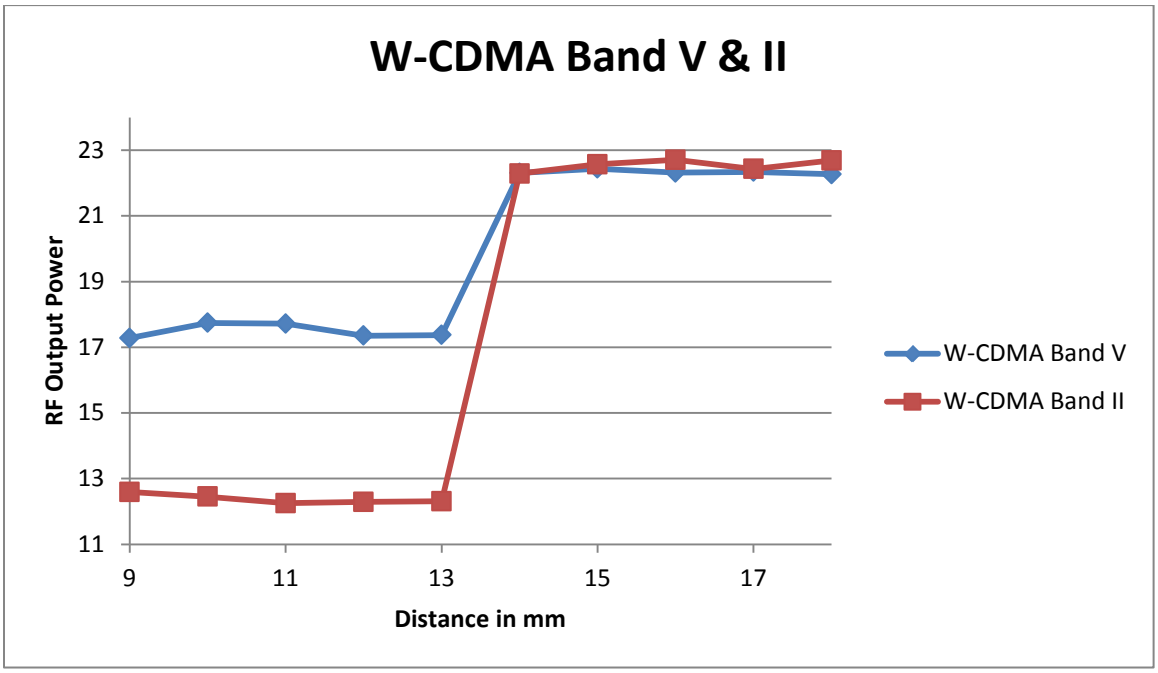
W-CDMA Bands V & II

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

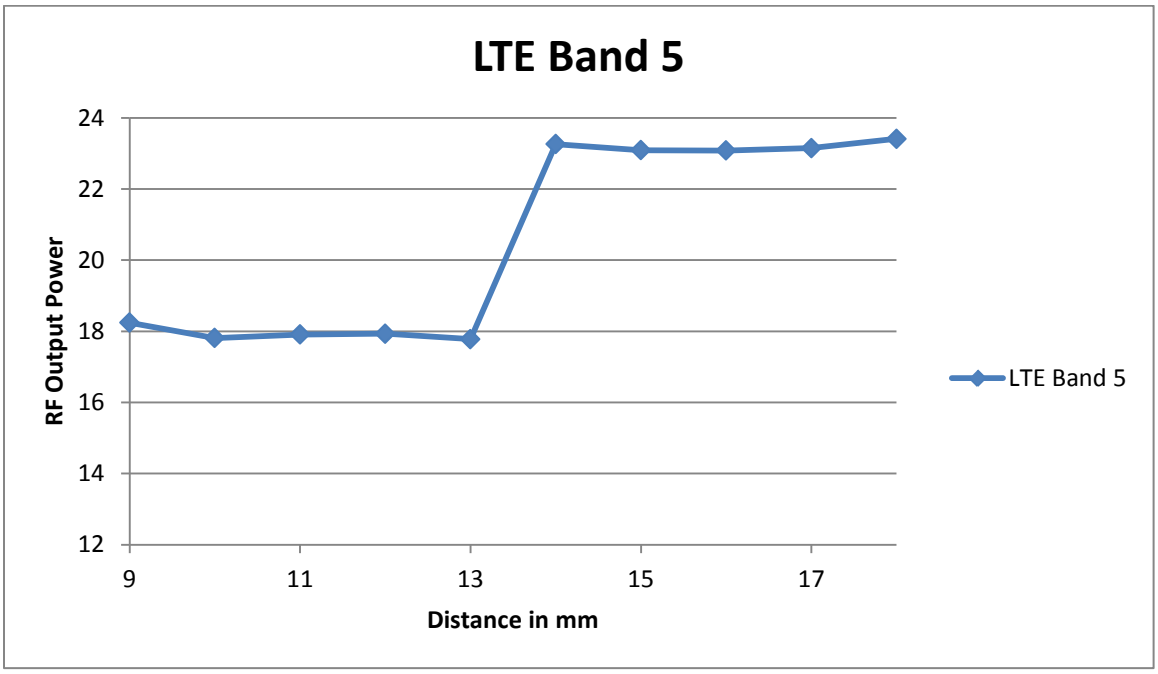
Distance to DUT vs. Output Power in dBm										
Distance	18	17	16	15	14	13	12	11	10	9
W-CDMA Band V	22.27	22.34	22.32	22.44	22.31	17.37	17.35	17.72	17.74	17.28
W-CDMA Band II	22.69	22.43	22.71	22.57	22.29	12.31	12.29	12.25	12.45	12.59



LTE Band 5

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

Distance to DUT vs. Output Power in dBm										
Distance	18	17	16	15	14	13	12	11	10	9
LTE Band 5	23.41	23.15	23.08	23.09	23.26	17.78	17.93	17.91	17.81	18.24



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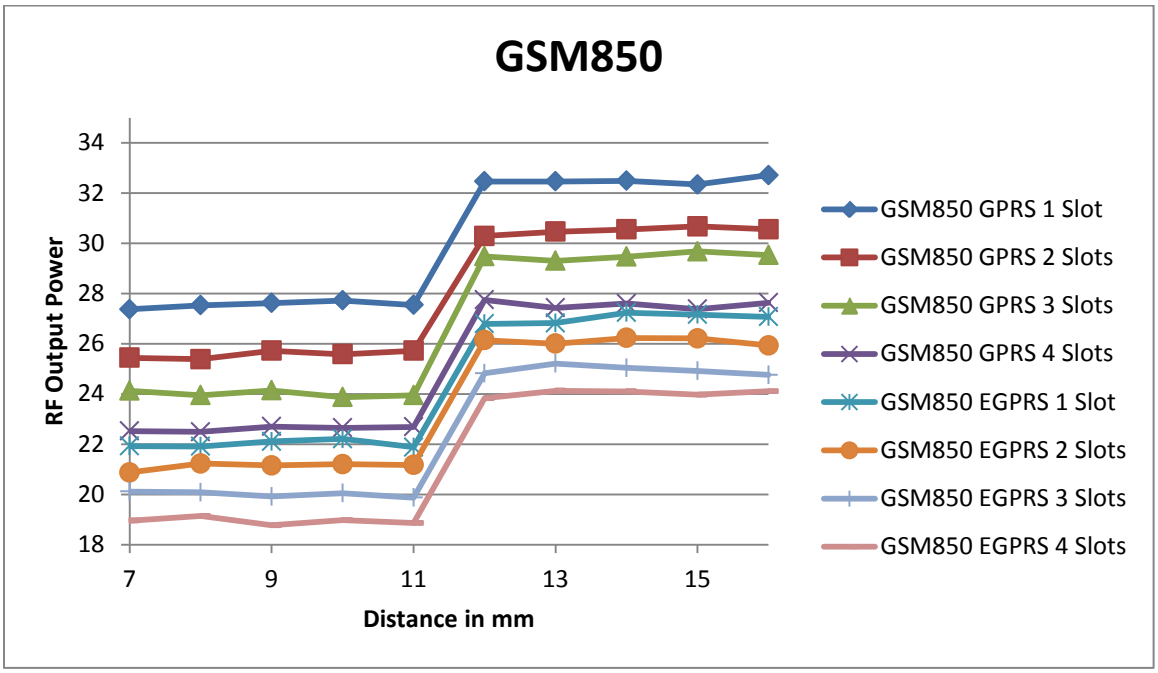
GSM850

Edge 3, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	16	15	14	13	12	11	10	9	8	7
GSM850 GPRS 1 Slot	32.71	32.34	32.49	32.46	32.46	27.54	27.72	27.62	27.53	27.37
GSM850 GPRS 2 Slots	30.56	30.67	30.55	30.46	30.29	25.72	25.58	25.72	25.38	25.44
GSM850 GPRS 3 Slots	29.53	29.68	29.47	29.30	29.48	23.95	23.87	24.14	23.95	24.13
GSM850 GPRS 4 Slots	27.63	27.38	27.60	27.43	27.75	22.69	22.65	22.70	22.49	22.52
GSM850 EGPRS 1 Slot	27.07	27.16	27.24	26.82	26.79	21.88	22.21	22.11	21.91	21.92
GSM850 EGPRS 2 Slots	25.93	26.21	26.23	26.00	26.14	21.17	21.20	21.15	21.23	20.87
GSM850 EGPRS 3 Slots	24.76	24.92	25.04	25.21	24.82	19.87	20.05	19.91	20.08	20.11
GSM850 EGPRS 4 Slots	24.11	23.97	24.10	24.13	23.83	18.86	18.97	18.77	19.14	18.95



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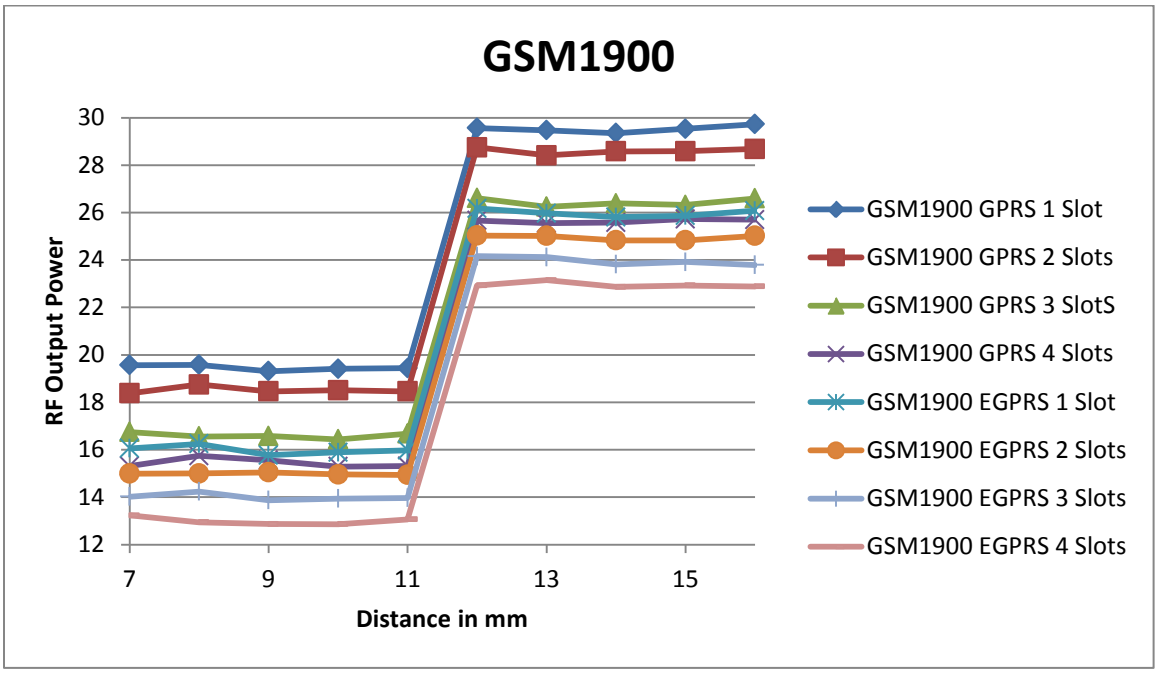
GSM1900

Edge 3, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	16	15	14	13	12	11	10	9	8	7
GSM1900 GPRS 1 Slot	29.73	29.53	29.35	29.47	29.57	19.44	19.41	19.31	19.58	19.57
GSM1900 GPRS 2 Slots	28.68	28.59	28.58	28.41	28.75	18.46	18.51	18.46	18.75	18.38
GSM1900 GPRS 3 SlotS	26.60	26.32	26.39	26.25	26.61	16.68	16.44	16.58	16.56	16.75
GSM1900 GPRS 4 Slots	25.70	25.73	25.58	25.55	25.67	15.31	15.29	15.56	15.74	15.31
GSM1900 EGPRS 1 Slot	26.08	25.87	25.81	25.97	26.17	15.98	15.89	15.77	16.25	16.06
GSM1900 EGPRS 2 Slots	25.02	24.83	24.83	25.02	25.03	14.94	14.96	15.05	15.00	14.99
GSM1900 EGPRS 3 Slots	23.79	23.92	23.82	24.12	24.16	13.97	13.94	13.87	14.24	14.02
GSM1900 EGPRS 4 Slots	22.89	22.93	22.87	23.15	22.93	13.06	12.86	12.87	12.94	13.23



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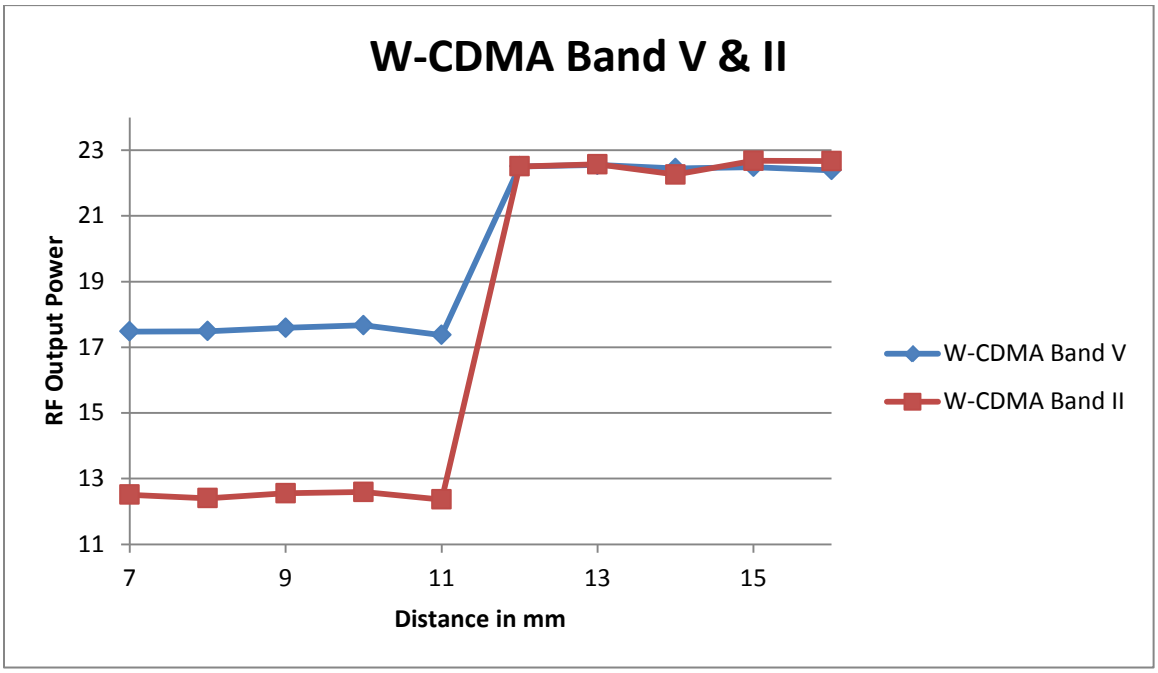
W-CDMA Bands V & II

Edge 3, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

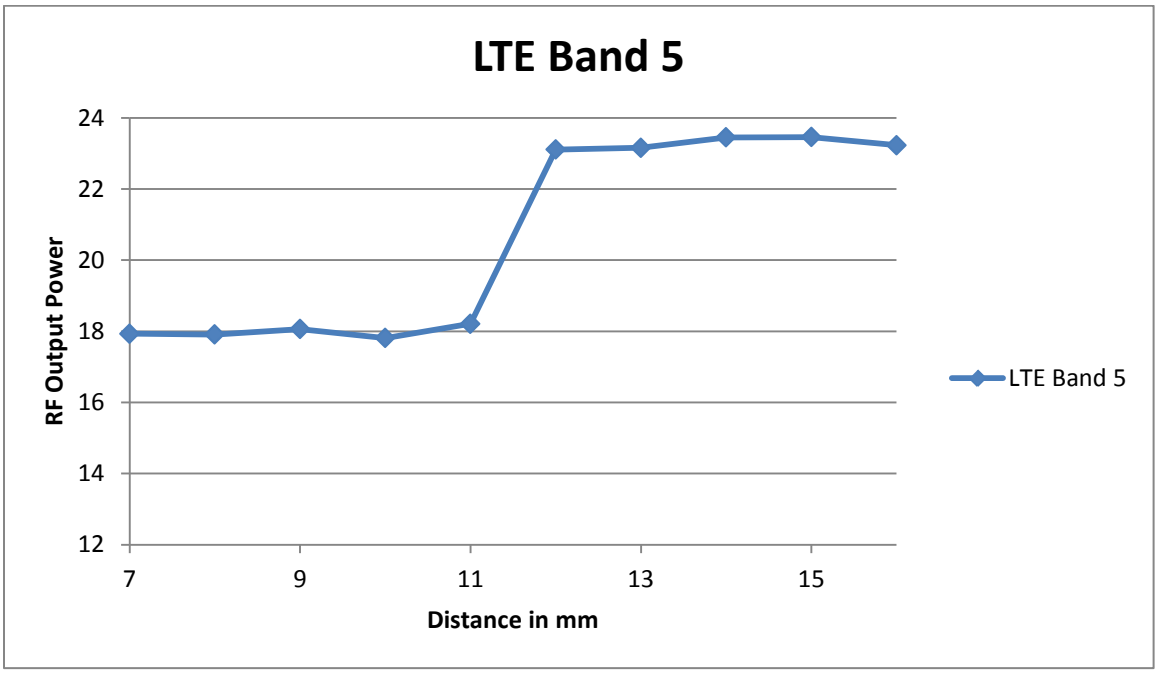
Distance to DUT vs. Output Power in dBm										
Distance	16	15	14	13	12	11	10	9	8	7
W-CDMA Band V	22.39	22.49	22.45	22.55	22.51	17.37	17.67	17.59	17.49	17.48
W-CDMA Band II	22.67	22.68	22.26	22.57	22.51	12.36	12.59	12.55	12.4	12.51



LTE Band 5

Edge 3, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	16	15	14	13	12	11	10	9	8	7
LTE Band 5	23.23	23.46	23.45	23.16	23.11	18.21	17.81	18.06	17.91	17.93



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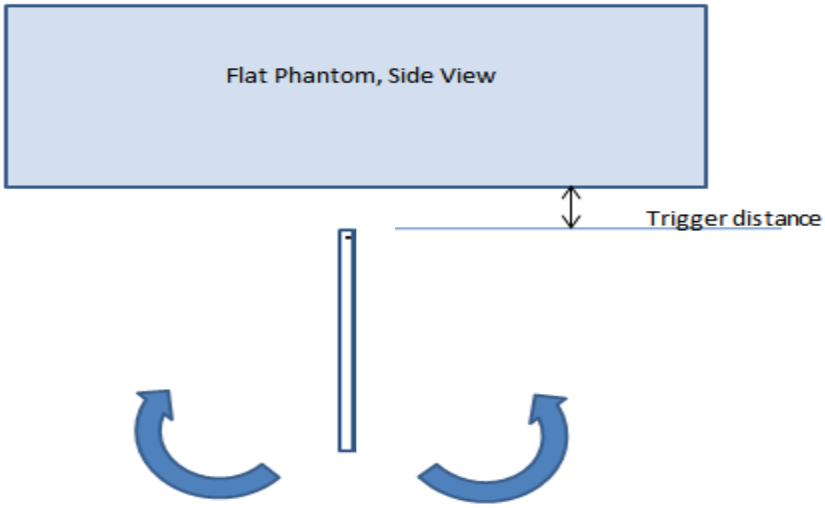
7.6.3. Proximity Sensor Coverage (KDB 616217 §6.3)

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

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

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Edges 2, 3 and 4 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edges 2, 3 and 4 for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment (Edges 2, 3 and 4) KDB 616217 §6.4

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Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Edge 3

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
850	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On
1900	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On

The minimum trigger distance measured for any of the steps required in KDB 616217 §6.2, §6.3 and §6.4 was 11 mm. Full Power SAR measurements for the Edge 3 were performed at 10mm separation distance from the phantom.

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Edge 4

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
850	0 mm	0 mm	On	On	On	On	On	On	On	On	On	On	On
1900	0 mm	0 mm	On	On	On	On	On	On	On	On	On	On	On

The minimum trigger distance measured for any of the steps required in KDB 616217 §6.2, §6.3 and §6.4 was 0 mm. Full Power SAR measurements for the Edge 4 were performed at 0 mm separation distance from the phantom.

7.7. Protrusions on the DUT

The DUT features protrusions at each corner. Although the protrusions do not affect the antenna to user separation distance they do increase the distance of the antennas from the flat phantom by 0.7 mm at the edges. The DUT also has protruding feet and a protruding camera lens on the rear. The feet protrusions are 0.7 mm and the camera protrusion is 1.2 mm. Again these protrusions do not affect the antenna to user separation distance but they do affect the antenna to flat phantom separation distance.

As these additional distances are less than 5 mm and the reported SAR is less than 1.2 W/kg a KDB enquiry was not required in accordance with KDB 616217 § 4.1.

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8. RF Exposure Conditions

This product is a phone supporting next to ear operations with diagonal dimensions greater than 20 cm. As such, it is categorized as a phablet and requires testing in accordance with the phablet procedures described in both KDB 648474 and 616217 in order to, respectively, demonstrate compliance for head SAR and body SAR exposure conditions. The usual body-worn accessory and hotspot mode testing required for phones are however not performed as they are effectively covered by the more conservative test procedures for tablets.

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	

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

The EUT implements the power reduction scheme for SAR compliance, for specific device configuration and orientations, as described below. The complete description of the implementation and functionality is provided in the "Operational Description of Power Reduction" exhibit.

8.1. Standalone SAR Test Exclusion Considerations

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

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

SAR Test Exclusion Calculations for WWAN

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off.																
Cellular	GSM 1 Slot	836.6	33.00	249	5	198	82.5	6.8	19.3		45.5 -MEASURE-	> 50 mm	> 50 mm	32.5 -MEASURE-	12 -MEASURE-	
Cellular	GSM 1 Slot	1880	30.00	125	5	198	82.5	6.8	19.3		34.3 -MEASURE-	> 50 mm	> 50 mm	24.5 -MEASURE-	9 -MEASURE-	
Cellular	GPRS 3 Slots	836.6	29.50	334	5	198	82.5	6.8	19.3		61.1 -MEASURE-	> 50 mm	> 50 mm	43.6 -MEASURE-	16.1 -MEASURE-	
Cellular	GPRS 4 Slots	1880	26.00	199	5	198	82.5	6.8	19.3		54.6 -MEASURE-	> 50 mm	> 50 mm	39 -MEASURE-	14.4 -MEASURE-	
Cellular	W-CDMA II	1880	23.00	200	5	198	82.5	6.8	19.3		54.8 -MEASURE-	> 50 mm	> 50 mm	39.2 -MEASURE-	14.4 -MEASURE-	
Cellular	W-CDMA V	836.6	23.00	200	5	198	82.5	6.8	19.3		36.6 -MEASURE-	> 50 mm	> 50 mm	26.1 -MEASURE-	9.6 -MEASURE-	
Cellular	LTE Band 5	836.5	23.80	240	5	198	82.5	6.8	19.3		43.9 -MEASURE-	> 50 mm	> 50 mm	31.4 -MEASURE-	11.6 -MEASURE-	
Reduced Power, Proximity Sensor On																
Cellular	GSM 1 Slot	836.6	28.00	79	5	198	82.5	6.8	19.3		14.5 -MEASURE-	> 50 mm	> 50 mm	10.3 -MEASURE-	3.8 -MEASURE-	
Cellular	GSM 1 Slot	1880	20.00	13	5	198	82.5	6.8	19.3		3.6 -MEASURE-	> 50 mm	> 50 mm	3 -EXEMPT-	1 -EXEMPT-	
Cellular	GPRS 3 Slots	836.6	24.50	106	5	198	82.5	6.8	19.3		19.4 -MEASURE-	> 50 mm	> 50 mm	13.9 -MEASURE-	5.1 -MEASURE-	
Cellular	GPRS 4 Slots	1880	16.00	20	5	198	82.5	6.8	19.3		5.5 -MEASURE-	> 50 mm	> 50 mm	3.9 -MEASURE-	1 -EXEMPT-	
Cellular	W-CDMA II	1880	18.00	63	5	198	82.5	6.8	19.3		17.3 -MEASURE-	> 50 mm	> 50 mm	12.3 -MEASURE-	4.5 -MEASURE-	
Cellular	W-CDMA V	836.6	18.00	63	5	198	82.5	6.8	19.3		11.5 -MEASURE-	> 50 mm	> 50 mm	8.2 -MEASURE-	3 -MEASURE-	
Cellular	LTE Band 5	836.5	18.50	71	5	198	82.5	6.8	19.3		13 -MEASURE-	> 50 mm	> 50 mm	9.3 -MEASURE-	3.4 -MEASURE-	

Conclusion:

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

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Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off.																
Cellular	GSM 1 Slot	836.6	33.00	249	5	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.3 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	GSM 1 Slot	1800	30.00	125	5	198	82.5	6.8	19.3		< 50 mm	1591.8 mW -EXEMPT-	436.8 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	GPRS 3 Slots	836.6	29.50	334	5	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.3 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	GPRS 4 Slots	1800	26.00	199	5	198	82.5	6.8	19.3		< 50 mm	1591.8 mW -EXEMPT-	436.8 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	W-CDMA 2	1800	23.00	200	5	198	82.5	6.8	19.3		< 50 mm	1591.8 mW -EXEMPT-	436.8 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	W-CDMA 5	836.6	23.00	200	5	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.3 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	LTE Band 5	836.5	23.80	240	5	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.2 mW -EXEMPT-	< 50 mm	< 50 mm	
Reduced Power, Proximity Sensor On																
Cellular	GSM 1 Slot	836.6	33.00	249	5	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.3 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	GSM 1 Slot	1800	30.00	125	5	198	82.5	6.8	19.3		< 50 mm	1591.8 mW -EXEMPT-	436.8 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	GPRS 3 Slots	836.6	29.50	334	5	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.3 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	GPRS 4 Slots	1800	26.00	199	5	198	82.5	6.8	19.3		< 50 mm	1591.8 mW -EXEMPT-	436.8 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	W-CDMA 2	1800	23.00	200	5	198	82.5	6.8	19.3		< 50 mm	1591.8 mW -EXEMPT-	436.8 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	W-CDMA 5	836.6	23.00	200	5	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.3 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	LTE Band 5	836.5	23.80	240	5	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.2 mW -EXEMPT-	< 50 mm	< 50 mm	

Conclusion:

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

SAR Test Exclusion Calculations for WLAN

Antennas < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Antenna 1															
Wi-Fi 2.4 GHz	2437	13.50	22	5	13	6.8	198	92		6.9 -MEASURE-	2.6 -EXEMPT-	4.9 -MEASURE-	> 50 mm	> 50 mm	
Wi-Fi 5.2 GHz	5240	10.50	11	5	13	6.8	198	92		5 -MEASURE-	1.9 -EXEMPT-	3.6 -MEASURE-	> 50 mm	> 50 mm	
Wi-Fi 5.3 GHz	5320	10.50	11	5	13	6.8	198	92		5.1 -MEASURE-	2 -EXEMPT-	3.6 -MEASURE-	> 50 mm	> 50 mm	
Wi-Fi 5.5 GHz	5700	10.50	11	5	13	6.8	198	92		5.3 -MEASURE-	2 -EXEMPT-	3.8 -MEASURE-	> 50 mm	> 50 mm	
Wi-Fi 5.8 GHz	5825	10.50	11	5	13	6.8	198	92		5.3 -MEASURE-	2 -EXEMPT-	3.8 -MEASURE-	> 50 mm	> 50 mm	
Bluetooth	2441	7.50	6	5	13	6.8	198	92		1.9 -EXEMPT-	0.7 -EXEMPT-	1.3 -EXEMPT-	> 50 mm	> 50 mm	

Conclusion:

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

Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Antenna 1															
Wi-Fi 2.4 GHz	2437	13.50	22	5	13	6.8	198	92		< 50 mm	< 50 mm	< 50 mm	1576.1 mW -EXEMPT-	516.1 mW -EXEMPT-	
Wi-Fi 5.2 GHz	5240	10.50	11	5	13	6.8	198	92		< 50 mm	< 50 mm	< 50 mm	1545.5 mW -EXEMPT-	485.5 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	10.50	11	5	13	6.8	198	92		< 50 mm	< 50 mm	< 50 mm	1545 mW -EXEMPT-	485 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	10.50	11	5	13	6.8	198	92		< 50 mm	< 50 mm	< 50 mm	1542.8 mW -EXEMPT-	482.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	10.50	11	5	13	6.8	198	92		< 50 mm	< 50 mm	< 50 mm	1542.2 mW -EXEMPT-	482.2 mW -EXEMPT-	
Bluetooth	2441	7.50	6	5	13	6.8	198	92		< 50 mm	< 50 mm	< 50 mm	1576 mW -EXEMPT-	516 mW -EXEMPT-	

Conclusion:

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

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8.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 8.1:

Test Configurations	Rear	Edge 1 (Top Edge)	Edge 2 (Right Edge)	Edge 3 (Bottom Edge)	Edge 4 (Left Edge)
GSM850 Full Power	Yes	No	No	Yes	Yes
GSM850 w/ Power Reduction	Yes	No	No	Yes	Yes
GSM1900 Full Power	Yes	No	No	Yes	Yes
GSM1900 w/ Power Reduction	Yes	No	No	Yes*	No
W-CDMA Band V Full Power	Yes	No	No	Yes	Yes
W-CDMA Band V w/ Power Reduction	Yes	No	No	Yes	Yes
W-CDMA Band II Full Power	Yes	No	No	Yes	Yes
W-CDMA Band II w/ Power Reduction	Yes	No	No	Yes	Yes
LTE Band 5 Full Power	Yes	No	No	Yes	Yes
LTE Band 5 w/ Power Reduction	Yes	No	No	Yes	Yes
Wi-Fi 2.4 GHz	Yes	No	Yes	No	No
Wi-Fi 5 GHz	Yes	No	Yes	No	No
Bluetooth	No	No	No	No	No

Note(s):

- Yes = Testing is required.
- No = Testing is not required.

* Testing for GSM1900 w/ Power Reduction on Edge 3 is excluded for GSM 1 Slot.

8.3. Additional Test Scenarios

The DUT supports an external plastic/rubber case which serves as a holder for the aluminum stylus for use with the device. Additional testing was performed with the case on the DUT on the worse case configuration for both Head and Body for each frequency band.

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9. RF Output Power Measurement

9.1. GSM

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Power		with Pwr Back-off	
						Burst Pwr (dBm)	Frame Pwr (dBm)	Burst Pwr (dBm)	Frame Pwr (dBm)
850	GSM (Voice)	CS1	1	128	824.2	32.8	23.8	27.9	18.9
				190	836.6	32.6	23.6	27.8	18.8
				251	848.8	32.5	23.5	27.6	18.6
	GPRS (GMSK)	CS1	1	128	824.2	32.8	23.8	27.9	18.9
				190	836.6	32.6	23.6	27.8	18.8
				251	848.8	32.5	23.5	27.6	18.6
			2	128	824.2	30.2	24.2	26.0	20.0
				190	836.6	30.1	24.1	26.0	20.0
				251	848.8	30.0	24.0	25.8	19.8
			3	**128**	**824.2**	**28.4**	**24.1**	**24.4**	**20.1**
				190	**836.6**	**28.4**	**24.1**	**24.3**	**20.0**
				251	**848.8**	**28.2**	**23.9**	**24.1**	**19.8**
			4	128	824.2	27.3	24.3	22.8	19.8
				190	836.6	27.2	24.2	22.6	19.6
				251	848.8	27.0	24.0	22.5	19.5
	EGPRS (8PSK)	MCS5	1	128	824.2	27.3	18.3	22.2	13.2
				190	836.6	27.2	18.2	22.0	13.0
				251	848.8	27.0	18.0	21.9	12.9
			2	128	824.2	26.0	20.0	21.2	15.2
				190	836.6	25.8	19.8	21.0	15.0
				251	848.8	25.6	19.6	20.9	14.9
			3	128	824.2	24.6	20.3	20.2	15.9
				190	836.6	24.5	20.2	20.1	15.8
				251	848.8	24.3	20.0	19.9	15.6
			4	128	824.2	23.5	20.5	19.3	16.3
				190	836.6	23.4	20.4	19.3	16.3
				251	848.8	23.2	20.2	19.0	16.0

Notes:

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

- GMSK (GPRS) mode with 3 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

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Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Power		with Pwr Back-off	
						Burst Pwr (dBm)	Frame Pwr (dBm)	Burst Pwr (dBm)	Frame Pwr (dBm)
1900	GSM (Voice)	CS1	1	512	1850.2	29.9	20.9	20.0	11.0
				661	1880.0	29.9	20.9	20.0	11.0
				810	1909.8	29.9	20.9	20.0	11.0
	GPRS (GMSK)	CS1	1	512	1850.2	29.9	20.9	20.0	11.0
				661	1880.0	29.9	20.9	20.0	11.0
				810	1909.8	29.9	20.9	20.0	11.0
			2	512	1850.2	28.7	22.7	18.8	12.8
				661	1880.0	28.7	22.7	18.8	12.8
				810	1909.8	28.7	22.7	18.8	12.8
			3	512	1850.2	26.5	22.2	16.8	12.5
				661	1880.0	26.5	22.2	16.9	12.6
				810	1909.8	26.6	22.3	16.9	12.6
			4	**512**	**1850.2**	**25.4**	**22.4**	**15.8**	**12.8**
				661	**1880.0**	**25.5**	**22.5**	**15.8**	**12.8**
				810	**1909.8**	**25.5**	**22.5**	**15.9**	**12.9**
	EGPRS (8PSK)	MCS5	1	512	1850.2	26.5	17.5	16.0	7.0
				661	1880.0	26.5	17.5	16.0	7.0
				810	1909.8	26.5	17.5	15.9	6.9
			2	512	1850.2	25.2	19.2	14.9	8.9
				661	1880.0	25.2	19.2	14.9	8.9
				810	1909.8	25.2	19.2	14.8	8.8
			3	512	1850.2	23.8	19.5	13.4	9.1
				661	1880.0	23.8	19.5	13.3	9.0
				810	1909.8	23.9	19.6	13.4	9.1
			4	512	1850.2	22.8	19.8	11.9	8.9
				661	1880.0	22.8	19.8	11.8	8.8
				810	1909.8	22.8	19.8	11.8	8.8

Notes:

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

- GMSK (GPRS) mode with 4 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

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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
	Rel99 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)	
				Max	Pwr Back-off
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	22.7	17.8
		4183	836.6	22.8	17.9
		4233	846.6	22.9	17.9
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.7	12.4
		9400	1880.0	22.7	12.7
		9538	1907.6	23.0	12.7

HSDPA

The following 4 Sub-tests were completed according to Release 5 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	11/15	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			

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Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	
				Max	Pwr Back-off
W-CDMA Band V	Subtest 1	4132	826.4	21.4	17.8
		4183	836.6	21.4	17.7
		4233	846.6	21.5	17.8
	Subtest 2	4132	826.4	21.5	17.8
		4183	836.6	21.5	17.9
		4233	846.6	21.5	17.8
	Subtest 3	4132	826.4	21.0	17.8
		4183	836.6	21.0	17.8
		4233	846.6	21.0	17.8
	Subtest 4	4132	826.4	21.0	17.8
		4183	836.6	21.0	17.9
		4233	846.6	21.0	17.8
W-CDMA Band II	Subtest 1	9262	1852.4	21.8	12.2
		9400	1880.0	21.9	12.5
		9538	1907.6	22.0	12.5
	Subtest 2	9262	1852.4	21.8	12.2
		9400	1880.0	21.9	12.5
		9538	1907.6	22.0	12.5
	Subtest 3	9262	1852.4	21.3	12.0
		9400	1880.0	21.4	12.5
		9538	1907.6	21.5	12.5
	Subtest 4	9262	1852.4	21.3	12.0
		9400	1880.0	21.4	12.5
		9538	1907.6	21.5	12.5

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

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HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 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	12.2kbps 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

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Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	
				Max	Pwr Back-off
W-CDMA Band V	Subtest 1	4132	826.4	20.7	17.7
		4183	836.6	21.0	17.7
		4233	846.6	21.0	17.7
	Subtest 2	4132	826.4	20.3	17.3
		4183	836.6	20.4	17.4
		4233	846.6	19.9	17.5
	Subtest 3	4132	826.4	20.1	17.6
		4183	836.6	20.2	17.6
		4233	846.6	20.0	17.6
	Subtest 4	4132	826.4	20.5	17.7
		4183	836.6	20.5	17.4
		4233	846.6	20.2	17.5
	Subtest 5	4132	826.4	21.2	17.8
		4183	836.6	21.2	17.8
		4233	846.6	21.3	17.8
W-CDMA Band II	Subtest 1	9262	1852.4	21.6	11.4
		9400	1880.0	21.5	11.7
		9538	1907.6	21.5	11.7
	Subtest 2	9262	1852.4	20.4	11.5
		9400	1880.0	20.5	11.6
		9538	1907.6	20.5	11.8
	Subtest 3	9262	1852.4	20.5	11.6
		9400	1880.0	20.4	11.6
		9538	1907.6	20.6	11.7
	Subtest 4	9262	1852.4	20.5	11.0
		9400	1880.0	20.9	11.5
		9538	1907.6	21.0	11.7
	Subtest 5	9262	1852.4	21.8	12.2
		9400	1880.0	21.9	12.5
		9538	1907.6	22.0	12.5

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DC-HSDPA

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121-1, since DC-HSDPA has only one transmitting uplink. 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	11/15	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			

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Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	
				Max	Pwr Back-off
W-CDMA Band V	Subtest 1	4132	826.4	21.4	17.8
		4183	836.6	21.4	17.7
		4233	846.6	21.5	17.8
	Subtest 2	4132	826.4	21.5	17.8
		4183	836.6	21.5	17.9
		4233	846.6	21.5	17.8
	Subtest 3	4132	826.4	21.0	17.8
		4183	836.6	21.0	17.8
		4233	846.6	21.0	17.8
	Subtest 4	4132	826.4	21.0	17.8
		4183	836.6	21.0	17.9
		4233	846.6	21.0	17.8
W-CDMA Band II	Subtest 1	9262	1852.4	21.8	12.2
		9400	1880.0	21.9	12.5
		9538	1907.6	22.0	12.5
	Subtest 2	9262	1852.4	21.8	12.2
		9400	1880.0	21.9	12.5
		9538	1907.6	22.0	12.5
	Subtest 3	9262	1852.4	21.3	12.0
		9400	1880.0	21.4	12.5
		9538	1907.6	21.5	12.5
	Subtest 4	9262	1852.4	21.3	12.0
		9400	1880.0	21.4	12.5
		9538	1907.6	21.5	12.5

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

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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.					

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LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
							Max. Power			with Pwr Back-off		
							829 MHz	836.5 MHz	844 MHz	829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	0	23.5	23.6	23.6	18.0	18.1	18.0
			1	25	0	0	23.5	23.6	23.5	17.9	18.0	17.9
			1	49	0	0	23.5	23.6	23.5	17.9	18.1	18.0
			25	0	1	0	22.6	22.6	22.5	18.1	18.0	18.0
			25	12	1	1	22.6	22.6	22.6	18.1	18.0	18.0
			25	25	1	1	22.6	22.6	22.6	18.1	18.0	18.0
			50	0	1	1	22.7	22.6	22.6	18.1	18.0	18.1
		16QAM	1	0	1	1	22.5	22.8	22.6	17.8	18.2	17.8
			1	25	1	1	22.3	22.7	22.4	17.7	18.2	17.7
			1	49	1	1	22.4	22.8	22.4	17.8	18.1	17.8
			25	0	2	2	21.6	21.6	21.6	17.9	18.0	17.9
			25	12	2	2	21.6	21.5	21.5	17.9	17.9	17.9
			25	25	2	2	21.6	21.6	21.6	17.9	17.9	17.9
			50	0	2	2	21.7	21.6	21.6	18.0	17.9	17.9

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
							Max. Power			with Pwr Back-off		
							826.5 MHz	836.5 MHz	846.5 MHz	826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	0	23.5	23.5	23.6	18.0	18.0	18.0
			1	12	0	0	23.5	23.5	23.6	17.9	17.9	18.0
			1	24	0	0	23.4	23.5	23.6	18.0	18.0	18.0
			12	0	1	0	22.6	22.6	22.6	18.0	18.0	18.0
			12	7	1	0	22.6	22.6	22.6	18.0	18.0	18.0
			12	13	1	0	22.5	22.5	22.6	17.9	18.0	18.0
			25	0	1	0	22.6	22.6	22.6	18.0	18.0	18.0
		16QAM	1	0	1	0	22.4	22.4	22.8	17.7	17.7	17.7
			1	12	1	0	22.3	22.3	22.8	17.7	17.7	17.7
			1	24	1	0	22.4	22.4	22.8	17.7	17.8	17.8
			12	0	2	0	21.6	21.6	21.5	17.9	18.0	18.0
			12	7	2	0	21.6	21.6	21.5	17.9	17.9	18.0
			12	13	2	0	21.6	21.6	21.6	17.9	17.9	18.0
			25	0	2	0	21.7	21.7	21.5	18.0	18.0	18.0

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LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
							Max. Power			with Pwr Back-off		
							825.5 MHz	836.5 MHz	847.5 MHz	825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	0	23.6	23.6	23.5	18.0	18.0	18.1
			1	8	0	0	23.5	23.6	23.5	17.9	17.9	18.0
			1	14	0	0	23.5	23.6	23.6	18.0	18.0	18.0
			8	0	1	0	22.6	22.6	22.6	18.1	18.0	18.0
			8	4	1	1	22.6	22.6	22.6	18.0	18.0	18.0
			8	7	1	1	22.6	22.6	22.6	18.0	18.0	18.1
			15	0	1	1	22.6	22.6	22.6	18.1	18.0	18.1
		16QAM	1	0	1	1	22.5	22.8	22.5	17.8	17.8	17.8
			1	8	1	1	22.4	22.7	22.4	17.8	17.7	17.8
			1	14	1	1	22.4	22.7	22.5	17.8	17.7	17.9
			8	0	2	2	21.6	21.4	21.6	17.9	18.0	18.0
			8	4	2	2	21.6	21.4	21.6	17.9	18.0	17.9
			8	7	2	2	21.6	21.4	21.6	17.9	18.0	17.9
			15	0	2	2	21.6	21.6	21.6	18.0	17.8	17.9

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
							Max. Power			with Pwr Back-off		
							824.7 MHz	836.5 MHz	848.3 MHz	824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	0	23.6	23.6	23.6	18.1	18.2	18.1
			1	3	0	0	23.5	23.5	23.5	18.1	18.1	18.0
			1	5	0	0	23.6	23.6	23.6	18.1	18.2	18.1
			3	0	0	0	23.6	23.6	23.6	18.2	18.1	18.2
			3	1	0	0	23.6	23.6	23.6	18.1	18.1	18.1
			3	3	0	0	23.5	23.6	23.6	18.1	18.1	18.1
			6	0	1	0	22.7	22.6	22.7	18.0	18.0	18.1
		16QAM	1	0	1	0	22.7	22.7	22.7	18.1	18.2	18.1
			1	3	1	0	22.6	22.6	22.6	18.1	18.2	18.1
			1	5	1	0	22.7	22.6	22.7	18.1	18.2	18.1
			3	0	1	0	22.6	22.6	22.6	18.0	18.0	18.0
			3	1	1	0	22.5	22.5	22.6	17.9	17.9	18.0
			3	3	1	0	22.5	22.5	22.5	18.0	17.9	18.0
			6	0	2	0	21.7	21.7	21.7	18.0	17.8	18.0

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 KDB941225 D05 SAR for LTE Devices v02r02

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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	Ch #	Freq. (MHz)	Avg Pwr (dBm) WiFi 1	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1	2412	13.0	Yes
		6	2437	12.6	
		11	2462	13.0	
	802.11g	1	2412	12.1	No
		6	2437	11.7	
		11	2462	12.5	
	802.11n (HT20)	1	2412	11.2	No
		6	2437	10.8	
		11	2462	10.6	

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 WiFi 1	SAR test (Yes/No)
802.11b	6	2437	1 Mbps	12.6	Yes
			2 Mbps	12.7	No
			5.5 Mbps	12.7	No
			11 Mbps	12.7	No

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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		*
	UNII (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.

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Wi-Fi 5 GHz Bands Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm) WiFi 1	SAR Test (Yes/No)
5.2 (UNII)	802.11a	6 Mbps	36	5180	**10.5**	Yes
			40	5200	9.8	
			44	5220	**9.8**	
			48	5240	9.7	
	802.11n (HT20)	MCS 0	36	5180	10.4	No
			40	5200	9.9	
			48	5240	9.8	
	802.11n (HT40)	MCS 0	38	5190	9.8	No
			46	5230	10.5	
5.3 (UNII)	802.11a	6 Mbps	52	5260	**10.5**	Yes
			56	5280	10.5	
			60	5300	10.0	
			64	5320	**10.4**	
	802.11n (HT20)	MCS 0	52	5260	10.5	No
			60	5300	10.0	
			64	5320	10.5	
	802.11n (HT40)	MCS 0	54	5270	10.5	No
			62	5310	10.5	
5.5 (UNII)	802.11a		100	5500	9.7	Yes
			104	5520	9.7	
			108	5540	**10.1**	
			112	5560	**10.5**	
			116	5580	10.3	
			120	5600	9.8	
			124	5620	**10.2**	
			128	5640	9.7	
			132	5660	10.1	
			136	5680	10.0	
			140	5700	**10.4**	
	802.11n (HT20)		100	5500	9.8	No
			116	5580	10.3	
			140	5700	10.5	
	802.11n (HT40)		102	5510	10.5	No
			110	5550	10.0	
			134	5670	10.0	
5.8 (UNII)	802.11a		149	5745	**10.0**	Yes
			153	5765	**10.4**	
			157	5785	10.0	
			161	5805	9.9	
			165	5825	**10.5**	
	802.11n (HT20)		149	5745	10.0	No
			157	5785	10.0	
			161	5805	10.0	
	802.11n (HT40)		151	5755	10.4	No
			159	5795	10.4	

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.

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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	36	5180	6 Mbps	10.5	Yes
				9 Mbps	10.0	No
				12 Mbps	10.0	No
				18 Mbps	10.1	No
				24 Mbps	10.2	No
				36 Mbps	10.1	No
				48 Mbps	10.2	No
				54 Mbps	10.2	No
5.3 GHz (UNII)	802.11a	56	5280	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	10.5	No
5.5 GHz (UNII)	802.11a	116	5580	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	10.5	No
5.8 GHz (UNII)	802.11a	149	5745	6 Mbps	10.5	Yes
				9 Mbps	10.5	No
				12 Mbps	10.5	No
				18 Mbps	10.5	No
				24 Mbps	10.0	No
				36 Mbps	10.0	No
				48 Mbps	10.0	No
				54 Mbps	10.0	No

9.6. Bluetooth

Maximum tune-up tolerance limit is 7.5 dBm. This power level qualifies for exclusion of SAR testing. Refer to Standalone SAR Test Exclusion Considerations Section.

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10. Tissue Dielectric Properties

IEEE Std 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
600	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 v01r03

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

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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%
C8H18O3	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

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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 Room 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/7/2014	Head 2450	e'	38.0600	Relative Permittivity (ε_r):	38.06	39.20	-2.91	5
		e''	13.8600	Conductivity (σ):	1.89	1.80	4.90	5
	Head 2410	e'	38.2300	Relative Permittivity (ε_r):	38.23	39.28	-2.67	5
		e''	13.7000	Conductivity (σ):	1.84	1.76	4.28	5
	Head 2475	e'	37.9700	Relative Permittivity (ε_r):	37.97	39.17	-3.06	5
		e''	13.9300	Conductivity (σ):	1.92	1.83	4.93	5
8/8/2014	Body 2450	e'	50.3300	Relative Permittivity (ε_r):	50.33	52.70	-4.50	5
		e''	14.9300	Conductivity (σ):	2.03	1.95	4.30	5
	Body 2410	e'	50.4700	Relative Permittivity (ε_r):	50.47	52.76	-4.34	5
		e''	14.8300	Conductivity (σ):	1.99	1.91	4.18	5
	Body 2475	e'	50.2600	Relative Permittivity (ε_r):	50.26	52.67	-4.57	5
		e''	14.9900	Conductivity (σ):	2.06	1.99	3.92	5
8/11/2014	Head 2450	e'	39.5300	Relative Permittivity (ε_r):	39.53	39.20	0.84	5
		e''	13.0000	Conductivity (σ):	1.77	1.80	-1.61	5
	Head 2410	e'	39.6900	Relative Permittivity (ε_r):	39.69	39.28	1.05	5
		e''	12.8700	Conductivity (σ):	1.72	1.76	-2.03	5
	Head 2475	e'	39.4400	Relative Permittivity (ε_r):	39.44	39.17	0.69	5
		e''	13.0800	Conductivity (σ):	1.80	1.83	-1.48	5
8/11/2014	Body 2450	e'	51.8800	Relative Permittivity (ε_r):	51.88	52.70	-1.56	5
		e''	14.9500	Conductivity (σ):	2.04	1.95	4.44	5
	Body 2410	e'	52.0000	Relative Permittivity (ε_r):	52.00	52.76	-1.44	5
		e''	14.8500	Conductivity (σ):	1.99	1.91	4.32	5
	Body 2475	e'	51.8100	Relative Permittivity (ε_r):	51.81	52.67	-1.63	5
		e''	15.0100	Conductivity (σ):	2.07	1.99	4.06	5
8/14/2014	Head 2450	e'	38.2600	Relative Permittivity (ε_r):	38.26	39.20	-2.40	5
		e''	13.5900	Conductivity (σ):	1.85	1.80	2.85	5
	Head 2410	e'	38.4200	Relative Permittivity (ε_r):	38.42	39.28	-2.19	5
		e''	13.4800	Conductivity (σ):	1.81	1.76	2.61	5
	Head 2475	e'	38.1700	Relative Permittivity (ε_r):	38.17	39.17	-2.55	5
		e''	13.6600	Conductivity (σ):	1.88	1.83	2.89	5

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SAR Room 1 (continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/9/2014	Body 5180	e'	49.4800	Relative Permittivity (ε_r):	49.48	49.05	0.88	5
		e''	18.2300	Conductivity (σ):	5.25	5.27	-0.39	5
	Body 5200	e'	49.4500	Relative Permittivity (ε_r):	49.45	49.02	0.88	5
		e''	18.2500	Conductivity (σ):	5.28	5.29	-0.34	5
	Body 5600	e'	48.8500	Relative Permittivity (ε_r):	48.85	48.48	0.77	5
		e''	18.5600	Conductivity (σ):	5.78	5.76	0.32	5
	Body 5800	e'	48.5700	Relative Permittivity (ε_r):	48.57	48.20	0.77	5
		e''	18.7400	Conductivity (σ):	6.04	6.00	0.73	5
	Body 5825	e'	48.5400	Relative Permittivity (ε_r):	48.54	48.20	0.71	5
		e''	18.7700	Conductivity (σ):	6.08	6.00	1.32	5
8/12/2014	Head 5180	e'	34.8000	Relative Permittivity (ε_r):	34.80	36.01	-3.37	5
		e''	15.6500	Conductivity (σ):	4.51	4.63	-2.65	5
	Head 5200	e'	34.7700	Relative Permittivity (ε_r):	34.77	35.99	-3.39	5
		e''	15.6700	Conductivity (σ):	4.53	4.65	-2.58	5
	Head 5600	e'	34.2000	Relative Permittivity (ε_r):	34.20	35.53	-3.75	5
		e''	15.8200	Conductivity (σ):	4.93	5.06	-2.65	5
	Head 5800	e'	33.9200	Relative Permittivity (ε_r):	33.92	35.30	-3.91	5
		e''	15.9000	Conductivity (σ):	5.13	5.27	-2.70	5
	Head 5825	e'	33.8900	Relative Permittivity (ε_r):	33.89	35.30	-3.99	5
		e''	15.9200	Conductivity (σ):	5.16	5.27	-2.16	5
8/12/2014	Body 5180	e'	47.7800	Relative Permittivity (ε_r):	47.78	49.05	-2.58	5
		e''	18.7500	Conductivity (σ):	5.40	5.27	2.45	5
	Body 5200	e'	47.7500	Relative Permittivity (ε_r):	47.75	49.02	-2.59	5
		e''	18.7600	Conductivity (σ):	5.42	5.29	2.45	5
	Body 5600	e'	47.1100	Relative Permittivity (ε_r):	47.11	48.48	-2.82	5
		e''	19.1000	Conductivity (σ):	5.95	5.76	3.23	5
	Body 5800	e'	46.7900	Relative Permittivity (ε_r):	46.79	48.20	-2.93	5
		e''	19.3200	Conductivity (σ):	6.23	6.00	3.84	5
	Body 5825	e'	46.7200	Relative Permittivity (ε_r):	46.72	48.20	-3.07	5
		e''	19.3200	Conductivity (σ):	6.26	6.00	4.29	5
8/20/2014	Body 5180	e'	47.0300	Relative Permittivity (ε_r):	47.03	49.05	-4.11	5
		e''	18.6400	Conductivity (σ):	5.37	5.27	1.85	5
	Body 5200	e'	46.9900	Relative Permittivity (ε_r):	46.99	49.02	-4.14	5
		e''	18.6700	Conductivity (σ):	5.40	5.29	1.95	5
	Body 5600	e'	46.2700	Relative Permittivity (ε_r):	46.27	48.48	-4.55	5
		e''	18.9600	Conductivity (σ):	5.90	5.76	2.48	5
	Body 5800	e'	45.9300	Relative Permittivity (ε_r):	45.93	48.20	-4.71	5
		e''	19.1200	Conductivity (σ):	6.17	6.00	2.77	5
	Body 5825	e'	45.9100	Relative Permittivity (ε_r):	45.91	48.20	-4.75	5
		e''	19.1800	Conductivity (σ):	6.21	6.00	3.54	5

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SAR Room 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/19/2014	Body 835	e'	53.0200	Relative Permittivity (ε_r):	53.02	55.20	-3.95	5
		e''	21.5100	Conductivity (σ):	1.00	0.97	2.96	5
	Body 820	e'	53.1800	Relative Permittivity (ε_r):	53.18	55.28	-3.79	5
		e''	21.6000	Conductivity (σ):	0.98	0.97	1.69	5
	Body 850	e'	52.8700	Relative Permittivity (ε_r):	52.87	55.16	-4.15	5
		e''	21.4400	Conductivity (σ):	1.01	0.99	2.65	5
8/19/2014	Body 1900	e'	51.9900	Relative Permittivity (ε_r):	51.99	53.30	-2.46	5
		e''	14.2700	Conductivity (σ):	1.51	1.52	-0.82	5
	Body 1850	e'	52.1800	Relative Permittivity (ε_r):	52.18	53.30	-2.10	5
		e''	14.2000	Conductivity (σ):	1.46	1.52	-3.90	5
	Body 1910	e'	51.9600	Relative Permittivity (ε_r):	51.96	53.30	-2.51	5
		e''	14.2700	Conductivity (σ):	1.52	1.52	-0.30	5

SAR Room 3

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/8/2014	Body 2450	e'	51.5900	Relative Permittivity (ε_r):	51.59	52.70	-2.11	5
		e''	14.4300	Conductivity (σ):	1.97	1.95	0.81	5
	Body 2410	e'	51.7600	Relative Permittivity (ε_r):	51.76	52.76	-1.89	5
		e''	14.2500	Conductivity (σ):	1.91	1.91	0.11	5
	Body 2475	e'	51.5000	Relative Permittivity (ε_r):	51.50	52.67	-2.22	5
		e''	14.5500	Conductivity (σ):	2.00	1.99	0.87	5

SAR Room 5

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/12/2014	Head 835	e'	43.0995	Relative Permittivity (ε_r):	43.10	41.50	3.85	5
		e''	19.1089	Conductivity (σ):	0.89	0.90	-1.42	5
	Head 820	e'	43.2472	Relative Permittivity (ε_r):	43.25	41.60	3.95	5
		e''	19.1328	Conductivity (σ):	0.87	0.90	-2.91	5
	Head 850	e'	42.9542	Relative Permittivity (ε_r):	42.95	41.50	3.50	5
		e''	19.0880	Conductivity (σ):	0.90	0.92	-1.40	5
8/8/2014	Body 1900	e'	51.2700	Relative Permittivity (ε_r):	51.27	53.30	-3.81	5
		e''	14.2500	Conductivity (σ):	1.51	1.52	-0.96	5
	Body 1850	e'	51.4500	Relative Permittivity (ε_r):	51.45	53.30	-3.47	5
		e''	14.0600	Conductivity (σ):	1.45	1.52	-4.85	5
	Body 1910	e'	51.2400	Relative Permittivity (ε_r):	51.24	53.30	-3.86	5
		e''	14.2800	Conductivity (σ):	1.52	1.52	-0.23	5
8/13/2014	Head 1900	e'	38.1000	Relative Permittivity (εr):	38.10	40.00	-4.75	5
		e''	13.3200	Conductivity (σ):	1.41	1.40	0.51	5
	Head 1850	e'	38.3700	Relative Permittivity (εr):	38.37	40.00	-4.08	5
		e''	13.2300	Conductivity (σ):	1.36	1.40	-2.79	5
	Head 1910	e'	38.0500	Relative Permittivity (εr):	38.05	40.00	-4.88	5
		e''	13.3400	Conductivity (σ):	1.42	1.40	1.20	5
8/14/2014	Body 1900	e'	51.3500	Relative Permittivity (ε_r):	51.35	53.30	-3.66	5
		e''	14.6900	Conductivity (σ):	1.55	1.52	2.10	5
	Body 1850	e'	51.5600	Relative Permittivity (ε_r):	51.56	53.30	-3.26	5
		e''	14.5800	Conductivity (σ):	1.50	1.52	-1.33	5
	Body 1910	e'	51.3000	Relative Permittivity (ε_r):	51.30	53.30	-3.75	5
		e''	14.6900	Conductivity (σ):	1.56	1.52	2.64	5

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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 remeasured 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
D835V2	4d002	11/15/2013	835	1g	9.49	9.43
				10g	6.18	6.21
D835V2	4d142	9/17/2013	835	1g	9.44	9.36
				10g	6.12	6.20
D1900V2	5d043	11/12/2013	1900	1g	40.1	39.00
				10g	21.1	20.8
D2450V2	899	9/10/2013	2450	1g	51.3	49.70
				10g	23.9	23.3
D5GHzV2	1138	11/19/2013	5200	1g	78.5	72.9
				10g	22.5	20.4
			5500	1g	82.7	78.3
				10g	23.5	21.7
			5800	1g	78.3	72.8
				10g	22.4	20.1

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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 Room 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				
8/7/2014	D2450V2	899	Head	1g	5.71	5.55	55.5	51.3	8.19	2.80	
				10g	2.49	2.49	24.9	23.9	4.18		
8/8/2014	D2450V2	899	Body	1g	4.77	4.77	47.7	49.7	-4.02	0.00	
				10g	2.08	2.21	22.1	23.3	-5.15		
8/11/2014	D2450V2	899	Head	1g	5.66	5.55	55.5	51.3	8.19	1.94	
				10g	2.48	2.51	25.1	23.9	5.02		
8/11/2014	D2450V2	899	Body	1g	4.71	4.70	47.0	49.7	-5.43	0.21	
				10g	2.04	2.18	21.8	23.3	-6.44		
8/14/2014	D2450V2	899	Head	1g	5.72	5.58	55.8	51.3	8.77	2.45	1,2
				10g	2.50	2.52	25.2	23.9	5.44		
8/10/2014	D5GHzV2 5200	1138	Body	1g	6.55	6.69	66.9	72.9	-8.23	-2.14	3,4
				10g	1.86	1.94	19.4	20.4	-4.90		
8/12/2014	D5GHzV2 5200	1138	Head	1g	7.28	7.79	77.9	78.5	-0.76	-7.01	
				10g	2.04	2.25	22.5	22.5	0.00		
8/12/2014	D5GHzV2 5200	1138	Body	1g	7.52	7.74	77.4	72.9	6.17	-2.93	
				10g	2.06	2.20	22.0	20.4	7.84		
8/10/2014	D5GHzV2 5600	1138	Body	1g	8.02	8.25	82.5	78.3	5.36	-2.87	5,6
				10g	2.21	2.32	23.2	21.7	6.91		
8/12/2014	D5GHzV2 5600	1138	Head	1g	7.72	8.28	82.8	82.7	0.12	-7.25	
				10g	2.10	2.36	23.6	23.5	0.43		
8/12/2014	D5GHzV2 5600	1138	Body	1g	7.25	7.55	75.5	78.3	-3.58	-4.14	
				10g	2.05	2.19	21.9	21.7	0.92		
8/10/2014	D5GHzV2 5800	1138	Body	1g	6.88	7.26	72.6	72.8	-0.27	-5.52	
				10g	1.89	2.03	20.3	20.1	1.00		
8/12/2014	D5GHzV2 5800	1138	Head	1g	6.80	7.48	74.8	78.3	-4.47	-10.00	
				10g	1.93	2.16	21.6	22.4	-3.57		
8/12/2014	D5GHzV2 5800	1138	Body	1g	7.17	7.56	75.6	72.8	3.85	-5.44	
				10g	1.92	2.11	21.1	20.1	4.98		
8/20/2014	D5GHzV2 5800	1138	Body	1g	7.15	7.70	77.0	72.8	5.77	-7.69	7,8
				10g	1.96	2.14	21.4	20.1	6.47		

SAR Room 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				
8/19/2014	D835V2	4d002	Body	1g	0.96	0.96	9.56	9.43	1.38	0.10	9,10
				10g	0.65	0.66	6.56	6.21	5.64		
8/19/2014	D1900V2	5d043	Body	1g	3.69	3.81	38.10	39.00	-2.31	-3.25	11,12
				10g	1.86	2.12	21.20	20.80	1.92		

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SAR Room 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				
8/8/2014	D2450V2	899	Body	1g	5.38	5.40	54.00	49.70	8.65	-0.37	13,14
				10g	2.32	2.51	25.10	23.30	7.73		

SAR Room 5

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				
8/18/2014	D835V2	4d142	Head	1g	1.04	1.02	10.20	9.44	8.05	1.92	15,16
				10g	0.70	0.67	6.72	6.12	9.80		
8/14/2014	D835V2	4d002	Body	1g	1.06	1.03	10.30	9.4	9.23	2.83	17,18
				10g	0.71	0.68	6.80	6.2	9.50		
8/8/2014	D1900V2	5d043	Body	1g	4.26	4.22	42.20	39.00	8.21	0.94	19,20
				10g	2.14	2.20	22.00	20.80	5.77		
8/13/2014	D1900V2	5d043	Head	1g	3.98	3.95	39.50	40.10	-1.50	0.75	
				10g	2.09	2.06	20.60	21.10	-2.37		
8/14/2014	D1900V2	5d043	Body	1g	4.20	4.15	41.50	39.00	6.41	1.19	
				10g	2.12	2.16	21.60	20.80	3.85		

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12. SAR Test Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance v05r02:
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 v02 (pg.12):
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 v02r02:
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.

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12.1. GSM850

RF Exposure Conditions	Mode	PWR back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	off	0	Left Touch	190	836.6	33.0	32.6	0.065	0.071	1
				Left Tilt	190	836.6	33.0	32.6	0.060	0.066	
				Right Touch	190	836.6	33.0	32.6	0.058	0.064	
				Right Tilt	190	836.6	33.0	32.6	0.065	0.071	
Head VoIP	GPRS 3 Slots	off	0	Left Touch	190	836.6	29.5	28.4	0.082	0.105	2
				Left Tilt	190	836.6	29.5	28.4	0.073	0.094	
				Right Touch	190	836.6	29.5	28.4	0.074	0.095	
				Right Tilt	190	836.6	29.5	28.4	0.081	0.104	
Body	Voice	on	0	Rear	190	836.6	28.0	27.8	0.557	0.583	3
				Edge 3	190	836.6	28.0	27.8	0.249	0.261	
				Edge 4	190	836.6	28.0	27.8	0.115	0.120	
		off	12	Rear	190	836.6	33.0	32.6	0.489	0.536	
			10	Edge 3	190	836.6	33.0	32.6	0.326	0.357	
			0	Edge 4	190	836.6	33.0	32.6	0.293	0.321	
	GPRS 3 Slots	on	0	Rear	190	836.6	24.5	24.3	0.744	0.779	4
				Edge 3	190	836.6	24.5	24.3	0.324	0.339	
				Edge 4	190	836.6	24.5	24.3	0.146	0.153	
		off	12	Rear	190	836.6	29.5	28.4	0.574	0.739	
			10	Edge 3	190	836.6	29.5	28.4	0.364	0.469	
			0	Edge 4	190	836.6	29.5	28.4	0.378	0.487	
Head with Case	GPRS 3 Slots	off	0	Left Touch	190	836.6	29.5	28.4	0.079	0.102	
Body with Case	GPRS 3 Slots	on	0	Rear	190	836.6	24.5	24.3	0.597	0.625	
		off	12	Rear	190	836.6	29.5	28.4	0.500	0.644	

12.2. GSM1900

RF Exposure Conditions	Mode	PWR back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	off	0	Left Touch	661	1880.0	30.0	29.9	0.019	0.020	
				Left Tilt	661	1880.0	30.0	29.9	0.014	0.015	
				Right Touch	661	1880.0	30.0	29.9	0.015	0.015	
				Right Tilt	661	1880.0	30.0	29.9	0.022	0.023	5
Head VoIP	GPRS 4 Slots	off	0	Left Touch	661	1880.0	26.0	25.5	0.035	0.039	6
				Left Tilt	661	1880.0	26.0	25.5	0.023	0.026	
				Right Touch	661	1880.0	26.0	25.5	0.023	0.026	
				Right Tilt	661	1880.0	26.0	25.5	0.031	0.035	
Body	Voice	on	0	Rear	661	1880.0	20.0	20.0	0.235	0.235	
		off	12	Rear	661	1880.0	30.0	29.9	0.377	0.386	7
			10	Edge 3	661	1880.0	30.0	29.9	0.374	0.383	
			0	Edge 4	661	1880.0	30.0	29.9	0.328	0.336	
	GPRS 4 Slots	on	0	Rear	661	1880.0	16.0	15.8	0.324	0.339	
				Edge 3	661	1880.0	16.0	15.8	0.260	0.272	
				Edge 4	661	1880.0	16.0	15.8	0.046	0.048	
		off	12	Rear	661	1880.0	26.0	25.5	0.481	0.540	8
			10	Edge 3	661	1880.0	26.0	25.5	0.473	0.531	
Head with Case	Voice	off	0	Right Tilt	661	1880.0	30.0	29.9	0.018	0.018	
	GPRS 4 Slots	off	0	Left Touch	661	1880.0	26.0	25.5	0.031	0.035	
Body with Case	GPRS 4 Slots	on	0	Rear	661	1880.0	16.0	15.8	0.245	0.257	
		off	12	Rear	661	1880.0	26.0	25.5	0.353	0.396	

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12.3. W-CDMA Band V

RF Exposure Conditions	Mode	PWR back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC 12.2 kbps	off	0	Left Touch	4183	836.6	23.0	22.8	0.044	0.046	
				Left Tilt	4183	836.6	23.0	22.8	0.043	0.045	
				Right Touch	4183	836.6	23.0	22.8	0.045	0.047	
				Right Tilt	4183	836.6	23.0	22.8	0.046	0.048	9
Body	Rel 99 RMC 12.2 kbps	on	0	Rear	4183	836.6	18.0	17.9	0.557	0.570	10
				Edge 3	4183	836.6	18.0	17.9	0.275	0.281	
				Edge 4	4183	836.6	18.0	17.9	0.078	0.080	
	Rel 99 RMC 12.2 kbps	off	12	Rear	4183	836.6	23.0	22.8	0.374	0.392	
			10	Edge 3	4183	836.6	23.0	22.8	0.256	0.268	
			0	Edge 4	4183	836.6	23.0	22.8	0.223	0.234	
Head with Case	Rel 99 RMC 12.2 kbps	off	0	Right Tilt	4183	836.6	23.0	22.8	0.051	0.053	
Body with Case	Rel 99 RMC 12.2 kbps	on	0	Rear	4183	836.6	18.0	17.9	0.367	0.376	
		off	12	Rear	4183	836.6	23.0	22.8	0.308	0.323	

12.4. W-CDMA Band II

RF Exposure Conditions	Mode	PWR back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC 12.2 kbps	off	0	Left Touch	9400	1880.0	23.0	22.7	0.041	0.044	11
				Left Tilt	9400	1880.0	23.0	22.7	0.027	0.029	
				Right Touch	9400	1880.0	23.0	22.7	0.029	0.032	
				Right Tilt	9400	1880.0	23.0	22.7	0.037	0.040	
Body	Rel 99 RMC 12.2 kbps	on	0	Rear	9400	1880.0	13.0	12.7	0.430	0.461	
				Edge 3	9400	1880.0	13.0	12.7	0.328	0.351	
				Edge 4	9400	1880.0	13.0	12.7	0.058	0.062	
	Rel 99 RMC 12.2 kbps	off	12	Rear	9400	1880.0	23.0	22.7	0.665	0.713	12
			10	Edge 3	9400	1880.0	23.0	22.7	0.656	0.703	
			0	Edge 4	9400	1880.0	23.0	22.7	0.580	0.621	
Head with Case	Rel 99 RMC 12.2 kbps	off	0	Left Touch	9400	1880.0	23.0	22.7	0.041	0.044	
Body with Case	Rel 99 RMC 12.2 kbps	on	0	Rear	9400	1880.0	13.0	12.7	0.404	0.433	
		off	12	Rear	9400	1880.0	23.0	22.7	0.446	0.478	

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12.5. LTE Band 5

RF Exposure Conditions	Mode	PWR back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	off	0	Left Touch	20525	836.6	1	49	23.8	23.6	0.055	0.057	
							25	0	23.8	22.6	0.040	0.052	
				Left Tilt	20525	836.6	1	49	23.8	23.6	0.048	0.050	
							25	0	23.8	22.6	0.034	0.045	
				Right Touch	20525	836.6	1	49	23.8	23.6	0.055	0.057	
							25	0	23.8	22.6	0.040	0.053	
				Right Tilt	20525	836.6	1	49	23.8	23.6	0.057	0.059	
							25	0	23.8	22.6	0.038	0.050	
Body	QPSK	on	0	Rear	20525	836.6	1	49	18.5	18.1	0.557	0.604	13
							25	0	18.5	18.0	0.534	0.601	
				Edge 3	20525	836.6	1	49	18.5	18.1	0.298	0.323	
							25	0	18.5	18.0	0.283	0.318	
				Edge 4	20525	836.6	1	49	18.5	18.1	0.068	0.074	
							25	0	18.5	18.0	0.067	0.075	
		off	12	Rear	20525	836.6	1	49	23.8	23.6	0.535	0.555	
							25	0	23.8	22.6	0.386	0.508	
			10	Edge 3	20525	836.6	1	49	23.8	23.6	0.376	0.390	
							25	0	23.8	22.6	0.273	0.360	
			0	Edge 4	20525	836.6	1	49	23.8	23.6	0.282	0.293	
							25	0	23.8	22.6	0.203	0.267	
Head with Case	QPSK	off	0	Right Touch	20525	836.6	25	0	23.8	22.6	0.046	0.061	
				Right Tilt	20525	836.6	1	49	23.8	23.6	0.059	0.061	14
Body with Case	QPSK	on	0	Rear	20525	836.6	1	49	18.5	18.1	0.447	0.485	
		off	12	Rear	20525	836.6	1	49	23.8	23.6	0.419	0.435	

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12.6. 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	13.5	12.6	0.438	0.539	15
			Left Tilt	6	2437.0	13.5	12.6	0.337	0.415	
			Right Touch	6	2437.0	13.5	12.6	0.081	0.100	
			Rightt Tilt	6	2437.0	13.5	12.6	0.076	0.094	
Body	802.11b 1 Mbps	0	Rear	6	2437.0	13.5	12.6	0.572	0.704	16
			Edge 2	6	2437.0	13.5	12.6	0.067	0.082	
Head with Case	802.11b 1 Mbps	0	Left Touch	6	2437	13.5	12.6	0.297	0.365	
Body with Case	802.11b 1 Mbps	0	Rear	6	2437	13.5	12.6	0.536	0.659	

12.7. 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	36	5180.0	10.5	10.5	0.090	0.090	17
				52	5260.0	10.5	10.5	0.089	0.089	18
				140	5700.0	10.5	10.4	0.026	0.027	
				165	5825.0	10.5	10.5	0.063	0.063	
			Left Tilt	36	5180.0	10.5	10.5	0.088	0.088	
				52	5260.0	10.5	10.5	0.088	0.088	
				140	5700.0	10.5	10.4	0.027	0.028	19
				165	5825.0	10.5	10.5	0.082	0.082	20
			Right Touch	36	5180.0	10.5	10.5	0.048	0.048	
				52	5260.0	10.5	10.5	0.026	0.026	
				140	5700.0	10.5	10.4	0.011	0.011	
				165	5825.0	10.5	10.5	0.029	0.029	
			Rightt Tilt	36	5180.0	10.5	10.5	0.052	0.052	
				52	5260.0	10.5	10.5	0.064	0.064	
				140	5700.0	10.5	10.4	0.020	0.020	
				165	5825.0	10.5	10.5	0.044	0.044	
Body	802.11a 6 Mbps	0	Rear	36	5180.0	10.5	10.5	0.367	0.367	21
				52	5260.0	10.5	10.5	0.284	0.284	22
				140	5700.0	10.5	10.4	0.241	0.247	23
				165	5825.0	10.5	10.5	0.420	0.420	24
			Edge 2	36	5180.0	10.5	10.5	0.104	0.104	
				52	5260.0	10.5	10.5	0.074	0.074	
				140	5700.0	10.5	10.4	0.063	0.064	
				165	5825.0	10.5	10.5	0.073	0.073	
Head with Case	802.11a 6 Mbps	0	Left Touch	36	5180.0	10.5	10.5	0.064	0.064	
				52	5260.0	10.5	10.5	0.055	0.055	
			Left Tilt	140	5700.0	10.5	10.4	0.011	0.011	
				165	5825.0	10.5	10.5	0.029	0.029	
Body with Case	802.11a 6 Mbps	0	Rear	36	5180.0	10.5	10.5	0.223	0.223	
				52	5260.0	10.5	10.5	0.164	0.164	
				140	5700.0	10.5	10.4	0.168	0.172	
				165	5825.0	10.5	10.5	0.370	0.370	

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13. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03. 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	Stand-alone (W/kg)	Repeated SAR (Yes/No)
850	LTE Band 5		No
	GSM 850	0.744	No
	W-CDMA Band V		No
1900	GSM 1900		No
	W-CDMA Band II	0.665	No
2400	Wi-Fi 802.11b/g/n	0.572	No
5200	Wi-Fi 802.11a/n	0.367	No
5300	Wi-Fi 802.11a/n	0.284	No
5500	Wi-Fi 802.11a/n	0.241	No
5800	Wi-Fi 802.11a/n	0.420	No

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14. Simultaneous Transmission SAR Analysis

14.1. Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

1. When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
2. Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
   - When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
   - When the separation distance from the antenna to an adjacent edge is > 5 mm but ≤ 50 mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
   - When the minimum test separation distance is > 50 mm, the estimated SAR value is 0.4 W/kg
3. Test positions Edge 3 and Edge 4 are inherently compliant as they consist of only estimated SAR values for all applicable transmitters and consequently will always have sum of SAR values < 1.2 W/kg. Simultaneous transmission SAR analysis was therefore not performed for these test positions.

14.1.1. Estimated SAR for WWAN

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off.																
Cellular	GSM 1 Slot	836.6	33.00	249	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	GSM 1 Slot	1880	30.00	125	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	GPRS 3 Slots	836.6	29.50	334	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	GPRS 4 Slots	1880	26.00	199	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	W-CDMA 2	1880	23.00	200	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	W-CDMA 5	836.6	23.00	200	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	LTE Band 5	836.5	23.80	240	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Second Stage Power Back-off, Proximity Sensor On																
Cellular	GSM 1 Slot	836.6	28.00	79	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	GSM 1 Slot	1880	20.00	13	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	0.340	0.125	
Cellular	GPRS 3 Slots	836.6	24.50	106	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	GPRS 4 Slots	1880	16.00	20	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	0.192	
Cellular	W-CDMA 2	1880	18.00	63	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	W-CDMA 5	836.6	18.00	63	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	LTE Band 5	836.5	18.50	71	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	

14.1.2. Estimated SAR for WLAN

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Antenna 1															
Wi-Fi 2.4 GHz	2437	13.50	22	2	13	6.8	198	92		-MEASURE-	0.352	-MEASURE-	0.400	0.400	
Wi-Fi 5.2 GHz	5240	10.50	11	2	13	6.8	198	92		-MEASURE-	0.258	-MEASURE-	0.400	0.400	
Wi-Fi 5.3 GHz	5320	10.50	11	2	13	6.8	198	92		-MEASURE-	0.260	-MEASURE-	0.400	0.400	
Wi-Fi 5.5 GHz	5700	10.50	11	2	13	6.8	198	92		-MEASURE-	0.269	-MEASURE-	0.400	0.400	
Wi-Fi 5.8 GHz	5825	10.50	11	2	13	6.8	198	92		-MEASURE-	0.272	-MEASURE-	0.400	0.400	
Bluetooth	2441	7.50	6	2	13	6.8	198	92		0.250	0.096	0.179	0.400	0.400	

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14.2. 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)	0.105	0.539			0.644	No
		WWAN + Wi-Fi(UNII)	0.105		0.090		0.195	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.094	0.539			0.633	No
		WWAN + Wi-Fi(UNII)	0.094		0.090		0.184	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.095	0.539			0.634	No
		WWAN + Wi-Fi(UNII)	0.095		0.090		0.185	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.104	0.539			0.643	No
		WWAN + Wi-Fi(UNII)	0.104		0.090		0.194	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.779	0.704			1.483	No
		WWAN + Wi-Fi(UNII)	0.779		0.420		1.199	No
		WWAN + BT	0.779			0.250	1.029	No
		Wi-Fi(UNII) + BT			0.420	0.250	0.670	No
		WWAN + Wi-Fi(UNII) + BT	0.779		0.420	0.250	1.449	No
	Edge 1	WWAN + Wi-Fi(DTS)	0.400	0.352			0.752	No
		WWAN + Wi-Fi(UNII)	0.400		0.272		0.672	No
		WWAN + BT	0.400			0.096	0.496	No
		Wi-Fi(UNII) + BT			0.272	0.096	0.368	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.272	0.096	0.768	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.082			0.482	No
		WWAN + Wi-Fi(UNII)	0.400		0.104		0.504	No
		WWAN + BT	0.400			0.179	0.579	No
		Wi-Fi(UNII) + BT			0.104	0.179	0.283	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.104	0.179	0.683	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.469	0.400			0.869	No
		WWAN + Wi-Fi(UNII)	0.469		0.400		0.869	No
		WWAN + BT	0.469			0.400	0.869	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.469		0.400	0.400	1.269	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.487	0.400			0.887	No
		WWAN + Wi-Fi(UNII)	0.487		0.400		0.887	No
		WWAN + BT	0.487			0.400	0.887	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.487		0.400	0.400	1.287	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.

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14.3. 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)	0.039	0.539			0.578	No
		WWAN + Wi-Fi(UNII)	0.039		0.090		0.129	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.026	0.539			0.565	No
		WWAN + Wi-Fi(UNII)	0.026		0.090		0.116	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.026	0.539			0.565	No
		WWAN + Wi-Fi(UNII)	0.026		0.090		0.116	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.035	0.539			0.574	No
		WWAN + Wi-Fi(UNII)	0.035		0.090		0.125	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.540	0.704			1.244	No
		WWAN + Wi-Fi(UNII)	0.540		0.420		0.960	No
		WWAN + BT	0.540			0.250	0.790	No
		Wi-Fi(UNII) + BT			0.420	0.250	0.670	No
		WWAN + Wi-Fi(UNII) + BT	0.540		0.420	0.250	1.210	No
	Edge 1	WWAN + Wi-Fi(DTS)	0.400	0.352			0.752	No
		WWAN + Wi-Fi(UNII)	0.400		0.272		0.672	No
		WWAN + BT	0.400			0.096	0.496	No
		Wi-Fi(UNII) + BT			0.272	0.096	0.368	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.272	0.096	0.768	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.082			0.482	No
		WWAN + Wi-Fi(UNII)	0.400		0.104		0.504	No
		WWAN + BT	0.400			0.179	0.579	No
		Wi-Fi(UNII) + BT			0.104	0.179	0.283	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.104	0.179	0.683	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.531	0.400			0.931	No
		WWAN + Wi-Fi(UNII)	0.531		0.400		0.931	No
		WWAN + BT	0.531			0.400	0.931	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.531		0.400	0.400	1.331	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.192	0.400			0.592	No
		WWAN + Wi-Fi(UNII)	0.192		0.400		0.592	No
		WWAN + BT	0.192			0.400	0.592	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.192		0.400	0.400	0.992	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.

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14.4. 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)
			WCDMA Band V	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.046	0.539			0.585	No
		WWAN + Wi-Fi(UNII)	0.046		0.090		0.136	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.045	0.539			0.584	No
		WWAN + Wi-Fi(UNII)	0.045		0.090		0.135	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.047	0.539			0.586	No
		WWAN + Wi-Fi(UNII)	0.047		0.090		0.137	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.048	0.539			0.587	No
		WWAN + Wi-Fi(UNII)	0.048		0.090		0.138	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.570	0.704			1.274	No
		WWAN + Wi-Fi(UNII)	0.570		0.420		0.990	No
		WWAN + BT	0.570			0.250	0.820	No
		Wi-Fi(UNII) + BT			0.420	0.250	0.670	No
		WWAN + Wi-Fi(UNII) + BT	0.570		0.420	0.250	1.240	No
	Edge 1	WWAN + Wi-Fi(DTS)	0.400	0.352			0.752	No
		WWAN + Wi-Fi(UNII)	0.400		0.272		0.672	No
		WWAN + BT	0.400			0.096	0.496	No
		Wi-Fi(UNII) + BT			0.272	0.096	0.368	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.272	0.096	0.768	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.082			0.482	No
		WWAN + Wi-Fi(UNII)	0.400		0.104		0.504	No
		WWAN + BT	0.400			0.179	0.579	No
		Wi-Fi(UNII) + BT			0.104	0.179	0.283	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.104	0.179	0.683	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.281	0.400			0.681	No
		WWAN + Wi-Fi(UNII)	0.281		0.400		0.681	No
		WWAN + BT	0.281			0.400	0.681	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.281		0.400	0.400	1.081	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.234	0.400			0.634	No
		WWAN + Wi-Fi(UNII)	0.234		0.400		0.634	No
		WWAN + BT	0.234			0.400	0.634	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.234		0.400	0.400	1.034	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.

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14.5. 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)
			WCDMA Band II	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.044	0.539			0.583	No
		WWAN + Wi-Fi(UNII)	0.044		0.090		0.134	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.029	0.539			0.568	No
		WWAN + Wi-Fi(UNII)	0.029		0.090		0.119	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.032	0.539			0.571	No
		WWAN + Wi-Fi(UNII)	0.032		0.090		0.122	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.040	0.539			0.579	No
		WWAN + Wi-Fi(UNII)	0.040		0.090		0.130	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.713	0.704			1.417	No
		WWAN + Wi-Fi(UNII)	0.713		0.420		1.133	No
		WWAN + BT	0.713			0.250	0.963	No
		Wi-Fi(UNII) + BT			0.420	0.250	0.670	No
		WWAN + Wi-Fi(UNII) + BT	0.713		0.420	0.250	1.383	No
	Edge 1	WWAN + Wi-Fi(DTS)	0.400	0.352			0.752	No
		WWAN + Wi-Fi(UNII)	0.400		0.272		0.672	No
		WWAN + BT	0.400			0.096	0.496	No
		Wi-Fi(UNII) + BT			0.272	0.096	0.368	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.272	0.096	0.768	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.082			0.482	No
		WWAN + Wi-Fi(UNII)	0.400		0.104		0.504	No
		WWAN + BT	0.400			0.179	0.579	No
		Wi-Fi(UNII) + BT			0.104	0.179	0.283	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.104	0.179	0.683	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.703	0.400			1.103	No
		WWAN + Wi-Fi(UNII)	0.703		0.400		1.103	No
		WWAN + BT	0.703			0.400	1.103	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.703		0.400	0.400	1.503	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.621	0.400			1.021	No
		WWAN + Wi-Fi(UNII)	0.621		0.400		1.021	No
		WWAN + BT	0.621			0.400	1.021	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.621		0.400	0.400	1.421	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.

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14.6. 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)	0.057	0.539			0.596	No
		WWAN + Wi-Fi(UNII)	0.057		0.090		0.147	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.050	0.539			0.589	No
		WWAN + Wi-Fi(UNII)	0.050		0.090		0.140	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.057	0.539			0.596	No
		WWAN + Wi-Fi(UNII)	0.057		0.090		0.147	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.059	0.539			0.598	No
		WWAN + Wi-Fi(UNII)	0.059		0.090		0.149	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.604	0.704			1.308	No
		WWAN + Wi-Fi(UNII)	0.604		0.420		1.024	No
		WWAN + BT	0.604			0.250	0.854	No
		Wi-Fi(UNII) + BT			0.420	0.250	0.670	No
		WWAN + Wi-Fi(UNII) + BT	0.604		0.420	0.250	1.274	No
	Edge 1	WWAN + Wi-Fi(DTS)	0.400	0.352			0.752	No
		WWAN + Wi-Fi(UNII)	0.400		0.272		0.672	No
		WWAN + BT	0.400			0.096	0.496	No
		Wi-Fi(UNII) + BT			0.272	0.096	0.368	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.272	0.096	0.768	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.082			0.482	No
		WWAN + Wi-Fi(UNII)	0.400		0.104		0.504	No
		WWAN + BT	0.400			0.179	0.579	No
		Wi-Fi(UNII) + BT			0.104	0.179	0.283	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.104	0.179	0.683	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.390	0.400			0.790	No
		WWAN + Wi-Fi(UNII)	0.390		0.400		0.790	No
		WWAN + BT	0.390			0.400	0.790	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.390		0.400	0.400	1.190	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.293	0.400			0.693	No
		WWAN + Wi-Fi(UNII)	0.293		0.400		0.693	No
		WWAN + BT	0.293			0.400	0.693	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.293		0.400	0.400	1.093	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.

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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 EX3DV4 - SN 3773

15.5. Calibration Certificate for E-Field Probe EX3DV3 - SN 3531

15.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3902

15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3991

15.8. Calibration Certificate for D835V2 - SN 4d002

15.9. Calibration Certificate for D835V2 - SN 4d142

15.10. Calibration Certificate for D1900V2- SN 5d043

15.11. Calibration Certificate for D2450V2 - SN 899

15.12. Calibration Certificate for D5GHzV2 - SN 1138

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