



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

SAR EVALUATION REPORT

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

**Model: SM-G850S, SM-G850K and SM-G850L
FCC ID: A3LSMG850KOR**

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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 Tablet + Bluetooth, DTS/UNII a/b/g/n/ac, ANT+ & NFC			
Model	SM-G850S, SM-G850K and SM-G850L			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	06/04/2104 – 06/25/2014			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	1.058 W/kg	0.353 W/kg	0.539 W/kg
	Body-worn Accessory	1.115 W/kg	0.127 W/kg	0.182 W/kg
	Wireless Router (Hotspot)	1.115 W/kg	0.192 W/kg	0.182 W/kg
	Simultaneous Transmission	Head: 1.453 W/kg Body: 1.217 W/kg	Head: 1.411 W/kg Body: 1.165 W/kg	Head: 1.453 W/kg Body: 1.217 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:




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 UL Verification Services Inc.

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 UL Verification Services Inc.

2. Test Methodology

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

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

3. Facilities and Accreditation

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

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

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

4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

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

Tissue Dielectric Properties

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

System Performance Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator*	HP	8665B	3438A00633	6/13/2014
Base Station Simulator (Signal Generator)	R & S	CMU200	16233	7/23/2014
Power Meter	HP	438A	2822A05684	10/10/2014
Power Sensor	HP	8481A	2237A31744	10/2/2014
Power Sensor	HP	8481A	2349A36506	9/3/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Directional coupler	Werlatone	C8060-102	2710	N/A
DC Power Supply	AMETEK	XT15-4	1319A02778	N/A
E-Field Probe (SAR Lab 1)	SPEAG	EX3DV4	3902	5/19/2105
E-Field Probe (SAR Lab 4)	SPEAG	EX3DV4	3929	5/9/2015
E-Field Probe (SAR Lab 5)	SPEAG	EX3DV4	3991	5/16/2015
Data Acquisition Electronics (SAR Lab 1)	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics (SAR Lab 4)	SPEAG	DAE3	1352	9/11/2014
Data Acquisition Electronics (SAR Lab 5)	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D750V3	1071	10/15/2014
System Validation Dipole	SPEAG	D835V2	4d002	10/15/2014
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 4)	EXTECH	445703	CCS-238	6/3/2015
Thermometer (SAR Lab 5)	EXTECH	445703	CCS-239	6/3/2015

Notes:

*: HP Signal Generator was used for System Checks performed 6/7/2014 thru 6/10/2014 (before the calibration due date). HP Signal Generator was then replaced with the Agilent ESG Vecto Signal Generator for every system check thereafter.

Others

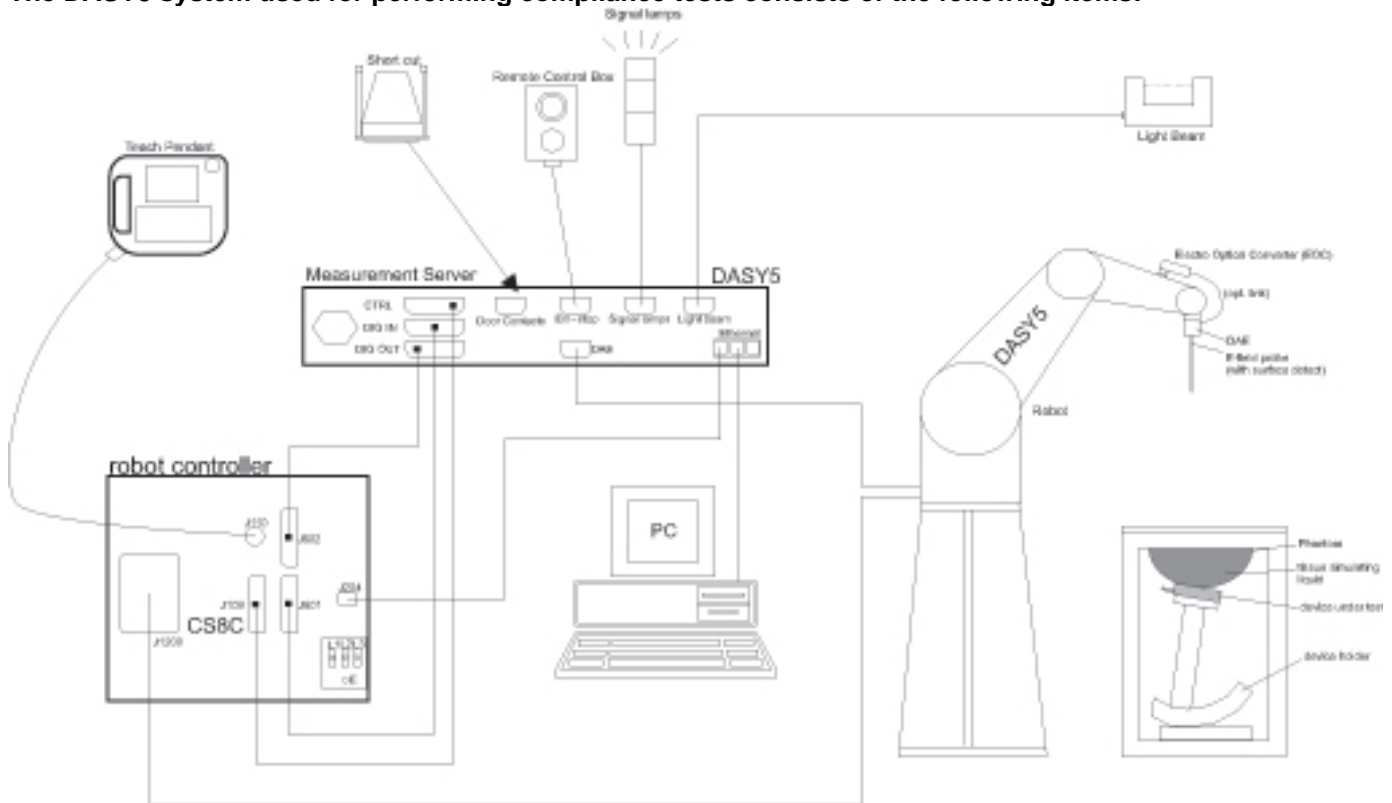
Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMU200	838114/032	7/23/2014
Base Station Simulator	R & S	CMW500	15697	7/2/2014
Base Station Simulator	R & S	CMW500	20613	5/29/2015
Base Station Simulator	Agilent	8960	GB46160222	11/21/2014
Power Meter	Agilent	N1912A	MY53040015	6/29/2014
Power Sensor	Agilent	N1921A	MY52260009	12/12/2014
Power Sensor	Agilent	N1921A	MY52200012	9/25/2014

4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

5. Measurement System Description and Setup

The DASY5 system used for performing compliance tests consists of the following items:



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

6. SAR Measurement Procedure

6.1. Normal SAR Measurement Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

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

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

Step 3: Zoom Scan

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

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

		≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm *	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <i>reported</i> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.			

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

6.2. Volume Scan Procedures

Step 1: Repeat Step 1-4 in Section 6.1

Step 2: Volume Scan

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

Step 3: Power drift measurement

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

7. Device Under Test

7.1. General Information

Operating Configuration(s)	Held to head, Body-worn (Voice call)
Mobile Hotspot	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi -enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz) (FCC: Ch.1 ~ Ch.11) <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz) (FCC: Ch.149 ~ Ch.165)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz) (FCC: Ch.1 ~ Ch.11) <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz) (FCC: Ch.149 ~ Ch.165)
Device dimension	Overall (Length x Width): 132 mm x 65mm Overall Diagonal: 140mm Display Diagonal: 118.3mm
Back Cover	<input type="checkbox"/> Normal Battery Cover <input checked="" type="checkbox"/> Normal Battery Cover with NFC <input type="checkbox"/> Wireless Charger Battery Cover <input type="checkbox"/> Wireless Charger Battery Cover with NFC
Accessory	<input checked="" type="checkbox"/> Headset
Battery Options	<input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 3.85Vdc, 8.18Wh <input type="checkbox"/> Extended (large capacity)
SIM Information	<input checked="" type="checkbox"/> Single SIM <input type="checkbox"/> Dual SIM

7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 1900 W-CDMA Band: V / II LTE Band 5/17 Wi-Fi : 2.4 / 5 GHz Bluetooth: 2.4 GHz.
Mode	GSM - <input checked="" type="checkbox"/> Voice (GMSK) - <input checked="" type="checkbox"/> GPRS (GMSK) W-CDMA - <input checked="" type="checkbox"/> UMTS Rel. 99 (Voice & Data) - <input checked="" type="checkbox"/> HSDPA (Rel. 5) - <input checked="" type="checkbox"/> HSUPA (Rel. 6) LTE - <input checked="" type="checkbox"/> QPSK - <input checked="" type="checkbox"/> 16QAM Wi-Fi 2.4GHz (802.11b/g/n) - <input checked="" type="checkbox"/> 802.11b - <input checked="" type="checkbox"/> 802.11g - <input checked="" type="checkbox"/> 802.11n (HT20) Wi-Fi 5GHz (802.11a/n/ac) - <input checked="" type="checkbox"/> 802.11a - <input checked="" type="checkbox"/> 802.11n (HT20) - <input checked="" type="checkbox"/> 802.11n (HT40) - <input checked="" type="checkbox"/> 802.11ac (VHT80) Bluetooth - <input checked="" type="checkbox"/> Version 4.0 LE
Duty Cycle	GSM Voice: 12.5%; GPRS 1 Slot: 12.5%; 2 Slots: 25%, W-CDMA: 100% LTE (FDD): 100% Wi-Fi 802.11a/b/g/n: 100%
GPRS Multi-Slot Class	<input type="checkbox"/> Class 8 - One Up <input checked="" type="checkbox"/> Class 10 - Two Up <input type="checkbox"/> Class 12 - Four Up <input type="checkbox"/> Class 33 - Four Up
DTM (Dual Transfer Mode)	<input type="checkbox"/> Supported
VoIP (GPRS)	<input checked="" type="checkbox"/> Supported
SV-LTE & SV-DO	<input type="checkbox"/> Supported

7.3. RF Output Power Tolerance

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
GSM1900	Voice	29.0	29.5
	GPRS 1 slot	29.0	29.5
	GPRS 2 slots	26.5	27.0
W-CDMA Band V	R99	23.0	23.5
	HSDPA	22.0	22.5
	HSUPA	22.0	22.5
W-CDMA Band II	R99	22.5	23.0
	HSDPA	22.0	22.5
	HSUPA	20.0	20.5
LTE Band 5	QPSK	23.5	24.0
LTE Band 17	QPSK	24.0	24.5

Upper limit (dB): 0.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	14.0	14.5
	802.11g	14.0	14.5
	802.11n HT20	12.0	12.5
WiFi 5 GHz	802.11a	12.0	12.5
	802.11n HT20	12.0	12.5
	802.11n HT40	12.0	12.5
	802.11ac 80MHz	10.0	10.5
Bluetooth		6.0	6.5
Bluetooth LE		5.0	5.5

7.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	<ol style="list-style-type: none"> GSM 1900 Voice + Wi-Fi 2.4/5GHz GSM 1900 (GPRS) + Wi-Fi 2.4/5GHz (VoIP) WCDMA Band V/II + Wi-Fi 2.4/5GHz LTE B5/B17 + Wi-Fi 2.4/5GHz
Body	<ol style="list-style-type: none"> GSM 1900 Voice + Wi-Fi 2.4/5GHz GSM 1900 (GPRS) + Wi-Fi 2.4/5GHz (VoIP) WCDMA Band V/II + Wi-Fi 2.4/5GHz LTE B5/B17 + Wi-Fi 2.4/5GHz GSM 1900 Voice + Wi-Fi 2.4/5GHz(Antenna 2) +BT(Antenna 1) GSM 1900 (GPRS) + Wi-Fi 2.4/5GHz(Antenna 2) +BT(Antenna 1) (VoIP) WCDMA Band V/II + Wi-Fi 2.4/5GHz(Antenna 2) +BT(Antenna 1) LTE B5/B17 + Wi-Fi 2.4/5GHz(Antenna 2) +BT(Antenna 1)
Wireless Router (Hotspot) & Wi-Fi Direct	<ol style="list-style-type: none"> GSM 1900 (GPRS) + Wi-Fi 2.4/5.8GHz WCDMA Band V/II + Wi-Fi 2.4/5.8GHz LTE B5/B17 + Wi-Fi 2.4/5.8GHz

Notes:

- Wi-Fi 2.4/5.8GHz supports Hotspot and Wi-Fi Direct.
- GPRS, WCDMA, and LTE support Hotspot.
- VoIP is support in GPRS, WCDMA, and LTE.
- Bluetooth cannot transmit simultaneously with Wi-Fi on Wi-Fi Antenna 1
- Wi-Fi MIMO:
 1. Is not possible between 2.4 GHz and 5 GHz.
 2. Is supported in all Wi-Fi bands and is possible during WWAN transmission.

7.5. General LTE SAR Test and Reporting Considerations

Item	Description																																						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 5	Frequency range: 824 - 849 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low			20450/ 829	20425/ 826.5																																		
	Mid			20525/ 836.5	20525/ 836.5																																		
	High			20600/ 844	20625/ 846.5																																		
	Band 17	Frequency range: 704 - 716 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low				23755/ 706.5																																		
Mid			23790/ 710	23790/ 710																																			
High				23825/ 713.5																																			
LTE transmitter and antenna implementation	LTE has one (1) TX/RX antennas Refer to Appendix 15.1. Photos and Antenna Locations.																																						
Maximum power reduction (MPR)	<p align="center">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td>QPSK</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 2</td> </tr> </tbody> </table> <p>MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing</p>	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
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																																
Power reduction	No																																						
Spectrum plots for RB configurations	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.																																						

8. RF Exposure Conditions

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

8.1. Head Exposure Conditions

For WWAN, LTE and Wi-Fi

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

8.2. Body-worn Accessory Exposure Conditions

For WWAN, LTE and Wi-Fi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	3 mm	Yes	

8.3. Hotspot Exposure Conditions and Wi-Fi Direct

For WWAN and LTE

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	3 mm	Yes	
Edge 1 (Top)	111 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 2 (Right)	23 mm	Yes	
Edge 3 (Bottom)	5 mm	Yes	
Edge 4 (Left)	5 mm	Yes	

For Wi-Fi Antenna 1

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	3 mm	Yes	
Edge 1 (Top)	5 mm	Yes	
Edge 2 (Right)	50 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR
Edge 3 (Bottom)	102 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR
Edge 4 (Left)	2 mm	Yes	

For Wi-Fi Antenna 2

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	3 mm	Yes	
Edge 1 (Top)	10 mm	Yes	
Edge 2 (Right)	2 mm	Yes	
Edge 3 (Bottom)	97 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR
Edge 4 (Left)	50 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR

9. RF Output Power Measurement

9.1. GSM

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)
1900	GSM (Voice)	CS1	1	512	1850.2	29.2	20.2
				661	1880.0	29.4	20.4
				810	1909.8	29.2	20.2
	GPRS (GMSK)	CS1	1	512	1850.2	29.3	20.3
				661	1880.0	29.5	20.5
			810	1909.8	29.3	20.3	
			2	512	1850.2	27.0	21.0
				661	1880.0	27.0	21.0
810	1909.8	26.8	20.8				

EGPRS(8PSK) is Rx only

Notes:

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

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above

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 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c/β_d	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.0
		4183	836.6	23.0
		4233	846.6	23.0
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.9
		9400	1880.0	22.9
		9538	1907.6	22.8

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-Set1			
	Power Control Algorithm	Algorithm 2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	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			
$A_{hs}=\beta_{hs}/\beta_c$	30/15				

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	22.5
		4183	836.6	0	22.2
		4233	846.6	0	22.1
	Subtest 2	4132	826.4	0	21.4
		4183	836.6	0	20.7
		4233	846.6	0	20.7
	Subtest 3	4132	826.4	0.5	21.3
		4183	836.6	0.5	20.6
		4233	846.6	0.5	20.6
	Subtest 4	4132	826.4	0.5	20.4
		4183	836.6	0.5	20.0
		4233	846.6	0.5	20.0
W-CDMA Band II	Subtest 1	9262	1852.4	0	21.6
		9400	1880.0	0	21.7
		9538	1907.6	0	20.5
	Subtest 2	9262	1852.4	0	22.2
		9400	1880.0	0	22.3
		9538	1907.6	0	21.2
	Subtest 3	9262	1852.4	0.5	21.2
		9400	1880.0	0.5	21.3
		9538	1907.6	0.5	21.2
	Subtest 4	9262	1852.4	0.5	21.2
		9400	1880.0	0.5	21.3
		9538	1907.6	0.5	20.2

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

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
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	11/15	15/9	2/15	15/0
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	β_{ed}	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				
	A _{hs} = β_{hs}/β_c	30/15				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
Reference E-TFCI PO	27	27	27	27	27	
Maximum Channelisation Codes	2xSF2				SF4	

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	20.5
		4183	836.6	0	20.5
		4233	846.6	0	20.8
	Subtest 2	4132	826.4	2	18.9
		4183	836.6	2	19.5
		4233	846.6	2	18.6
	Subtest 3	4132	826.4	1	20.4
		4183	836.6	1	21.5
		4233	846.6	1	21.1
	Subtest 4	4132	826.4	2	19.0
		4183	836.6	2	18.5
		4233	846.6	2	19.0
	Subtest 5	4132	826.4	0	22.5
		4183	836.6	0	22.5
		4233	846.6	0	22.5
W-CDMA Band II	Subtest 1	9262	1852.4	0	20.1
		9400	1880.0	0	20.1
		9538	1907.6	0	19.7
	Subtest 2	9262	1852.4	2	18.5
		9400	1880.0	2	18.3
		9538	1907.6	2	18.2
	Subtest 3	9262	1852.4	1	19.4
		9400	1880.0	1	19.3
		9538	1907.6	1	19.1
	Subtest 4	9262	1852.4	2	18.2
		9400	1880.0	2	18.3
		9538	1907.6	2	18.5
	Subtest 5	9262	1852.4	0	20.5
		9400	1880.0	0	20.5
		9538	1907.6	0	20.5

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	13	10	Table 6.2.4-2	Table 6.2.4-2
	6.6.3.3.2				
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	0	23.8	23.8	23.7
			1	25	0	0	23.8	23.7	23.6
			1	49	0	0	23.8	23.7	23.7
			25	0	1	2	22.3	22.3	22.2
			25	12	1	2	22.3	22.3	22.2
			25	25	1	2	22.3	22.3	22.2
			50	0	1	2	22.3	22.2	22.2
		16QAM	1	0	1	1	23.0	22.9	22.7
			1	25	1	1	23.0	22.8	22.6
			1	49	1	1	23.0	22.8	22.6
			25	0	2	3	21.1	21.0	21.1
			25	12	2	3	21.1	21.0	21.1
			25	25	2	3	21.1	21.0	21.0
			50	0	2	3	21.1	21.0	21.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	0	24.0	23.9	23.8
			1	12	0	0	24.0	23.8	23.8
			1	24	0	0	24.0	23.8	23.8
			12	0	1	1	22.4	22.4	22.3
			12	6	1	1	22.3	22.3	22.2
			12	11	1	1	22.3	22.3	22.3
			25	0	1	1	22.3	22.4	22.3
		16QAM	1	0	1	0	22.7	22.7	22.8
			1	12	1	0	22.6	22.7	22.8
			1	24	1	0	22.9	22.7	22.8
			12	0	2	0	21.1	21.2	21.0
			12	6	2	0	21.0	21.1	21.0
			12	11	2	0	21.1	21.1	21.0
			25	0	2	0	21.3	21.2	21.1

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)
							710 MHz
LTE Band 17	10	QPSK	1	0	0	0	24.5
			1	25	0	0	24.5
			1	49	0	0	24.4
			25	0	1	1	23.0
			25	12	1	1	23.0
			25	25	1	1	23.0
			50	0	1	1	23.0
		16QAM	1	0	1	1	23.3
			1	25	1	1	23.3
			1	49	1	1	23.4
			25	0	2	3	21.9
			25	12	2	3	21.8
			25	25	2	3	21.8
			50	0	2	3	21.8
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)
							710 MHz
LTE Band 17	5	QPSK	1	0	0	0	24.4
			1	12	0	0	24.3
			1	24	0	0	24.4
			12	0	1	0	23.1
			12	6	1	0	23.1
			12	11	1	0	23.0
			25	0	1	0	23.1
		16QAM	1	0	1	0	23.3
			1	12	1	0	23.2
			1	24	1	0	23.1
			12	0	2	0	21.9
			12	6	2	0	21.9
			12	11	2	0	21.9
			25	0	2	0	22.0

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 KDB 941225 D05 SAR for LTE Devices

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	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
						Wi-Fi 1	Wi-Fi 2	
2.4	802.11b	1 Mbps	1 Tx	1	2412	14.4	14.5	Yes
				6	2437	14.5	14.3	
				11	2462	14.3	14.5	
			2 Tx	1	2412	13.5	14.5	Yes
				6	2437	13.5	14.3	
				11	2462	13.1	14.5	
	802.11g	6 Mbps	1 Tx	1	2412	14.5	14.0	No
				6	2437	14.0	14.1	
				11	2462	14.0	14.2	
			2 Tx	1	2412	14.5	14.5	No
				6	2437	14.3	13.9	
				11	2462	14.5	14.5	
802.11n (HT20)	MCS0	1 Tx	1	2412	12.5	12.0	No	
			6	2437	12.1	12.3		
			11	2462	12.5	12.3		
		2 Tx	1	2412	12.4	12.3	No	
			6	2437	12.1	12.5		
			11	2462	12.5	12.3		

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		SAR test (Yes/No)
				Wi-Fi 1	Wi-Fi 2	
802.11b	6	2437	1 Mbps	14.5	14.5	Yes
			2 Mbps	14.4	14.4	No
			5.5 Mbps	14.5	14.5	No
			11 Mbps	14.3	14.3	No

9.5. Wi-Fi (5 GHz Bands)

Required Test Channels per KDB 248227 D01

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

√ = "default test channels"

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

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

Measured Results

Band (GHz)	Mode	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
						Wi-Fi 1	Wi-Fi 2	
5.2 (UNII)	802.11a	6 Mbps	1 Tx	36	5180	12.5	12.5	Yes
				40	5200	12.1	12.4	
				44	5220	12.1	12.2	
				48	5240	12.1	12.3	
			2 Tx	36	5180	12.3	12.4	Yes
				40	5200	12.3	12.4	
	44	5220		12.2	12.1			
	802.11n (HT20)	MCS0	1 Tx	36	5180	12.4	12.4	No
				40	5200	12.1	12.3	
				44	5220	12.0	12.3	
				48	5240	12.2	12.3	
			2 Tx	36	5180	12.2	12.1	No
				40	5200	12.1	12.2	
	44	5220		12.0	12.0			
	802.11n (HT40)	MCS0	1 Tx	38	5190	11.7	11.8	No
				46	5230	11.7	11.7	
			2 Tx	38	5190	11.7	11.8	No
				46	5230	11.8	11.7	
802.11ac (VHT80)	MCS0	1 Tx	42	5210	10.1	10.1	Yes	
		2 Tx	42	5210	10.0	9.9	Yes	
5.3 (UNII)	802.11a	6 Mbps	1 Tx	52	5260	12.3	12.4	Yes
				56	5280	12.3	12.5	
				60	5300	12.4	12.4	
				64	5320	12.4	12.4	
			2 Tx	52	5260	12.2	12.5	Yes
				56	5280	12.2	12.5	
	60	5300		12.2	12.4			
	64	5320		12.4	12.3			
	802.11n (HT20)	MCS0	1 Tx	52	5260	12.4	12.5	No
				56	5280	12.4	12.5	
				60	5300	12.4	12.5	
				64	5320	12.2	12.4	
			2 Tx	52	5260	12.2	12.4	No
				56	5280	12.2	12.3	
	60	5300		12.3	12.3			
	802.11n (HT40)	MCS0	1 Tx	54	5270	11.9	12.1	No
				62	5310	11.9	12.1	
			2 Tx	54	5270	11.9	12.2	No
62				5310	11.7	12.0		
802.11ac (VHT80)	MCS0	1 Tx	58	5290	10.1	10.3	Yes	
		2 Tx	58	5290	10.2	10.4	Yes	

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

Band (GHz)	Mode	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)	
						Wi-Fi 1	Wi-Fi 2		
5.5 (UNII)	802.11a	6 Mbps	1 Tx	100	5500	12.5	12.1	Yes	
				104	5520	12.5	11.8		
				108	5540	12.4	11.8		
				112	5560	12.4	11.8		
				116	5580	12.4	11.9		
				120	5600	12.5	12.0		
				124	5620	12.4	11.9		
				128	5640	12.4	11.8		
				132	5660	12.4	11.8		
			136	5680	12.4	11.6			
			140	5700	12.4	11.7			
			2 Tx	100	5500	11.6	12.0		Yes
				104	5520	11.7	11.9		
				108	5540	11.5	11.8		
				112	5560	11.5	11.9		
				116	5580	11.5	11.9		
				120	5600	11.5	11.8		
				124	5620	11.5	11.9		
	128	5640		11.5	11.8				
	132	5660		11.5	11.8				
	136	5680	11.3	11.8					
	140	5700	11.5	11.8					
	802.11n (HT20)	MCS0	1 Tx	100	5500	12.4	11.8	No	
				104	5520	12.5	11.8		
				108	5540	12.4	11.7		
				112	5560	12.3	11.8		
				116	5580	12.3	11.8		
				120	5600	12.3	11.7		
				124	5620	12.3	11.7		
				128	5640	12.3	11.7		
				132	5660	12.3	11.9		
			136	5680	12.4	11.6			
			140	5700	12.4	11.6			
			2 Tx	100	5500	11.3	11.8		No
				104	5520	11.5	11.8		
				108	5540	11.4	11.8		
112				5560	11.3	11.7			
116				5580	11.3	11.8			
120				5600	11.3	11.8			
124				5620	11.3	11.8			
128	5640	11.4		11.8					
132	5660	11.2		11.8					
136	5680	11.4	11.6						
140	5700	11.4	11.7						
802.11n (HT40)	MCS0	1 Tx	102	5510	12.0	12.4	No		
			110	5550	11.9	12.3			
			134	5670	12.0	12.3			
		2 Tx	102	5510	11.9	12.3		No	
			110	5550	11.9	12.2			
			134	5670	11.8	12.1			
802.11ac (VHT80)	MCS0	1 Tx	106	5530	10.3	9.8	Yes		
			138	5690	10.2	9.7			
		2 Tx	106	5530	9.4	9.9			
			138	5690	9.4	9.9			

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

Band (GHz)	Mode	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
						Wi-Fi 1	Wi-Fi 2	
5.8 (DTS)	802.11a	6 Mbps	1 Tx	149	5745	12.1	12.3	Yes
				153	5765	12.2	12.4	
				157	5785	12.0	12.3	
				161	5805	12.2	12.3	
				165	5825	12.3	12.5	
			2 Tx	149	5745	12.2	12.5	Yes
				153	5765	12.3	12.5	
				157	5785	12.2	12.4	
				161	5805	12.2	12.4	
				165	5825	12.3	12.4	
	802.11n (HT20)	MCS0	1 Tx	149	5745	12.0	12.2	No
				153	5765	12.1	12.3	
				157	5785	12.0	12.3	
				161	5805	12.2	12.2	
				165	5825	12.1	12.3	
			2 Tx	149	5745	12.0	12.3	No
				153	5765	12.0	12.2	
				157	5785	12.0	12.3	
				161	5805	12.0	12.3	
				165	5825	12.1	12.3	
802.11n (HT40)	MCS0	1 Tx	151	5755	11.5	11.8	No	
			159	5795	11.6	11.6		
		2 Tx	151	5755	11.5	11.8	No	
			159	5795	11.5	11.8		
802.11ac (80MHz)	MCS0	1 Tx	155	5775	9.8	10.0	Yes	
		2 Tx	155	5775	10.0	10.0	Yes	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 and 802.11ac VHT80 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

Power measurements to determine worst-case data rates

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)		SAR test (Yes/No)
					Wi-Fi 1	Wi-Fi 2	
5.2 GHz (UNII)	802.11a	36	5180	6 Mbps	12.5	12.5	Yes
				9 Mbps	12.5	12.4	No
				12 Mbps	12.5	12.5	No
				18 Mbps	12.4	12.5	No
				24 Mbps	12.5	12.5	No
				36 Mbps	12.5	12.5	No
				48 Mbps	12.5	12.5	No
				54 Mbps	12.5	12.5	No
5.3 GHz (UNII)	802.11a	64	5280	6 Mbps	12.4	12.5	Yes
				9 Mbps	12.4	12.5	No
				12 Mbps	12.4	12.4	No
				18 Mbps	12.3	12.5	No
				24 Mbps	12.4	12.5	No
				36 Mbps	12.4	12.5	No
				48 Mbps	12.4	12.5	No
				54 Mbps	12.4	12.4	No
5.5 GHz (UNII)	802.11a	100	5580	6 Mbps	12.5	12.1	Yes
				9 Mbps	12.5	12.0	No
				12 Mbps	12.5	12.0	No
				18 Mbps	12.4	12.0	No
				24 Mbps	12.5	12.0	No
				36 Mbps	12.4	12.0	No
				48 Mbps	12.5	12.1	No
				54 Mbps	12.5	12.1	No
5.8 GHz (DTS)	802.11a	165	5745	6 Mbps	12.3	12.5	Yes
				9 Mbps	12.2	12.3	No
				12 Mbps	12.3	12.3	No
				18 Mbps	12.3	12.4	No
				24 Mbps	12.3	12.4	No
				36 Mbps	12.3	12.5	No
				48 Mbps	12.2	12.5	No
				54 Mbps	12.3	12.5	No

9.6. Bluetooth

Maximum tune-up tolerance limit is 6.5 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

Refer to Standalone SAR Test Exclusion Considerations Section.

10. Tissue Dielectric Properties

IEEE 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
6000	35.1	5.48

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

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

10.2. 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 $\pm 2^\circ\text{C}$ 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

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit \pm (%)	
6/13/2014	Head 1900	e'	39.2300	Relative Permittivity (ϵ_r):	39.23	40.00	-1.93	5
		e"	13.5500	Conductivity (σ):	1.43	1.40	2.25	5
	Head 1850	e'	39.5300	Relative Permittivity (ϵ_r):	39.53	40.00	-1.18	5
		e"	13.3700	Conductivity (σ):	1.38	1.40	-1.76	5
	Head 1910	e'	39.1900	Relative Permittivity (ϵ_r):	39.19	40.00	-2.03	5
		e"	13.6200	Conductivity (σ):	1.45	1.40	3.32	5
6/13/2014	Body 1900	e'	53.0500	Relative Permittivity (ϵ_r):	53.05	53.30	-0.47	5
		e"	14.8100	Conductivity (σ):	1.56	1.52	2.94	5
	Body 1850	e'	53.3300	Relative Permittivity (ϵ_r):	53.33	53.30	0.06	5
		e"	14.5700	Conductivity (σ):	1.50	1.52	-1.40	5
	Body 1910	e'	53.0200	Relative Permittivity (ϵ_r):	53.02	53.30	-0.53	5
		e"	14.8800	Conductivity (σ):	1.58	1.52	3.97	5
6/17/2014	Head 835	e'	43.1400	Relative Permittivity (ϵ_r):	43.14	41.50	3.95	5
		e"	20.2700	Conductivity (σ):	0.94	0.90	4.57	5
	Head 820	e'	43.0300	Relative Permittivity (ϵ_r):	43.03	41.60	3.43	5
		e"	20.2900	Conductivity (σ):	0.93	0.90	2.97	5
	Head 850	e'	43.2200	Relative Permittivity (ϵ_r):	43.22	41.50	4.14	5
		e"	20.2500	Conductivity (σ):	0.96	0.92	4.60	5
6/17/2014	Body 835	e'	53.1600	Relative Permittivity (ϵ_r):	53.16	55.20	-3.70	5
		e"	21.7700	Conductivity (σ):	1.01	0.97	4.20	5
	Body 820	e'	53.0100	Relative Permittivity (ϵ_r):	53.01	55.28	-4.10	5
		e"	21.8200	Conductivity (σ):	0.99	0.97	2.73	5
	Body 850	e'	53.2600	Relative Permittivity (ϵ_r):	53.26	55.16	-3.44	5
		e"	21.7200	Conductivity (σ):	1.03	0.99	3.99	5

Tissue Dielectric Parameter Check Results (continued)

SAR Room 4

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
6/4/2014	Body 750	e'	53.3100	Relative Permittivity (ϵ_r):	53.31	55.55	-4.03	5
		e"	23.2400	Conductivity (σ):	0.97	0.96	0.63	5
	Body 700	e'	53.9800	Relative Permittivity (ϵ_r):	53.98	55.74	-3.15	5
		e"	23.5500	Conductivity (σ):	0.92	0.96	-4.44	5
	Body 725	e'	53.6400	Relative Permittivity (ϵ_r):	53.64	55.64	-3.60	5
		e"	23.3800	Conductivity (σ):	0.94	0.96	-1.94	5
6/4/2014	Head 750	e'	40.2700	Relative Permittivity (ϵ_r):	40.27	41.96	-4.03	5
		e"	21.7600	Conductivity (σ):	0.91	0.89	1.61	5
	Head 700	e'	41.0000	Relative Permittivity (ϵ_r):	41.00	42.22	-2.88	5
		e"	22.1300	Conductivity (σ):	0.86	0.89	-3.14	5
	Head 725	e'	40.6300	Relative Permittivity (ϵ_r):	40.63	42.09	-3.47	5
		e"	21.9500	Conductivity (σ):	0.88	0.89	-0.71	5
6/6/2014	Body 5180	e'	48.9700	Relative Permittivity (ϵ_r):	48.97	49.05	-0.16	5
		e"	18.3700	Conductivity (σ):	5.29	5.27	0.37	5
	Body 5200	e'	48.9300	Relative Permittivity (ϵ_r):	48.93	49.02	-0.18	5
		e"	18.3900	Conductivity (σ):	5.32	5.29	0.43	5
	Body 5600	e'	48.2800	Relative Permittivity (ϵ_r):	48.28	48.48	-0.41	5
		e"	18.7800	Conductivity (σ):	5.85	5.76	1.50	5
	Body 5800	e'	47.9700	Relative Permittivity (ϵ_r):	47.97	48.20	-0.48	5
		e"	18.9800	Conductivity (σ):	6.12	6.00	2.02	5
	Body 5825	e'	47.9200	Relative Permittivity (ϵ_r):	47.92	48.20	-0.58	5
		e"	19.0200	Conductivity (σ):	6.16	6.00	2.67	5
6/9/2014	Head 5180	e'	35.3600	Relative Permittivity (ϵ_r):	35.36	36.01	-1.81	5
		e"	15.6600	Conductivity (σ):	4.51	4.63	-2.59	5
	Head 5200	e'	35.3100	Relative Permittivity (ϵ_r):	35.31	35.99	-1.89	5
		e"	15.6900	Conductivity (σ):	4.54	4.65	-2.46	5
	Head 5600	e'	34.8400	Relative Permittivity (ϵ_r):	34.84	35.53	-1.95	5
		e"	15.8500	Conductivity (σ):	4.94	5.06	-2.47	5
	Head 5800	e'	34.5000	Relative Permittivity (ϵ_r):	34.50	35.30	-2.27	5
		e"	15.9200	Conductivity (σ):	5.13	5.27	-2.58	5
	Head 5825	e'	34.4900	Relative Permittivity (ϵ_r):	34.49	35.30	-2.29	5
		e"	15.9600	Conductivity (σ):	5.17	5.27	-1.91	5
6/9/2014	Body 5180	e'	48.1700	Relative Permittivity (ϵ_r):	48.17	49.05	-1.79	5
		e"	18.2900	Conductivity (σ):	5.27	5.27	-0.07	5
	Body 5200	e'	48.1300	Relative Permittivity (ϵ_r):	48.13	49.02	-1.81	5
		e"	18.3200	Conductivity (σ):	5.30	5.29	0.04	5
	Body 5600	e'	47.5700	Relative Permittivity (ϵ_r):	47.57	48.48	-1.87	5
		e"	18.7000	Conductivity (σ):	5.82	5.76	1.07	5
	Body 5800	e'	47.2700	Relative Permittivity (ϵ_r):	47.27	48.20	-1.93	5
		e"	18.8400	Conductivity (σ):	6.08	6.00	1.26	5
	Body 5825	e'	47.2400	Relative Permittivity (ϵ_r):	47.24	48.20	-1.99	5
		e"	18.9000	Conductivity (σ):	6.12	6.00	2.02	5

Tissue Dielectric Parameter Check Results (continued)

SAR Room 4(continued)

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
6/13/2014	Head 5180	e'	36.3600	Relative Permittivity (ϵ_r):	36.36	36.01	0.96	5	
		e"	15.3400	Conductivity (σ):	4.42	4.63	-4.58	5	
	Head 5200	e'	36.3500	Relative Permittivity (ϵ_r):	36.35	35.99	1.00	5	
		e"	15.3700	Conductivity (σ):	4.44	4.65	-4.45	5	
	Head 5600	e'	35.8600	Relative Permittivity (ϵ_r):	35.86	35.53	0.92	5	
		e"	15.5100	Conductivity (σ):	4.83	5.06	-4.56	5	
	Head 5800	e'	35.5500	Relative Permittivity (ϵ_r):	35.55	35.30	0.71	5	
		e"	15.6400	Conductivity (σ):	5.04	5.27	-4.29	5	
	Head 5825	e'	35.5500	Relative Permittivity (ϵ_r):	35.55	35.30	0.71	5	
		e"	15.6500	Conductivity (σ):	5.07	5.27	-3.82	5	
	6/20/2014	Body 2450	e'	51.2600	Relative Permittivity (ϵ_r):	51.26	52.70	-2.73	5
			e"	14.8800	Conductivity (σ):	2.03	1.95	3.95	5
Body 2410		e'	51.3800	Relative Permittivity (ϵ_r):	51.38	52.76	-2.61	5	
		e"	14.7700	Conductivity (σ):	1.98	1.91	3.76	5	
Body 2475		e'	51.1900	Relative Permittivity (ϵ_r):	51.19	52.67	-2.81	5	
		e"	14.9400	Conductivity (σ):	2.06	1.99	3.57	5	

Tissue Dielectric Parameter Check Results (continued)

SAR Room 5

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
6/7/2014	Head 2450	e'	40.8100	Relative Permittivity (ϵ_r):	40.81	39.20	4.11	5
		e"	13.3400	Conductivity (σ):	1.82	1.80	0.96	5
	Head 2410	e'	40.9900	Relative Permittivity (ϵ_r):	40.99	39.28	4.36	5
		e"	13.2000	Conductivity (σ):	1.77	1.76	0.48	5
	Head 2475	e'	40.7100	Relative Permittivity (ϵ_r):	40.71	39.17	3.94	5
		e"	13.4300	Conductivity (σ):	1.85	1.83	1.16	5
6/7/2014	Body 2450	e'	51.1200	Relative Permittivity (ϵ_r):	51.12	52.70	-3.00	5
		e"	14.3700	Conductivity (σ):	1.96	1.95	0.39	5
	Body 2410	e'	50.8400	Relative Permittivity (ϵ_r):	50.84	52.76	-3.64	5
		e"	14.2000	Conductivity (σ):	1.90	1.91	-0.24	5
	Body 2475	e'	51.0400	Relative Permittivity (ϵ_r):	51.04	52.67	-3.09	5
		e"	14.4200	Conductivity (σ):	1.98	1.99	-0.03	5
6/11/2014	Head 2450	e'	38.3200	Relative Permittivity (ϵ_r):	38.32	39.20	-2.24	5
		e"	13.8500	Conductivity (σ):	1.89	1.80	4.82	5
	Head 2410	e'	38.4300	Relative Permittivity (ϵ_r):	38.43	39.28	-2.16	5
		e"	13.6500	Conductivity (σ):	1.83	1.76	3.90	5
	Head 2475	e'	38.2600	Relative Permittivity (ϵ_r):	38.26	39.17	-2.32	5
		e"	13.9100	Conductivity (σ):	1.91	1.83	4.77	5
6/11/2014	Body 2450	e'	51.2300	Relative Permittivity (ϵ_r):	51.23	52.70	-2.79	5
		e"	14.7800	Conductivity (σ):	2.01	1.95	3.25	5
	Body 2410	e'	51.3200	Relative Permittivity (ϵ_r):	51.32	52.76	-2.73	5
		e"	14.6600	Conductivity (σ):	1.96	1.91	2.99	5
	Body 2475	e'	51.1900	Relative Permittivity (ϵ_r):	51.19	52.67	-2.81	5
		e"	14.8300	Conductivity (σ):	2.04	1.99	2.81	5
6/20/2014	Head 2450	e'	39.1700	Relative Permittivity (ϵ_r):	39.17	39.20	-0.08	5
		e"	13.8600	Conductivity (σ):	1.89	1.80	4.90	5
	Head 2410	e'	39.3400	Relative Permittivity (ϵ_r):	39.34	39.28	0.15	5
		e"	13.7400	Conductivity (σ):	1.84	1.76	4.59	5
	Head 2475	e'	39.2060	Relative Permittivity (ϵ_r):	39.21	39.17	0.10	5
		e"	13.9300	Conductivity (σ):	1.92	1.83	4.93	5
6/23/2014	Head 2450	e'	39.6200	Relative Permittivity (ϵ_r):	39.62	39.20	1.07	5
		e"	13.7800	Conductivity (σ):	1.88	1.80	4.29	5
	Head 2410	e'	39.7900	Relative Permittivity (ϵ_r):	39.79	39.28	1.30	5
		e"	13.6500	Conductivity (σ):	1.83	1.76	3.90	5
	Head 2475	e'	39.5200	Relative Permittivity (ϵ_r):	39.52	39.17	0.90	5
		e"	13.8500	Conductivity (σ):	1.91	1.83	4.32	5
6/24/2014	Body 2450	e'	51.4800	Relative Permittivity (ϵ_r):	51.48	52.70	-2.31	5
		e"	14.7000	Conductivity (σ):	2.00	1.95	2.69	5
	Body 2410	e'	51.6400	Relative Permittivity (ϵ_r):	51.64	52.76	-2.12	5
		e"	14.5500	Conductivity (σ):	1.95	1.91	2.22	5
	Body 2475	e'	51.3900	Relative Permittivity (ϵ_r):	51.39	52.67	-2.43	5
		e"	14.7900	Conductivity (σ):	2.04	1.99	2.53	5

11. System Performance Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are 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
D750V3	1071	10/15/2013	750	1g	8.46	8.64
				10g	5.51	5.72
D835V2	4d002	10/15/2013	835	1g	9.49	9.43
				10g	6.18	6.21
D1900V2	5d043	11/12/2013	1900	1g	40.1	39.0
				10g	21.1	20.8
D2450V2	899	09/10/2013	2450	1g	51.3	49.7
				10g	23.9	23.3
D5GHzV2	1138	11/19/2013	5200	1g	78.5	72.9
				10g	22.5	20.4
			5500	1g	82.7	78.3
				10g	23.5	21.7
			5800	1g	78.3	72.8
				10g	22.4	20.1

11.3. System Performance Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR 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					
6/13/2014	D1900V2	5d043	Head	1g	4.02	3.96	39.6	40.10	-1.25	1.49	1,2
				10g	2.08	2.04	20.4	21.10	-3.32		
6/13/2014	D1900V2	5d043	Body	1g	4.01	4.02	40.2	39.00	3.08	-0.25	
				10g	2.06	2.12	21.2	20.80	1.92		
6/17/2014	D835V2	4d002	Head	1g	1.01	0.98	9.8	9.49	3.27	2.97	
				10g	0.98	0.64	6.4	6.18	3.88		
6/17/2014	D835V2	4d002	Body	1g	1.02	1.00	10.0	9.43	6.04	1.96	3,4
				10g	0.69	0.66	6.6	6.21	6.60		

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					
6/7/2014	D2450V2	899	Head	1g	4.84	4.77	47.7	51.30	-7.02	1.45	5,6
				10g	2.13	2.18	21.8	23.90	-8.79		
6/7/2014	D2450V2	899	Body	1g	5.11	5.06	50.6	49.70	1.81	0.98	
				10g	2.22	2.35	23.5	23.30	0.86		
6/11/2014	D2450V2	899	Head	1g	5.20	5.10	51.0	51.30	-0.58	1.92	
				10g	2.28	2.31	23.1	23.90	-3.35		
6/11/2014	D2450V2	899	Body	1g	5.29	5.35	53.5	49.70	7.65	-1.13	
				10g	2.28	2.48	24.8	23.30	6.44		
6/20/2014	D2450V2	899	Head	1g	5.52	5.48	54.8	51.30	6.82	0.72	
				10g	2.44	2.51	25.1	23.90	5.02		
6/23/2014	D2450V2	899	Head	1g	5.37	5.36	53.6	51.30	4.48	0.19	
				10g	2.36	2.47	24.7	23.90	3.35		
6/24/2014	D2450V2	899	Body	1g	5.10	5.19	51.9	49.70	4.43	-1.76	
				10g	2.22	2.41	24.1	23.30	3.43		

SAR Room 4

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
6/4/2014	D750V3	1071	Body	1g	0.95	0.92	9.2	8.64	6.71	2.43	7,8
				10g	0.64	0.61	6.1	5.72	6.99		
6/4/2014	D750V3	1071	Head	1g	0.86	0.84	8.4	8.50	-1.29	2.78	
				10g	0.59	0.55	5.5	5.50	-0.55		
6/6/2014	D5GHz (5.2GHz)	1138	Body	1g	7.35	7.75	77.5	72.9	6.31	-5.44	
				10g	1.99	2.18	21.8	20.4	6.86		
6/6/2014	D5GHz (5.6GHz)	1138	Body	1g	7.62	7.99	79.9	78.3	2.04	-4.86	
				10g	2.04	2.22	22.2	21.7	2.30		
6/6/2014	D5GHz (5.8GHz)	1138	Body	1g	6.83	7.33	73.3	72.8	0.69	-7.32	
				10g	1.83	2.04	20.4	20.1	1.49		
6/9/2014	D5GHz (5.2GHz)	1138	Head	1g	7.37	7.86	78.6	78.5	0.13	-6.65	
				10g	2.04	2.27	22.7	22.5	0.89		
6/9/2014	D5GHz (5.6GHz)	1138	Head	1g	7.42	7.98	79.8	82.7	-3.51	-7.55	
				10g	2.02	2.27	22.7	23.5	-3.40		
6/9/2014	D5GHz (5.8GHz)	1138	Head	1g	6.50	7.24	72.4	78.3	-7.54	-11.38	9,10
				10g	1.79	2.06	20.6	22.4	-8.04		
6/9/2014	D5GHz (5.2GHz)	1138	Body	1g	7.30	7.78	77.8	72.9	6.72	-6.58	
				10g	2.01	2.18	21.8	20.4	6.86		
6/9/2014	D5GHz (5.6GHz)	1138	Body	1g	7.70	8.19	81.9	78.3	4.60	-6.36	
				10g	2.09	2.27	22.7	21.7	4.61		
6/9/2014	D5GHz (5.8GHz)	1138	Body	1g	6.83	7.33	73.3	72.8	0.69	-7.32	
				10g	1.87	2.04	20.4	20.1	1.49		
6/13/2014	D5GHz (5.2GHz)	1138	Head	1g	7.49	7.53	75.3	78.5	-4.08	-7.32	
				10g	2.11	2.19	21.9	22.5	-2.67		
6/13/2014	D5GHz (5.6GHz)	1138	Head	1g	7.35	8.09	80.9	82.7	-2.18	-10.07	
				10g	2.05	2.29	22.9	23.5	-2.55		
6/13/2014	D5GHz (5.8GHz)	1138	Head	1g	6.67	7.65	76.5	78.3	-2.30	-14.69	
				10g	1.88	2.20	22.0	22.4	-1.79		
6/13/2014	D5GHz (5.2GHz)	1138	Body	1g	7.35	7.50	75.0	72.9	2.88	-2.04	
				10g	2.02	2.12	21.2	20.4	3.92		
6/13/2014	D5GHz (5.6GHz)	1138	Body	1g	9.25	7.87	78.7	78.3	0.51	14.92	
				10g	2.50	2.20	22.0	21.7	1.38		
6/13/2014	D5GHz (5.8GHz)	1138	Body	1g	8.15	7.57	75.7	72.8	3.98	7.12	
				10g	2.18	2.11	21.1	20.1	4.98		
6/20/2014	D2450V2	899	Body	1g	4.63	4.75	47.5	49.7	-4.43	-2.59	11,12
				10g	2.07	2.25	22.5	23.3	-3.43		

12. SAR Test Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:

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

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

KDB 648474 D04 Handset SAR:

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

KDB 941225 D01 SAR test for 3G devices:

Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least $\frac{1}{4}$ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2.

KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):

When the extrapolated maximum peak SAR for the maximum output channel is ≤ 1.6 W/kg and the 1-g averaged SAR is ≤ 0.8 W/kg, testing of other channels in the "default test channels" or "required test channels" configuration is optional.

April 2013 TCB Workshop Updates:

Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a configuration in each frequency band and each exposure condition.

12.1. GSM1900

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	661	1880.0	29.5	29.4	0.498	0.510	1
			Left Tilt	661	1880.0	29.5	29.4	0.231	0.236	
			Right Touch	661	1880.0	29.5	29.4	0.744	0.761	
			Right Tilt	661	1880.0	29.5	29.4	0.305	0.312	
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	27.0	27.0	0.575	0.575	2
			Left Tilt	661	1880.0	27.0	27.0	0.254	0.254	
			Right Touch	661	1880.0	27.0	27.0	0.739	0.739	
			Right Tilt	661	1880.0	27.0	27.0	0.320	0.320	
Body-worn	Voice	10	Rear	661	1880.0	29.5	29.4	0.391	0.400	3
			Front	661	1880.0	29.5	29.4	0.680	0.696	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	661	1880.0	27.0	27.0	0.420	0.420	4
			Front	661	1880.0	27.0	27.0	0.670	0.670	
Hotspot			Edge 2	661	1880.0	27.0	27.0	0.062	0.062	
			Edge 3	661	1880.0	27.0	27.0	0.567	0.567	
			Edge 4	661	1880.0	27.0	27.0	0.084	0.084	

12.2. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	23.5	23.0	0.253	0.284	5
			Left Tilt	4183	836.6	23.5	23.0	0.156	0.175	
			Right Touch	4183	836.6	23.5	23.0	0.199	0.223	
			Right Tilt	4183	836.6	23.5	23.0	0.143	0.160	
Body-worn & Hptspot	Rel 99 RMC	10	Rear	4183	836.6	23.5	23.0	0.328	0.368	6
			Front	4183	836.6	23.5	23.0	0.275	0.309	
Hotspot	Rel 99 RMC	10	Edge 2	4183	836.6	23.5	23.0	0.144	0.162	
			Edge 3	4183	836.6	23.5	23.0	0.060	0.068	
			Edge 4	4183	836.6	23.5	23.0	0.234	0.263	

12.3. W-CDMA Band II

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	
						Tune-up limit	Meas.	Meas.	Scaled		
Head	Rel 99 RMC	0	Left Touch	9262	1852.4	23.0	22.9	0.840	0.860	7	
				9400	1880.0	23.0	22.9	0.930	0.952		
				9538	1907.6	23.0	22.8	1.010	1.058		
			Left Tilt	9400	1880.0	23.0	22.9	0.254	0.260		
				Right Touch	9400	1880.0	23.0	22.9	0.754		0.772
					Right Tilt	9400	1880.0	23.0	22.9		0.442
Body-worn & Hptspot	Rel 99 RMC	10	Rear	9262	1852.4	23.0	22.9	0.777	0.795	8	
				9400	1880.0	23.0	22.9	0.847	0.867		
				9538	1907.6	23.0	22.8	0.884	0.926		
			Front	9262	1852.4	23.0	22.9	1.090	1.115		
				9400	1880.0	23.0	22.9	1.090	1.115		
				9538	1907.6	23.0	22.8	1.010	1.058		
Hotspot	Rel 99 RMC	10	Edge 2	9400	1880.0	23.0	22.9	0.124	0.127		
				9262	1852.4	23.0	22.9	0.984	1.007		
			Edge 3	9400	1880.0	23.0	22.9	1.060	1.085		
				9538	1907.6	23.0	22.8	1.040	1.089		
			Edge 4	9400	1880.0	23.0	22.9	0.349	0.357		

12.4. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	20525	836.5	1	0	24.0	23.8	0.108	0.114	9
						25	0	23.0	22.3	0.073	0.085	
			Left Tilt	20525	836.5	1	0	24.0	23.8	0.068	0.072	
						25	0	23.0	22.3	0.044	0.051	
			Right Touch	20525	836.5	1	0	24.0	23.8	0.078	0.082	
						25	0	23.0	22.3	0.054	0.063	
			Rightt Tilt	20525	836.5	1	0	24.0	23.8	0.054	0.057	
						25	0	23.0	22.3	0.035	0.041	
Body-worn & Hptspot	QPSK	10	Rear	20525	836.5	1	0	24.0	23.8	0.202	0.213	10
						25	0	23.0	22.3	0.142	0.166	
			Front	20525	836.5	1	0	24.0	23.8	0.198	0.209	
						25	0	23.0	22.3	0.138	0.161	
Hotspot	QPSK	10	Edge 2	20525	836.5	1	0	24.0	23.8	0.077	0.081	
						25	0	23.0	22.3	0.052	0.060	
			Edge 3	20525	836.5	1	0	24.0	23.8	0.053	0.056	
						25	0	23.0	22.3	0.038	0.044	
			Edge 4	20525	836.5	1	0	24.0	23.8	0.113	0.119	
						25	0	23.0	22.3	0.066	0.077	

12.5. LTE Band 17 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	23790	710.0	1	0	24.5	24.5	0.046	0.046	11
						25	0	23.5	23.0	0.031	0.035	
			Left Tilt	23790	710.0	1	0	24.5	24.5	0.011	0.011	
						25	0	23.5	23.0	0.012	0.014	
			Right Touch	23790	710.0	1	0	24.5	24.5	0.038	0.038	
						25	0	23.5	23.0	0.028	0.032	
			Rightt Tilt	23790	710.0	1	0	24.5	24.5	0.018	0.018	
						25	0	23.5	23.0	0.018	0.020	
Body-worn & Hptspot	QPSK	10	Rear	23790	710.0	1	0	24.5	24.5	0.139	0.139	
						25	0	23.5	23.0	0.105	0.117	
			Front	23790	710.0	1	0	24.5	24.5	0.156	0.156	12
						25	0	23.5	23.0	0.116	0.130	
Hotspot	QPSK	10	Edge 2	23790	710.0	1	0	24.5	24.5	0.020	0.020	
						25	0	23.5	23.0	0.015	0.017	
			Edge 3	23790	710.0	1	0	24.5	24.5	0.043	0.043	
						25	0	23.5	23.0	0.032	0.036	
			Edge 4	23790	710.0	1	0	24.5	24.5	0.040	0.040	
						25	0	23.5	23.0	0.031	0.035	

12.6. Wi-Fi (DTS Band)

RF Exposure Conditions	Mode	Dist. (mm)	Antenna	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	1	Left Touch	6	2437	14.5	14.5	0.046	0.046	
				Left Tilt	6	2437	14.5	14.5	0.050	0.050	
				Right Touch	6	2437	14.5	14.5	0.137	0.137	
				Right Tilt	6	2437	14.5	14.5	0.102	0.102	
			2	Left Touch	6	2437	14.5	14.3	0.337	0.353	13
				Left Tilt	6	2437	14.5	14.3	0.268	0.281	
				Right Touch	6	2437	14.5	14.3	0.161	0.169	
				Right Tilt	6	2437	14.5	14.3	0.156	0.163	
Body & Hotspot	802.11b 1 Mbps	10	1	Rear	6	2437	14.5	14.5	0.012	0.012	
				Front	6	2437	14.5	14.5	0.050	0.050	
			2	Rear	6	2437	14.5	14.3	0.052	0.054	
				Front	6	2437	14.5	14.3	0.055	0.058	
Hotspot	802.11b 1 Mbps	10	1	Edge 1	6	2437	14.5	14.5	0.020	0.020	
				Edge 4	6	2437	14.5	14.5	0.013	0.013	
			2	Edge 1	6	2437	14.5	14.3	0.053	0.055	
				Edge 2	6	2437	14.5	14.3	0.044	0.046	

RF Exposure Conditions	Mode	Dist. (mm)	Antenna	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)				Plot No.	
							Tune-up limit	Meas.		Meas.	Scaled	Meas.		Scaled
								Wi-Fi 1	Wi-Fi 2					
Head	802.11b 1 Mbps	0	1+2	Left Touch	6	2437	14.5	13.5	14.3	<.001	<.001	0.299	0.313	
				Left Tilt	6	2437	14.5	13.5	14.3	<.001	<.001	0.253	0.265	
				Right Touch	6	2437	14.5	13.5	14.3	<.001	<.001	0.196	0.205	
				Right Tilt	6	2437	14.5	13.5	14.3	<.001	<.001	0.235	0.246	
Body & Hotspot	802.11b 1 Mbps	10	1 + 2	Rear	6	2437	14.5	13.5	14.3	<.001	<.001	0.069	0.073	
				Front	6	2437	14.5	13.5	14.3	<.001	<.001	0.068	0.071	
Hotspot				Edge 1	6	2437	14.5	13.5	14.3	<.001	<.001	0.083	0.087	

Wi-Fi DTS (continued)

RF Exposure Conditions	Mode	Dist. (mm)	Antenna	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	1	Left Touch	149	5745	12.5	12.5	0.141	0.142	
				Left Tilt	149	5745	12.5	12.5	0.140	0.141	
				Right Touch	149	5745	12.5	12.5	0.183	0.185	
				Right Tilt	149	5745	12.5	12.5	0.259	0.261	
			2	Left Touch	149	5745	12.5	12.5	0.206	0.206	
				Left Tilt	149	5745	12.5	12.5	0.309	0.309	
				Right Touch	149	5745	12.5	12.5	0.202	0.202	
				Right Tilt	149	5745	12.5	12.5	0.228	0.228	
Body & Hotspot	802.11a 6 Mbps	10	1	Rear	149	5745	12.5	12.5	0.126	0.127	14
				Front	149	5745	12.5	12.5	0.073	0.074	
			2	Rear	149	5745	12.5	12.5	0.047	0.047	
				Front	149	5745	12.5	12.5	0.059	0.059	
Hotspot	802.11a 6 Mbps	10	1	Edge 1	149	5745	12.5	12.5	0.190	0.192	15
				Edge 4	149	5745	12.5	12.5	0.044	0.044	
			2	Edge 1	149	5745	12.5	12.5	0.080	0.080	
				Edge 2	149	5745	12.5	12.5	0.034	0.034	

RF Exposure Conditions	Mode	Dist. (mm)	Antenna	Test Position	Ch #.	Freq. (MHz)	Power (dBm)			1-g SAR (W/kg)				Plot No.
							Tune-up limit	Meas.		Meas.	Scaled	Meas.	Scaled	
								Wi-Fi 1	Wi-Fi 2					
Head	802.11a 6 Mbps	0	1 + 2	Left Touch	149	5745	12.5	12.2	12.5	0.075	0.081	0.154	0.154	
				Left Tilt	149	5745	12.5	12.2	12.5	0.059	0.064	0.168	0.168	
				Right Touch	149	5745	12.5	12.2	12.5	0.054	0.058	0.113	0.113	
				Right Tilt	149	5745	12.5	12.2	12.5	0.102	0.109	0.163	0.163	
Body & Hotspot	802.11a 6 Mbps	10	1 + 2	Rear	149	5745	12.5	12.2	12.5	0.023	0.025	0.030	0.030	
				Front	149	5745	12.5	12.2	12.5	0.028	0.030	0.077	0.077	
Hotspot				Edge 1	149	5745	12.5	12.2	12.5	0.057	0.062	0.126	0.126	

12.6.1. Wi-Fi DTS Additional Testing for 802.11ac

RF Exposure Conditions	Mode	Dist. (mm)	Antenna	Test Position	Ch #.	Freq. (MHz)	Power (dBm)			1-g SAR (W/kg)				Plot No.
							Tune-up limit	Meas.		Meas.	Scaled	Meas.	Scaled	
								Wi-Fi 1	Wi-Fi 2					
Head	802.11ac	0	1 + 2	Left Tilt	155	5775	10.5	10.0	10.0	0.065	0.073	<.001	<.001	
Body & Hotspot		10		Edge 1	155	5775	10.5	10.0	10.0	0.002	0.003	<.001	<.001	

12.7. Wi-Fi (UNII Band)

RF Exposure Conditions	Mode	Dist. (mm)	Antenna	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	1	Left Touch	36	5180	12.5	12.4	0.019	0.020	
					64	5320	12.5	11.7	0.048	0.058	
					132	5660	12.5	12.4	0.136	0.139	
				Left Tilt	36	5180	12.5	12.4	0.015	0.015	
					64	5320	12.5	11.7	0.033	0.039	
					132	5660	12.5	12.4	0.118	0.120	
				Right Touch	36	5180	12.5	12.4	0.022	0.022	
					64	5320	12.5	11.7	0.055	0.066	
					132	5660	12.5	12.4	0.182	0.185	
				Right Tilt	36	5180	12.5	12.4	0.027	0.027	
					64	5320	12.5	11.7	0.070	0.083	
					132	5660	12.5	12.4	0.254	0.259	
			2	Left Touch	36	5180	12.5	12.0	0.103	0.116	16
					64	5320	12.5	12.3	0.152	0.159	
					132	5660	12.5	12.0	0.349	0.395	
				Left Tilt	36	5180	12.5	12.0	0.096	0.108	
					64	5320	12.5	12.3	0.159	0.166	17
					132	5660	12.5	12.0	0.476	0.539	18
				Right Touch	36	5180	12.5	12.0	0.050	0.056	
					64	5320	12.5	12.3	0.091	0.095	
					132	5660	12.5	12.0	0.279	0.316	
				Right Tilt	36	5180	12.5	12.0	0.045	0.051	
					64	5320	12.5	12.3	0.084	0.088	
					132	5660	12.5	12.0	0.362	0.410	
Body	802.11a 6 Mbps	10	1	Rear	36	5180	12.5	12.4	0.085	0.087	19
					64	5320	12.5	11.7	0.089	0.107	20
					132	5660	12.5	12.4	0.179	0.182	21
				Front	36	5180	12.5	12.4	0.053	0.054	
					64	5320	12.5	11.7	0.045	0.054	
					132	5660	12.5	12.4	0.055	0.056	
			2	Rear	36	5180	12.5	12.0	0.020	0.022	
					64	5320	12.5	12.3	0.029	0.030	
					132	5660	12.5	12.0	0.075	0.085	
				Front	36	5180	12.5	12.0	<0.001	<0.001	
					64	5320	12.5	12.3	0.015	0.016	
					132	5660	12.5	12.0	0.079	0.090	

Wi-Fi UNII (continued)

RF Exposure Condition	Mode	Dist. (mm)	Antenna	Test Position	Ch #.	Freq. (MHz)	Power (dBm)			1-g SAR (W/kg)				Plot No.
							Tune-up limit	Meas.		Meas.	Scaled	Meas.	Scaled	
								Wi-Fi 1	Wi-Fi 2					
Head	802.11a 6 Mbps	0	1 + 2	Left Touch	36	5180	12.5	12.3	12.4	<.001	<.001	0.070	0.072	
					64	5320	12.5	12.4	12.3	0.104	0.106	0.043	0.045	
					132	5660	12.5	11.5	11.8	0.178	0.224	0.102	0.119	
				Left Tilt	36	5180	12.5	12.3	12.4	<.001	<.001	0.066	0.068	
					64	5320	12.5	12.4	12.3	<.001	<.001	0.096	0.101	
					132	5660	12.5	11.5	11.8	<.001	<.001	0.245	0.285	
				Right Touch	36	5180	12.5	12.3	12.4	0.038	0.040	0.020	0.020	
					64	5320	12.5	12.4	12.3	0.072	0.074	0.042	0.044	
					132	5660	12.5	11.5	11.8	0.191	0.240	0.106	0.123	
				Rightt Tilt	36	5180	12.5	12.3	12.4	0.033	0.035	0.020	0.021	
					64	5320	12.5	12.4	12.3	0.059	0.060	0.044	0.046	
					132	5660	12.5	11.5	11.8	0.207	0.261	0.145	0.169	
Body	802.11a 6 Mbps	10	1 + 2	Rear	36	5180	12.5	12.3	12.4	0.019	0.020	0.014	0.015	
					64	5320	12.5	12.4	12.3	0.020	0.021	0.019	0.020	
					132	5660	12.5	11.5	11.8	0.037	0.046	0.036	0.042	
				Front	36	5180	12.5	12.3	12.4	<.001	<.001	<.001	<.001	
					64	5320	12.5	12.4	12.3	0.029	0.030	0.031	0.032	
					132	5660	12.5	11.5	11.8	0.081	0.102	0.042	0.049	

12.7.1. Wi-Fi UNII Additional Testing for 802.11ac

RF Exposure Condition	Mode	Dist. (mm)	Antenna	Test Position	Ch #.	Freq. (MHz)	Power (dBm)			1-g SAR (W/kg)				Plot No.	
							Tune-up limit	Meas.		Meas.	Scaled	Meas.	Scaled		
								Wi-Fi 1	Wi-Fi 2						Wi-Fi 1
Head	802.11ac	0	1 + 2	Left Touch	42	5210	10.5	10.0	9.9	0.030	0.034	0.026	0.029		
					Left Tilt	58	5290	10.5	10.2	10.4	0.030	0.032	0.013	0.013	
						138	5690	10.5	9.4	9.9	0.084	0.108	0.032	0.036	
Body	802.11ac	10	1 + 2	Rear	42	5210	10.5	10.0	9.9	0.006	0.007	0.007	0.008		
					58	5290	10.5	10.2	10.4	0.005	0.006	0.002	0.002		
					138	5690	10.5	9.4	9.9	0.006	0.007	0.015	0.017		

12.8. Bluetooth

12.8.1. Standalone SAR Test Exclusion Considerations

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

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

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

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

Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
6.5	4	10	2.480	0.7

Conclusion:

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

12.8.2. Estimated SAR

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

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

Estimated SAR Result for Body-worn Accessory Conditions:

Test Configuration	Max. tune-up tolerance limit (mW)	Min. test separation distance (mm)	Frequency (GHz)	Estimated 1-g SAR (W/kg)
Rear/Front	4	10	2.480	0.084

13. SAR Measurement Variability

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

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the **ratio of largest to smallest SAR** for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

13.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn Accessory (W/kg)	Hotspot/Wi-Fi Direct (W/kg)	Repeated SAR (Yes/No)
750	LTE Band 17		0.139		No
850	WCDMA Band V		0.328		No
	LTE Band 5		0.202		No
1900	GSM 1900	0.744			No
	WCDMA Band II		1.090		Yes
2400	Wi-Fi 802.11b/g/n	0.337			No
5200	Wi-Fi 802.11a/n/ac	0.103			No
5300	Wi-Fi 802.11a/n/ac	0.159			No
5500	Wi-Fi 802.11a/n/ac	0.476			No
5800	Wi-Fi 802.11a/n/ac	0.309			No

13.2. Repeated Measurement Results

Head Exposure Condition

Not Applicable.

Body-worn Accessory and Hotspot Mode Exposure Condition

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
WCDMA Band II	Front	Rel 99 RMC 12.2 kbps	9400	1880.0	1.090	1.000	1.09	1

Note(s):

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

14. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance, introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

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

Where:

SAR₁ is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR₂ is the highest reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

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

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

A new threshold of 0.04 is also introduced in the KDB 447498. Thus, in order for a pair of simultaneously transmitting antennas, with the sum of 1-g SAR > 1.6 W/kg, to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

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

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① GSM1900	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1+2 (DTS)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	0.575	0.046				0.621	No
		① + ③	0.575		0.353			0.928	No
		① + ④	0.575			0.313		0.888	No
	Left Tilt	① + ②	0.351	0.050				0.401	No
		① + ③	0.351		0.281			0.632	No
		① + ④	0.351			0.265		0.616	No
	Right Touch	① + ②	0.761	0.137				0.898	No
		① + ③	0.761		0.169			0.930	No
		① + ④	0.761			0.205		0.966	No
	Right Tilt	① + ②	0.320	0.102				0.422	No
		① + ③	0.320		0.163			0.483	No
		① + ④	0.320			0.246		0.566	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.420	0.012				0.432	No
		① + ③ + ⑤	0.420		0.054		0.084	0.558	No
		① + ④	0.420			0.073		0.493	No
	Front	① + ②	0.696	0.050				0.746	No
		① + ③ + ⑤	0.696		0.058		0.084	0.838	No
Hotspot	Edge 1	① + ②		0.020				0.020	No
		① + ③			0.055			0.055	No
		① + ④				0.087		0.087	No
	Edge 2	① + ②	0.062					0.062	No
		① + ③	0.062		0.046			0.108	No
		① + ④	0.062					0.062	No
	Edge 3	① + ②	0.567					0.567	No
		① + ③	0.567					0.567	No
		① + ④	0.567					0.567	No
	Edge 4	① + ②	0.084	0.013				0.097	No
		① + ③	0.084					0.084	No
		① + ④	0.084					0.084	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.

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① GSM1900	② Wi-Fi 1 (UNII)	③ Wi-Fi 2 (UNII)	④ Wi-Fi 1+2 (UNII)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	0.575	0.139				0.714	No
		① + ③	0.575		0.395			0.970	No
		① + ④	0.575			0.224		0.799	No
	Left Tilt	① + ②	0.351	0.120				0.471	No
		① + ③	0.351		0.539			0.890	No
		① + ④	0.351			0.285		0.636	No
	Right Touch	① + ②	0.761	0.185				0.946	No
		① + ③	0.761		0.316			1.077	No
		① + ④	0.761			0.240		1.001	No
	Right Tilt	① + ②	0.320	0.259				0.579	No
		① + ③	0.320		0.410			0.730	No
		① + ④	0.320			0.261		0.581	No
Body-worn Accessory	Rear	① + ②	0.420	0.182				0.602	No
		① + ③ + ⑤	0.420		0.085		0.084	0.589	No
		① + ④	0.420			0.046		0.466	No
	Front	① + ②	0.696	0.056				0.752	No
		① + ③ + ⑤	0.696		0.090		0.084	0.870	No
		① + ④	0.696			0.102		0.798	No

SAR to Peak Location Separation Ratio (SPLSR)

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

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① W-CDMA Band V	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1+2 (DTS)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	0.284	0.046				0.330	No
		① + ③	0.284		0.353			0.637	No
		① + ④	0.284			0.313		0.597	No
	Left Tilt	① + ②	0.175	0.050				0.225	No
		① + ③	0.175		0.281			0.456	No
		① + ④	0.175			0.265		0.440	No
	Right Touch	① + ②	0.223	0.137				0.360	No
		① + ③	0.223		0.169			0.392	No
		① + ④	0.223			0.205		0.428	No
	Right Tilt	① + ②	0.160	0.102				0.262	No
		① + ③	0.160		0.163			0.323	No
		① + ④	0.160			0.246		0.406	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.368	0.012				0.380	No
		① + ③ + ⑤	0.368		0.054		0.084	0.506	No
		① + ④	0.368			0.073		0.441	No
	Front	① + ②	0.309	0.050				0.359	No
		① + ③ + ⑤	0.309		0.058		0.084	0.451	No
		① + ④	0.309			0.071		0.380	No
Hotspot	Edge 1	① + ②		0.020				0.020	No
		① + ③			0.055			0.055	No
		① + ④				0.087		0.087	No
	Edge 2	① + ②	0.162					0.162	No
		① + ③	0.162		0.046			0.208	No
		① + ④	0.162					0.162	No
	Edge 3	① + ②	0.068					0.068	No
		① + ③	0.068					0.068	No
		① + ④	0.068					0.068	No
	Edge 4	① + ②	0.263	0.013				0.276	No
		① + ③	0.263					0.263	No
		① + ④	0.263					0.263	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.

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① W-CDMA Band V	② Wi-Fi 1 (UNII)	③ Wi-Fi 2 (UNII)	④ Wi-Fi 1+2 (UNII)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	0.284	0.139				0.423	No
		① + ③	0.284		0.395			0.679	No
		① + ④	0.284			0.224		0.508	No
	Left Tilt	① + ②	0.175	0.120				0.295	No
		① + ③	0.175		0.539			0.714	No
		① + ④	0.175			0.285		0.460	No
	Right Touch	① + ②	0.223	0.185				0.408	No
		① + ③	0.223		0.316			0.539	No
		① + ④	0.223			0.240		0.463	No
	Right Tilt	① + ②	0.160	0.259				0.419	No
		① + ③	0.160		0.410			0.570	No
		① + ④	0.160			0.261		0.421	No
Body-worn Accessory	Rear	① + ②	0.368	0.182				0.550	No
		① + ③ + ⑤	0.368		0.085		0.084	0.537	No
		① + ④	0.368			0.046		0.414	No
	Front	① + ②	0.309	0.056				0.365	No
		① + ③ + ⑤	0.309		0.090		0.084	0.483	No
		① + ④	0.309			0.102		0.411	No

SAR to Peak Location Separation Ratio (SPLSR)

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

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① W-CDMA Band II	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1+2 (DTS)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	1.058	0.046				1.104	No
		① + ③	1.058		0.353			1.411	No
		① + ④	1.058			0.313		1.371	No
	Left Tilt	① + ②	0.260	0.050				0.310	No
		① + ③	0.260		0.281			0.541	No
		① + ④	0.260			0.265		0.525	No
	Right Touch	① + ②	0.772	0.137				0.909	No
		① + ③	0.772		0.169			0.941	No
		① + ④	0.772			0.205		0.977	No
	Right Tilt	① + ②	0.452	0.102				0.554	No
		① + ③	0.452		0.163			0.615	No
		① + ④	0.452			0.246		0.698	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.926	0.012				0.938	No
		① + ③ + ⑤	0.926		0.054		0.084	1.064	No
		① + ④	0.926			0.073		0.999	No
	Front	① + ②	1.115	0.050				1.165	No
		① + ③ + ⑤	1.115		0.058		0.084	1.257	No
	① + ④	1.115			0.071		1.186	No	
Hotspot	Edge 1	① + ②		0.020				0.020	No
		① + ③			0.055			0.055	No
		① + ④				0.087		0.087	No
	Edge 2	① + ②	0.127					0.127	No
		① + ③	0.127		0.046			0.173	No
		① + ④	0.127					0.127	No
	Edge 3	① + ②	1.089					1.089	No
		① + ③	1.089					1.089	No
		① + ④	1.089					1.089	No
	Edge 4	① + ②	0.357	0.013				0.370	No
		① + ③	0.357					0.357	No
		① + ④	0.357					0.357	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.

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① W-CDMA Band II	② Wi-Fi 1 (UNII)	③ Wi-Fi 2 (UNII)	④ Wi-Fi 1+2 (UNII)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	1.058	0.139				1.197	No
		① + ③	1.058		0.395			1.453	No
		① + ④	1.058			0.224		1.282	No
	Left Tilt	① + ②	0.260	0.120				0.380	No
		① + ③	0.260		0.539			0.799	No
		① + ④	0.260			0.285		0.545	No
	Right Touch	① + ②	0.772	0.185				0.957	No
		① + ③	0.772		0.316			1.088	No
		① + ④	0.772			0.240		1.012	No
	Right Tilt	① + ②	0.452	0.259				0.711	No
		① + ③	0.452		0.410			0.862	No
		① + ④	0.452			0.261		0.713	No
Body-worn Accessory	Rear	① + ②	0.926	0.182				1.108	No
		① + ③ + ⑤	0.926		0.085		0.084	1.095	No
		① + ④	0.926			0.046		0.972	No
	Front	① + ②	1.115	0.056				1.171	No
		① + ③ + ⑤	1.115		0.090		0.084	1.289	No
		① + ④	1.115			0.102	1.217	No	

SAR to Peak Location Separation Ratio (SPLSR)

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

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 5	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1+2 (DTS)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	0.114	0.046				0.160	No
		① + ③	0.114		0.353			0.467	No
		① + ④	0.114			0.313		0.427	No
	Left Tilt	① + ②	0.072	0.050				0.122	No
		① + ③	0.072		0.281			0.353	No
		① + ④	0.072			0.265		0.337	No
	Right Touch	① + ②	0.082	0.137				0.219	No
		① + ③	0.082		0.169			0.251	No
		① + ④	0.082			0.205		0.287	No
	Right Tilt	① + ②	0.057	0.102				0.159	No
		① + ③	0.057		0.163			0.220	No
		① + ④	0.057			0.246		0.303	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.213	0.012				0.225	No
		① + ③ + ⑤	0.213		0.054		0.084	0.351	No
		① + ④	0.213			0.073		0.286	No
	Front	① + ②	0.209	0.050				0.259	No
		① + ③ + ⑤	0.209		0.058		0.084	0.351	No
		① + ④	0.209			0.071	0.280	No	
Hotspot	Edge 1	① + ②		0.020				0.020	No
		① + ③			0.055			0.055	No
		① + ④				0.087		0.087	No
	Edge 2	① + ②	0.081					0.081	No
		① + ③	0.081		0.046			0.127	No
		① + ④	0.081					0.081	No
	Edge 3	① + ②	0.056					0.056	No
		① + ③	0.056					0.056	No
		① + ④	0.056					0.056	No
	Edge 4	① + ②	0.119	0.013				0.132	No
		① + ③	0.119					0.119	No
		① + ④	0.119					0.119	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.

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 5	② Wi-Fi 1 (UNII)	③ Wi-Fi 2 (UNII)	④ Wi-Fi 1+2 (UNII)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	0.114	0.139				0.253	No
		① + ③	0.114		0.395			0.509	No
		① + ④	0.114			0.224		0.338	No
	Left Tilt	① + ②	0.072	0.120				0.192	No
		① + ③	0.072		0.539			0.611	No
		① + ④	0.072			0.285		0.357	No
	Right Touch	① + ②	0.082	0.185				0.267	No
		① + ③	0.082		0.316			0.398	No
		① + ④	0.082			0.240		0.322	No
	Right Tilt	① + ②	0.057	0.259				0.316	No
		① + ③	0.057		0.410			0.467	No
		① + ④	0.057			0.261		0.318	No
Body-worn Accessory	Rear	① + ②	0.213	0.182				0.395	No
		① + ③ + ⑤	0.213		0.085		0.084	0.382	No
		① + ④	0.213			0.046		0.259	No
	Front	① + ②	0.209	0.056				0.265	No
		① + ③ + ⑤	0.209		0.090		0.084	0.383	No
		① + ④	0.209			0.102		0.311	No

SAR to Peak Location Separation Ratio (SPLSR)

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

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 17	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1+2 (DTS)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	0.046	0.046				0.092	No
		① + ③	0.046		0.353			0.399	No
		① + ④	0.046			0.313		0.359	No
	Left Tilt	① + ②	0.014	0.050				0.064	No
		① + ③	0.014		0.281			0.295	No
		① + ④	0.014			0.265		0.279	No
	Right Touch	① + ②	0.038	0.137				0.175	No
		① + ③	0.038		0.169			0.207	No
		① + ④	0.038			0.205		0.243	No
	Right Tilt	① + ②	0.020	0.102				0.122	No
		① + ③	0.020		0.163			0.183	No
		① + ④	0.020			0.246		0.266	No
Body-worn Accessory & Hotspot	Rear	① + ②	0.139	0.012				0.151	No
		① + ③ + ⑤	0.139		0.054		0.084	0.277	No
		① + ④	0.139			0.073		0.212	No
	Front	① + ②	0.156	0.050				0.206	No
		① + ③ + ⑤	0.156		0.058		0.084	0.298	No
	① + ④	0.156			0.071		0.227	No	
Hotspot	Edge 1	① + ②		0.020				0.020	No
		① + ③			0.055			0.055	No
		① + ④				0.087		0.087	No
	Edge 2	① + ②	0.020					0.020	No
		① + ③	0.020		0.046			0.066	No
		① + ④	0.020					0.020	No
	Edge 3	① + ②	0.043					0.043	No
		① + ③	0.043					0.043	No
		① + ④	0.043					0.043	No
	Edge 4	① + ②	0.040	0.013				0.053	No
		① + ③	0.040					0.040	No
		① + ④	0.040					0.040	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.

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 17	② Wi-Fi 1 (UNII)	③ Wi-Fi 2 (UNII)	④ Wi-Fi 1+2 (UNII)	⑤ Bluetooth (Antenna 1)		
Head	Left Touch	① + ②	0.046	0.139				0.185	No
		① + ③	0.046		0.395			0.441	No
		① + ④	0.046			0.224		0.270	No
	Left Tilt	① + ②	0.014	0.120				0.134	No
		① + ③	0.014		0.539			0.553	No
		① + ④	0.014			0.285		0.299	No
	Right Touch	① + ②	0.038	0.185				0.223	No
		① + ③	0.038		0.316			0.354	No
		① + ④	0.038			0.240		0.278	No
	Right Tilt	① + ②	0.020	0.259				0.279	No
		① + ③	0.020		0.410			0.430	No
		① + ④	0.020			0.261		0.281	No
Body-worn Accessory	Rear	① + ②	0.139	0.182				0.321	No
		① + ③ + ⑤	0.139		0.085		0.084	0.308	No
		① + ④	0.139			0.046		0.185	No
	Front	① + ②	0.156	0.056				0.212	No
		① + ③ + ⑤	0.156		0.090		0.084	0.330	No
		① + ④	0.156			0.102		0.258	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.

Conclusion:

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

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 3902**
- 15.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3929**
- 15.6. Calibration Certificate for E-Field Probe EX3DV3 - SN 3991**
- 15.7. Calibration Certificate for D750V3 - SN 1071**
- 15.8. Calibration Certificate for D835V2 - SN 4d002**
- 15.9. Calibration Certificate for D1900V2- SN 5d043**
- 15.10. Calibration Certificate for D2450V2 - SN 899**
- 15.11. Calibration Certificate for D5GHzV2 - SN 1138**

END OF REPORT