



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

SAR EVALUATION REPORT

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

**Model: SM-G710S, SM-G710L and SM-G710K
FCC ID: A3LSMG710S**

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1. Attestation of Test Results

Applicant	Samsung Electronics Co., Ltd.			
DUT description	GSM/WCDMA/LTE Phone + Bluetooth & DTS/UNII a/b/g/n/ac + NFC			
Model	SM-G710S, SM-G710L and SM-G710K			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	12/17/2013 – 12/26/2013			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	0.292 W/kg	0.908 W/kg	0.064 W/kg
	Body-worn Accessory	0.401 W/kg	0.142 W/kg	0.030 W/kg
	Wireless Router (Hotspot)	0.401 W/kg	0.142 W/kg	N/A
	Simultaneous Transmission	1.199 W/kg	1.199 W/kg	0.431 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.

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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 v05r01
- 648474 D04 Handset SAR v01r01
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 HSPA and 1x Advanced v02r02
- 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- 941225 D05 SAR for LTE Devices v02r02
- 941225 D06 Hot Spot SAR v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01
- 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, Fremont, California, USA.

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 F	

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	8753ES	MY40000980	2/20/2014
Dielectronic Probe kit	SPEAG	DAK-3.5	1103	2/5/2014
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	Agilent	8665B	3438A00633	6/13/2014
Power Meter	Agilent	N1912A	MY53040016	4/4/2014
Power Sensor	Agilent	E93223A	MY53070008	4/3/2014
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
Synthesized Signal Generator	HP	8665B	3744A01155	3/6/2014
Power Meter	Agilent	N1911A	MY53060002	4/4/2014
Power Meter	Agilent	N1911A	MY53060016	8/3/2014
Power Sensor	Agilent	E9323A	MY53070003	4/3/2014
Power Sensor	Agilent	E9323A	MY53070007	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Directional coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	KENWOOD	PA36-3A	7060074	N/A
Thermometer	TRACEABLE	4242	122529163	9/19/2014
E-Field Probe	SPEAG	EX3DV4	3929	6/24/2014
E-Field Probe	SPEAG	EX3DV4	3773	4/26/2014
E-Field Probe	SPEAG	EX3DV4	3902	7/12/2014
E-Field Probe	SPEAG	EX3DV4	3936	7/22/2014
Data Acquisition Electronics	SPEAG	DAE4	1259	2/7/2014
Data Acquisition Electronics	SPEAG	DAE4	1359	2/8/2014
Data Acquisition Electronics	SPEAG	DAE4	1377	7/15/2014
Data Acquisition Electronics	SPEAG	DAE4	1380	7/15/2014
System Validation Dipole	SPEAG	D750V3	1019	3/5/2014
System Validation Dipole	SPEAG	D835V2	4d117	5/28/2014
System Validation Dipole	SPEAG	D1900V2	5d163	9/17/2014
System Validation Dipole	SPEAG	D2450V2	748	2/11/2014
System Validation Dipole	SPEAG	D5GHzV2	1003	9/19/2014

Others

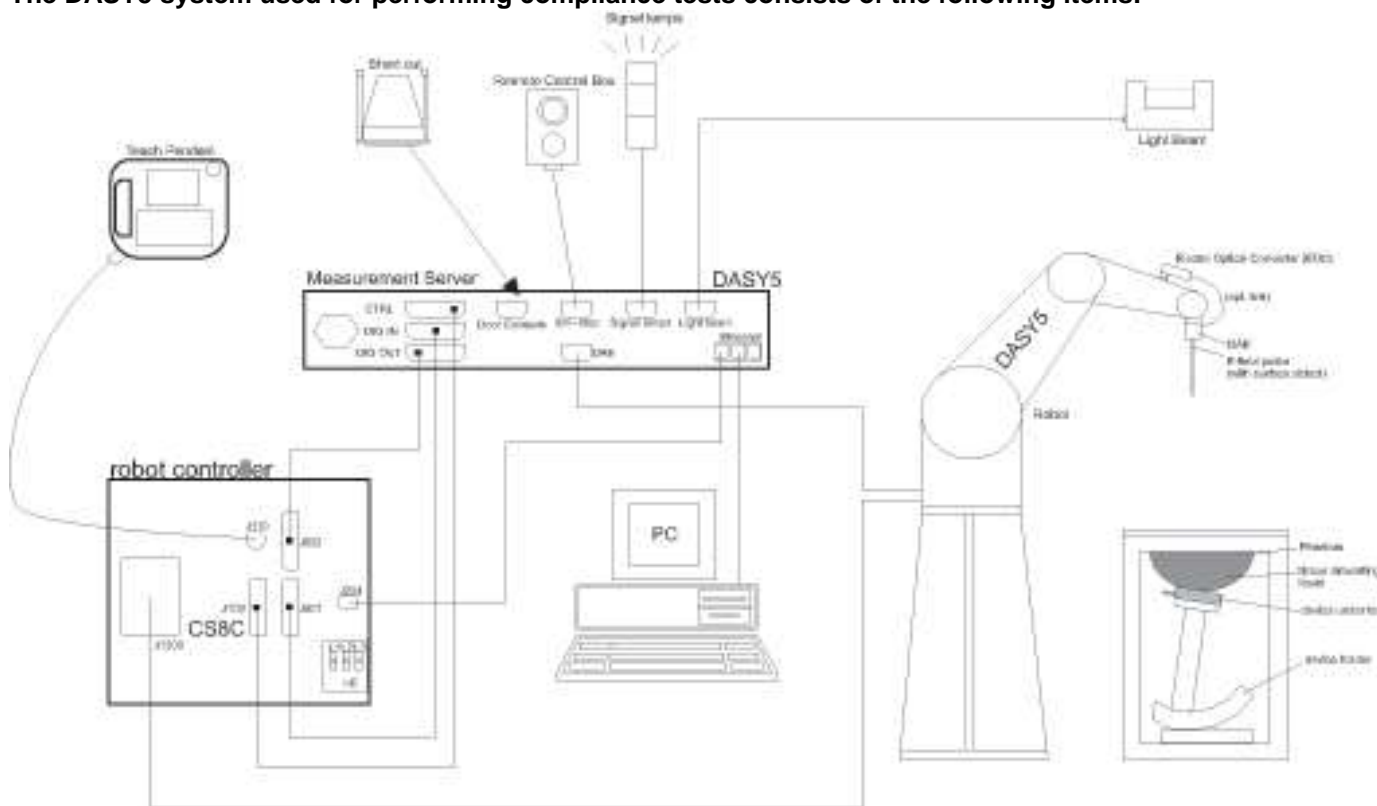
Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMU200	106301	7/3/2014
Base Station Simulator	R & S	CMW500	124594-HX	7/2/2014
Base Station Simulator	R & S	CMW500	132909-bp	2/19/2014
Power Meter	Agilent	N1912A	MY53040016	4/4/2014
Power Sensor	Agilent	N1921A	MY52020011	5/13/2014

4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01 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 1528-2013 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 v01r01

	≤ 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 v01r01

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 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: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
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	WiFi Hotspot mode permits the device to share its cellular data connection with other WiFi-enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (WiFi 2.4 GHz) (Mobile AP, FCC: Ch.1 ~ Ch.11) <input checked="" type="checkbox"/> Mobile Hotspot (WiFi 5 GHz) (Mobile AP, FCC: Ch.149~165)
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): 146 mm x 75mm Overall Diagonal: 154mm Display Diagonal: 134mm
Accessory	<input checked="" type="checkbox"/> Headset
Battery Options	<input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 3.8 Vdc, 9.88 Wh <input type="checkbox"/> Extended (large capacity)

7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 1900 W-CDMA Band: II / V LTE Band 5 / 17 WiFi: 2.4 / 5 GHz Bluetooth: 2.4 GHz.
Mode	GSM <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Voice (GMSK) <input checked="" type="checkbox"/> GPRS (GMSK) <input checked="" type="checkbox"/> EGPRS (8PSK) W-CDMA <ul style="list-style-type: none"> <input checked="" type="checkbox"/> UMTS Rel. 99 (Voice & Data) <input checked="" type="checkbox"/> HSDPA (Rel. 8, CAT 14) <input checked="" type="checkbox"/> HSUPA (Rel. 8, CAT 6) <input type="checkbox"/> DC-HSDPA <input type="checkbox"/> HSPA+ LTE <ul style="list-style-type: none"> <input checked="" type="checkbox"/> QPSK <input checked="" type="checkbox"/> 16QAM WiFi 2.4GHz (802.11b/g/n) <ul style="list-style-type: none"> <input checked="" type="checkbox"/> 802.11b <input checked="" type="checkbox"/> 802.11g <input checked="" type="checkbox"/> 802.11n (20MHz) <input type="checkbox"/> 802.11n (40MHz) WiFi 5GHz <ul style="list-style-type: none"> <input checked="" type="checkbox"/> 802.11a <input checked="" type="checkbox"/> 802.11n (20MHz) <input checked="" type="checkbox"/> 802.11n (40MHz) <input checked="" type="checkbox"/> 802.11ac (20MHz) <input checked="" type="checkbox"/> 802.11ac (40MHz) <input checked="" type="checkbox"/> 802.11ac (80MHz) Bluetooth Ver. 4.0 (LE)
Duty Cycle (used for SAR testing)	GSM Voice: 12.5%; GPRS 1 Slot: 12.5%; 2 Slots: 25%, 3 Slots: 37.5%, 4 Slots: 50%, W-CDMA: 100% LTE: 100% WiFi 802.11a/b/g/n/ac: 100%
GPRS Multi-Slot Class	<input type="checkbox"/> Class 8 - One Up <input type="checkbox"/> Class 10 - Two Up <input checked="" 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)							
		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
GSM1900	Voice	30.0				30.5			
	GPRS	30.0	29.5	28.5	26.5	30.5	30.0	29.0	27.0
Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)							
RF Air interface	Mode	Target				Max. tune-up tolerance limit			
W-CDMA Band V	R99	23.5				24.0			
	HSDPA	22.5				23.0			
	HSUPA	22.5				23.0			
W-CDMA Band II	R99	23.0				23.5			
	HSDPA	22.0				22.5			
	HSUPA	22.0				22.5			
Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)							
RF Air interface	Mode	Target				Max. tune-up tolerance limit			
LTE Band 5	QPSK	23.5				24.0			
LTE Band 17	QPSK	23.5				24.0			
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	16.0				16.5			
	802.11g	14.0				14.5			
	802.11n HT20	12.0				12.5			
Upper limit (dB): 0.5		RF Output Power (dBm)							
RF Air interface	Mode	Target				Max. tune-up tolerance limit			
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 HT20	10.0				10.5			
	802.11ac HT40	10.0				10.5			
	802.11ac HT80	10.0				10.5			
Upper limit (dB): 0.5		RF Output Power (dBm)							
RF Air interface	Mode	Target				Max. tune-up tolerance limit			
Bluetooth		8.5				9.0			
Bluetooth (LE)		8.5				9.0			

7.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	<ol style="list-style-type: none">1. GSM 1900 Voice + WiFi 2.4/5 GHz2. GSM 1900 (GPRS) + WiFi 2.4/5 GHz (VoIP)3. WCDMA Band 2/5 + WiFi 2.4/5 GHz4. LTE B5/B17 + WiFi 2.4/5 GHz
Body-worn Accessory	<ol style="list-style-type: none">1. GSM 1900 Voice + WiFi 2.4/5 GHz2. GSM 1900 Voice + BT3. GSM 1900 (GPRS/EDGE) + WiFi 2.4/5 GHz (VoIP)4. GSM 1900 (GPRS/EDGE) + BT5. WCDMA Band 2/5 + WiFi 2.4/5 GHz6. WCDMA Band 2/5 + BT7. LTE B5/B17 + WiFi 2.4/5 GHz8. LTE B5/B17 + BT
Wireless Router (Hotspot)	<ol style="list-style-type: none">1. GSM 1900 (GPRS) + WiFi 2.4/5.8 GHz2. WCDMA Band 2/5 + WiFi 2.4/5.8 GHz3. LTE B5/B17 + WiFi 2.4/5.8 GHz
<p>Notes:</p> <ol style="list-style-type: none">1. WiFi 2.4GHz support Hotspot.2. GPRS, WCDMA and LTE support Hotspot.3. VoIP is supported in LTE, WCDMA and GPRS.4. 2.4 GHz WLAN, 2.4 GHz Bluetooth, and 5 GHz WLAN share the same antenna path and cannot transmit simultaneously.	

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	20415/ 825.5	20407/ 824.7																																						
	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5																																						
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3																																						
Frequency range, Channel Bandwidth, Numbers and Frequencies	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 TX/RX antennas and one Rx only antennas. Refer to Appendix "Antenna Locations and Separation Distances" for antenna locations																																												
Maximum power reduction (MPR)	<p>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 basestation 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 GSM, W-CDMA, CDMA, LTE and WiFi

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

8.2. Body-worn Accessory Exposure Conditions

For WWAN and LTE

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

For WiFi

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

8.3. Hotspot Exposure Conditions

For WWAN and LTE

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	130 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 v01r01
Edge 2 (Right)	2 mm	Yes	
Edge 3 (Bottom)	1 mm	Yes	
Edge 4 (Left)	2 mm	Yes	

For WiFi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	1 mm	Yes	
Edge 2 (Right)	1 mm	Yes	
Edge 3 (Bottom)	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 v01r01
Edge 4 (Left)	63 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 v01r01

9. RF Output Power Measurement

9.1. GSM

GSM (GMSK) - Voice Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
1900	512	1850.2	30.4
	661	1880.0	30.4
	810	1909.8	30.1

GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg Power (dBm)				Avg Power (dBm)			
			1 time slot		2 time slots		3 time slots		4 time slots	
			Burst	Frame	Burst	Frame	Burst	Frame	Burst	Frame
1900	512	1850.2	30.46	21.43	29.69	23.67	28.62	24.36	26.65	23.64
	661	1880.0	30.43	21.40	29.48	23.46	28.62	24.36	26.70	23.69
	810	1909.8	30.09	21.06	29.26	23.24	28.42	24.16	26.58	23.57

EGPRS (8PSK) - Coding Scheme: MCS5

This mode 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 3 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	23.6
		4183	836.6	23.5
		4233	846.6	23.5
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.3
		9400	1880.0	23.4
		9538	1907.6	23.3

HSDPA

The following 4 Sub-tests were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. 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
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	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)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.3
		4183	836.6	22.3
		4233	846.6	22.4
	Subtest 2	4132	826.4	22.0
		4183	836.6	21.9
		4233	846.6	22.1
	Subtest 3	4132	826.4	21.9
		4183	836.6	21.9
		4233	846.6	22.1
	Subtest 4	4132	826.4	21.8
		4183	836.6	21.9
		4233	846.6	22.2
W-CDMA Band II	Subtest 1	9262	1852.4	22.4
		9400	1880.0	22.5
		9538	1907.6	22.3
	Subtest 2	9262	1852.4	22.0
		9400	1880.0	22.1
		9538	1907.6	21.9
	Subtest 3	9262	1852.4	21.9
		9400	1880.0	21.8
		9538	1907.6	21.8
	Subtest 4	9262	1852.4	21.8
		9400	1880.0	21.9
		9538	1907.6	21.8

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

HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	15/15
	β_{ec}	209/225	12/15	30/15	2/15	24/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/15
	β_{hs}	22/15	12/15	30/15	4/15	30/15
	β_{ed}	1309/225	94/75	47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	Ahs = β_{hs}/β_c	30/15				
HSUPA Specific Settings	D E-DPCCH	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	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18		E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.4
		4183	836.6	22.5
		4233	846.6	22.6
	Subtest 2	4132	826.4	21.9
		4183	836.6	22.0
		4233	846.6	22.1
	Subtest 3	4132	826.4	22.4
		4183	836.6	22.5
		4233	846.6	22.6
	Subtest 4	4132	826.4	22.4
		4183	836.6	22.5
		4233	846.6	22.4
	Subtest 5	4132	826.4	22.1
		4183	836.6	22.4
		4233	846.6	22.6
W-CDMA Band II	Subtest 1	9262	1852.4	22.4
		9400	1880.0	22.4
		9538	1907.6	22.2
	Subtest 2	9262	1852.4	21.9
		9400	1880.0	21.9
		9538	1907.6	21.9
	Subtest 3	9262	1852.4	22.3
		9400	1880.0	22.4
		9538	1907.6	22.3
	Subtest 4	9262	1852.4	22.3
		9400	1880.0	22.4
		9538	1907.6	22.3
	Subtest 5	9262	1852.4	22.3
		9400	1880.0	22.5
		9538	1907.6	22.3

9.3. LTE Band

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

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

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

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

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

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

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

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

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20450	20525	20600
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	23.2	23.3	23.1
			1	25	0	23.1	23.2	23.1
			1	49	0	23.2	23.2	23.1
			25	0	1	22.2	22.3	22.3
			25	11	1	22.4	22.3	22.2
			25	24	1	22.3	22.3	22.2
			50	0	1	22.4	22.3	22.3
		16QAM	1	0	1	22.3	22.5	22.0
			1	25	1	22.0	22.4	22.0
			1	49	1	22.2	22.5	22.0
			25	0	2	21.2	21.3	21.4
			25	11	2	21.3	21.3	21.4
			25	24	2	21.3	21.3	21.3
			50	0	2	21.3	21.3	21.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20425	20525	20625
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	23.2	23.3	23.1
			1	12	0	23.1	23.2	23.1
			1	24	0	23.1	23.2	23.1
			12	0	1	22.4	22.3	22.2
			12	6	1	22.3	22.3	22.2
			12	11	1	22.3	22.3	22.3
			25	0	1	22.2	22.2	22.2
		16QAM	1	0	1	22.1	22.6	22.0
			1	12	1	22.0	22.6	22.1
			1	24	1	22.1	22.6	22.1
			12	0	2	21.4	21.3	21.3
			12	6	2	21.3	21.3	21.3
			12	11	2	21.3	21.3	21.3
			25	0	2	21.4	21.3	21.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20415	20525	20635
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	23.2	23.3	23.2
			1	7	0	23.1	23.2	23.1
			1	14	0	23.1	23.3	23.2
			8	0	1	22.4	22.3	22.3
			8	4	1	22.3	22.3	22.3
			8	7	1	22.3	22.3	22.3
			15	0	1	22.3	22.3	22.3
		16QAM	1	0	1	22.2	22.4	22.1
			1	7	1	22.0	22.4	22.0
			1	14	1	22.0	22.5	22.0
			8	0	2	21.4	21.1	21.3
			8	4	2	21.4	21.1	21.3
			8	7	2	21.3	21.1	21.3
			15	0	2	21.3	21.3	21.2

LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)		
						20407	20525	20643
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	23.3	23.2	23.2
			1	2	0	23.2	23.2	23.2
			1	5	0	23.2	23.2	23.2
			3	0	0	23.3	23.3	23.2
			3	1	0	23.3	23.3	23.2
			3	2	0	23.2	23.2	23.2
			6	0	1	22.4	22.3	22.3
		16QAM	1	0	1	22.5	22.1	22.4
			1	2	1	22.4	22.1	22.4
			1	5	1	22.3	22.2	22.4
			3	0	1	22.3	22.5	22.2
			3	1	1	22.4	22.5	22.2
			3	2	1	22.3	22.4	22.2
			6	0	2	21.4	21.4	21.4

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)
						23790
						710 MHz
LTE Band 17	10	QPSK	1	0	0	23.3
			1	25	0	23.2
			1	49	0	23.2
			25	0	1	22.3
			25	12	1	22.3
			25	25	1	22.3
			50	0	1	22.3
		16QAM	1	0	1	22.5
			1	25	1	22.5
			1	49	1	22.4
			25	0	2	21.3
			25	12	2	21.3
			25	25	2	21.3
			50	0	2	21.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)
						23790
						710 MHz
LTE Band 17	5	QPSK	1	0	0	23.3
			1	12	0	23.3
			1	24	0	23.3
			12	0	1	22.3
			12	6	1	22.3
			12	11	1	22.3
			25	0	1	22.3
		16QAM	1	0	1	22.3
			1	12	1	22.2
			1	24	1	22.2
			12	0	2	21.3
			12	6	2	21.3
			12	11	2	21.2
			25	0	2	21.2

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

9.4. WiFi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

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

Notes:

√ = "default test channels"

▽ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

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

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1 Mbps	1	2412	16.4	Yes
			6	2437	16.5	
			11	2462	16.4	
	802.11g	6 Mbps	1	2412	14.0	No
			6	2437	14.3	
			11	2462	14.5	
	802.11n (HT20)	MCS0	1	2412	12.1	No
			6	2437	12.6	
			11	2462	12.2	

Note(s):

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

Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
802.11b	6	2437	1 Mbps	16.5	Yes
			2 Mbps	16.5	No
			5.5 Mbps	16.5	No
			11 Mbps	16.5	No

9.5. WiFi (5 GHz Bands)

Required Test Channels per KDB 248227 D01

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

√ = "default test channels"

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

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

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (UNII)	802.11a	6 Mbps	36	5180	12.0	Yes
			40	5200	11.9	
			44	5220	11.9	
			48	5240	12.0	
	802.11n (HT20)	MCS0	36	5180	12.0	No
			40	5200	11.9	
			48	5240	11.9	
	802.11n (HT40)	MCS0	38	5190	12.0	No
			46	5230	11.9	
	802.11ac (HT20)	MCS0	36	5180	10.1	No
			40	5200	10.0	
			48	5240	9.9	
	802.11ac (HT40)	MCS0	38	5190	10.0	No
			46	5230	9.8	
	802.11ac (HT80)	MCS0	42	5210	10.0	No
5.3 (UNII)	802.11a	6 Mbps	52	5260	11.9	Yes
			56	5280	12.2	
			60	5300	12.0	
			64	5320	12.0	
	802.11n (HT20)	MCS0	52	5260	11.9	No
			60	5300	12.0	
			64	5320	11.9	
	802.11n (HT40)	MCS0	54	5270	11.9	No
			62	5310	11.9	
	802.11ac (HT20)	MCS0	52	5260	9.9	No
			60	5300	9.6	
			64	5320	9.9	
	802.11ac (HT40)	MCS0	54	5270	9.8	No
			62	5310	9.6	
	802.11ac (HT80)	MCS0	58	5290	9.8	No

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.

Band (GHz)	Mode	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.5 (UNII)	802.11a	6 Mbps	100	5500	11.7	Yes
			104	5520	11.7	
			108	5540	11.7	
			112	5560	11.4	
			116	5580	11.6	
			120	5600	11.6	
			124	5620	11.7	
			128	5640	11.7	
			132	5660	11.7	
			136	5680	11.7	
			140	5700	11.7	
	802.11n (HT20)	MCS0	100	5500	11.7	No
			116	5580	11.7	
			140	5700	11.7	
	802.11n (HT40)	MCS0	102	5510	11.6	No
			110	5550	11.6	
			134	5670	11.7	
	802.11ac (HT20)	MCS0	100	5500	9.9	No
			116	5580	9.7	
			140	5700	9.7	
	802.11ac (HT40)	MCS0	134	5670	9.6	No
			142	5710	9.6	
	802.11ac (HT80)	MCS0	106	5530	9.5	No
			138	5690	9.5	
5.8 (DTS)	802.11a	6 Mbps	149	5745	11.7	Yes
			153	5765	11.6	
			157	5785	11.6	
			161	5805	11.7	
			165	5825	11.7	
	802.11n (HT20)	MCS0	149	5745	11.7	No
			157	5785	11.6	
			161	5805	11.7	
	802.11n (HT40)	MCS0	151	5755	11.7	No
			159	5795	11.7	
			155	5775	9.6	
	802.11ac (HT20)	MCS0	149	5745	9.7	No
			157	5785	9.7	
			165	5825	9.6	
	802.11ac (HT40)	MCS0	151	5755	9.6	No
			159	5795	9.7	
	802.11ac (HT80)	MCS0	155	5775	9.6	No

Note(s):

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

Power measurements to determine worst-case data rates

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
5.2 GHz (UNII)	802.11a	36	5180	6 Mbps	12.0	Yes
				9 Mbps	11.8	No
				12 Mbps	11.7	No
				18 Mbps	11.4	No
				24 Mbps	11.3	No
				36 Mbps	10.8	No
				48 Mbps	10.5	No
				54 Mbps	10.4	No
5.3 GHz (UNII)	802.11a	56	5280	6 Mbps	12.2	Yes
				9 Mbps	12.0	No
				12 Mbps	11.7	No
				18 Mbps	11.6	No
				24 Mbps	11.3	No
				36 Mbps	10.9	No
				48 Mbps	10.4	No
				54 Mbps	10.5	No
5.5 GHz (UNII)	802.11a	116	5580	6 Mbps	11.6	Yes
				9 Mbps	11.4	No
				12 Mbps	11.2	No
				18 Mbps	11.1	No
				24 Mbps	10.8	No
				36 Mbps	10.3	No
				48 Mbps	10.1	No
				54 Mbps	10.0	No
5.8 GHz (DTS)	802.11a	149	5745	6 Mbps	11.7	Yes
				9 Mbps	11.5	No
				12 Mbps	11.4	No
				18 Mbps	11.0	No
				24 Mbps	11.0	No
				36 Mbps	10.5	No
				48 Mbps	9.9	No
				54 Mbps	9.9	No

9.6. Bluetooth

Maximum tune-up tolerance limit is 9 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 1528-2003 Table 2

Target Frequency (MHz)	Head	
	ϵ_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800 – 2000	40.0	1.40
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40

FCC OET Bulletin 65 Supplement C 01-01

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

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

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

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

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

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

Item	Head Tissue Simulation Liquids HSL750 Muscle (body) Tissue Simulation Liquids MSL750
Type No	SL AAH 075
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H ² O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethyl-cellulose	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-methyl-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 ² O	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

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

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/16/2013	Head 1900	e'	38.8800	Relative Permittivity (ϵ_r):	38.88	40.00	-2.80	5
		e"	13.4500	Conductivity (σ):	1.42	1.40	1.50	5
	Head 1850	e'	39.0900	Relative Permittivity (ϵ_r):	39.09	40.00	-2.27	5
		e"	13.3200	Conductivity (σ):	1.37	1.40	-2.13	5
	Head 1910	e'	38.8500	Relative Permittivity (ϵ_r):	38.85	40.00	-2.88	5
		e"	13.4800	Conductivity (σ):	1.43	1.40	2.26	5
12/16/2013	Body 1900	e'	51.0500	Relative Permittivity (ϵ_r):	51.05	53.30	-4.22	5
		e"	14.5600	Conductivity (σ):	1.54	1.52	1.20	5
	Body 1850	e'	51.2100	Relative Permittivity (ϵ_r):	51.21	53.30	-3.92	5
		e"	14.4100	Conductivity (σ):	1.48	1.52	-2.48	5
	Body 1910	e'	51.0100	Relative Permittivity (ϵ_r):	51.01	53.30	-4.30	5
		e"	14.5900	Conductivity (σ):	1.55	1.52	1.94	5

SAR Room 2

SAR ROOM 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/19/2013	Head 5180	e'	37.1000	Relative Permittivity (ϵ_r):	37.10	36.01	3.02	5
		e"	15.4900	Conductivity (σ):	4.46	4.63	-3.65	5
	Head 5200	e'	37.0600	Relative Permittivity (ϵ_r):	37.06	35.99	2.97	5
		e"	15.5200	Conductivity (σ):	4.49	4.65	-3.52	5
	Head 5600	e'	36.5300	Relative Permittivity (ϵ_r):	36.53	35.53	2.80	5
		e"	15.7500	Conductivity (σ):	4.90	5.06	-3.08	5
	Head 5800	e'	36.2400	Relative Permittivity (ϵ_r):	36.24	35.30	2.66	5
		e"	15.8400	Conductivity (σ):	5.11	5.27	-3.07	5
	Head 5825	e'	36.2400	Relative Permittivity (ϵ_r):	36.24	35.30	2.66	5
		e"	15.8800	Conductivity (σ):	5.14	5.27	-2.40	5
12/19/2013	Body 5180	e'	47.3400	Relative Permittivity (ϵ_r):	47.34	49.05	-3.48	5
		e"	18.5400	Conductivity (σ):	5.34	5.27	1.30	5
	Body 5200	e'	47.2900	Relative Permittivity (ϵ_r):	47.29	49.02	-3.53	5
		e"	18.5600	Conductivity (σ):	5.37	5.29	1.35	5
	Body 5600	e'	46.6500	Relative Permittivity (ϵ_r):	46.65	48.48	-3.77	5
		e"	18.9600	Conductivity (σ):	5.90	5.76	2.48	5
	Body 5800	e'	46.2800	Relative Permittivity (ϵ_r):	46.28	48.20	-3.98	5
		e"	19.1100	Conductivity (σ):	6.16	6.00	2.72	5
	Body 5825	e'	46.2800	Relative Permittivity (ϵ_r):	46.28	48.20	-3.98	5
		e"	19.1700	Conductivity (σ):	6.21	6.00	3.48	5

Tissue Dielectric Parameter Check Results (continued)

SAR Room 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/22/2013	Body 5180	e'	47.7400	Relative Permittivity (ϵ_r):	47.74	49.05	-2.66	5
		e"	18.7300	Conductivity (σ):	5.39	5.27	2.34	5
	Body 5200	e'	47.6900	Relative Permittivity (ϵ_r):	47.69	49.02	-2.71	5
		e"	18.7300	Conductivity (σ):	5.42	5.29	2.28	5
	Body 5600	e'	47.0500	Relative Permittivity (ϵ_r):	47.05	48.48	-2.95	5
		e"	18.9800	Conductivity (σ):	5.91	5.76	2.59	5
	Body 5800	e'	46.7700	Relative Permittivity (ϵ_r):	46.77	48.20	-2.97	5
		e"	19.1600	Conductivity (σ):	6.18	6.00	2.98	5
	Body 5825	e'	46.7200	Relative Permittivity (ϵ_r):	46.72	48.20	-3.07	5
		e"	19.1900	Conductivity (σ):	6.22	6.00	3.59	5

SAR Room 3

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit \pm (%)
12/26/2013	Head 2450	e'	39.7800	Relative Permittivity (ϵ_r):	39.78	39.20	1.48	5
		e"	13.2600	Conductivity (σ):	1.81	1.80	0.35	5
	Head 2410	e'	39.9200	Relative Permittivity (ϵ_r):	39.92	39.28	1.63	5
		e"	13.0900	Conductivity (σ):	1.75	1.76	-0.36	5
	Head 2475	e'	39.6500	Relative Permittivity (ϵ_r):	39.65	39.17	1.23	5
		e"	13.2300	Conductivity (σ):	1.82	1.83	-0.35	5
12/26/2013	Body 2450	e'	51.5000	Relative Permittivity (ϵ_r):	51.50	52.70	-2.28	5
		e"	14.7500	Conductivity (σ):	2.01	1.95	3.04	5
	Body 2410	e'	51.7400	Relative Permittivity (ϵ_r):	51.74	52.76	-1.93	5
		e"	14.5500	Conductivity (σ):	1.95	1.91	2.22	5
	Body 2475	e'	51.1600	Relative Permittivity (ϵ_r):	51.16	52.67	-2.86	5
		e"	14.6900	Conductivity (σ):	2.02	1.99	1.84	5

SAR Room 4

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/20/2013	Head 750	e'	40.8300	Relative Permittivity (ϵ_r):	40.83	41.96	-2.70	5
		e"	21.5500	Conductivity (σ):	0.90	0.89	0.63	5
	Head 700	e'	41.5600	Relative Permittivity (ϵ_r):	41.56	42.22	-1.56	5
		e"	21.9700	Conductivity (σ):	0.86	0.89	-3.84	5
	Head 790	e'	40.3500	Relative Permittivity (ϵ_r):	40.35	41.76	-3.37	5
		e"	21.3400	Conductivity (σ):	0.94	0.90	4.60	5
12/20/2013	Body 750	e'	53.2400	Relative Permittivity (ϵ_r):	53.24	55.55	-4.15	5
		e"	23.3800	Conductivity (σ):	0.98	0.96	1.24	5
	Body 700	e'	53.8200	Relative Permittivity (ϵ_r):	53.82	55.74	-3.44	5
		e"	23.8200	Conductivity (σ):	0.93	0.96	-3.35	5
	Body 790	e'	52.8200	Relative Permittivity (ϵ_r):	52.82	55.39	-4.64	5
		e"	23.0400	Conductivity (σ):	1.01	0.97	4.75	5
12/21/2013	Head 835	e'	41.4000	Relative Permittivity (ϵ_r):	41.40	41.50	-0.24	5
		e"	19.7800	Conductivity (σ):	0.92	0.90	2.04	5
	Head 820	e'	41.5300	Relative Permittivity (ϵ_r):	41.53	41.60	-0.17	5
		e"	19.8300	Conductivity (σ):	0.90	0.90	0.63	5
	Head 850	e'	41.1600	Relative Permittivity (ϵ_r):	41.16	41.50	-0.82	5
		e"	19.6900	Conductivity (σ):	0.93	0.92	1.71	5
12/21/2013	Body 835	e'	55.2200	Relative Permittivity (ϵ_r):	55.22	55.20	0.04	5
		e"	21.8100	Conductivity (σ):	1.01	0.97	4.39	5
	Body 820	e'	55.3600	Relative Permittivity (ϵ_r):	55.36	55.28	0.15	5
		e"	21.9200	Conductivity (σ):	1.00	0.97	3.20	5
	Body 850	e'	55.0800	Relative Permittivity (ϵ_r):	55.08	55.16	-0.14	5
		e"	21.7300	Conductivity (σ):	1.03	0.99	4.04	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 ± 0.5 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm ± 0.5 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	1019	3/5/2013	700	1g	8.50	8.68
				10g	5.59	5.75
D835V2	4d117	5/28/2013	835	1g	9.54	9.4
				10g	6.21	6.16
D1900V2	5d163	9/17/2013	1900	1g	40.90	40.1
				10g	21.20	21.2
D2450V2	748	2/11/2013	2450	1g	52.9	49.9
				10g	24.6	23.2
D5GHzV2	1003	9/19/2013	5.2	1g	78.50	73.3
				10g	22.40	20.5
			5.5	1g	81.00	78.6
				10g	23.00	21.8
			5.8	1g	76.40	72.7
				10g	21.70	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 $\pm 10\%$	Est./Zoom Ratio	Plot No.
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W				
12/16/2013	D1900V2	5d163	Head	1g	4.44	4.35	43.50	40.90	6.36	1,2
				10g	2.33	2.24	22.40	21.20	5.66	
12/16/2013	D1900V2	5d163	Body	1g	4.09	4.03	40.30	40.10	0.50	1.47
				10g	2.07	2.10	21.00	21.20	-0.94	

SAR Room 2

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W				
12/19/2013	D5GHzV2 (5.2 GHz)	1003	Head	1g	7.78	8.34	83.40	78.50	6.24	3,4
				10g	2.15	2.37	23.70	22.40	5.80	
12/19/2013	D5GHzV2 (5.6 GHz)	1003	Head	1g	8.07	8.73	87.30	81.0	7.78	5,6
				10g	2.25	2.50	25.00	23.0	8.70	
12/19/2013	D5GHzV2 (5.8 GHz)	1003	Head	1g	7.08	7.76	77.60	76.40	1.57	7,8
				10g	1.98	2.24	22.40	21.70	3.23	
12/19/2013	D5GHzV2 (5.2 GHz)	1003	Body	1g	7.52	7.73	77.30	73.3	5.46	-2.79
				10g	2.12	2.18	21.80	20.5	6.34	
12/19/2013	D5GHzV2 (5.6 GHz)	1003	Body	1g	7.55	7.95	79.50	78.6	1.15	-5.30
				10g	2.11	2.22	22.20	21.8	1.83	
12/19/2013	D5GHzV2 (5.8 GHz)	1003	Body	1g	8.14	7.33	73.30	72.7	0.83	9.95
				10g	2.27	2.05	20.50	20.1	1.99	
12/22/2013	D5GHzV2 (5.2 GHz)	1003	Body	1g	7.07	7.24	72.40	73.3	-1.23	-2.40
				10g	2.08	1.97	19.70	20.5	-3.90	
12/22/2013	D5GHzV2 (5.6 GHz)	1003	Body	1g	8.85	8.11	81.10	78.6	3.18	8.36
				10g	2.47	2.26	22.60	21.8	3.67	
12/22/2013	D5GHzV2 (5.8 GHz)	1003	Body	1g	7.37	7.37	73.70	72.7	1.38	0.00
				10g	2.08	1.97	19.70	20.1	-1.99	

SAR Room 3

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W				
12/26/2013	D2450V2	748	Head	1g	5.24	5.20	52.00	52.9	-1.70	0.76
				10g	2.29	2.38	23.80	24.6	-3.25	
12/26/2013	D2450V2	748	Body	1g	5.02	4.95	49.50	49.9	-0.80	1.39
				10g	2.14	2.30	23.00	23.2	-0.86	

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				
12/20/2013	D750V3	1019	Head	1g	0.84	0.81	8.14	8.5	-4.24	3.55	11,12
				10g	0.57	0.53	5.30	5.6	-5.36		
12/20/2013	D750V3	1019	Body	1g	0.89	0.87	8.66	8.68	-0.23	2.91	
				10g	0.61	0.58	5.76	5.75	0.17		
12/21/2013	D835V2	4d117	Body	1g	0.965	0.942	9.42	9.54	-1.26	2.38	
				10g	0.65	0.616	6.16	6.21	-0.81		
12/21/2013	D835V2	4d117	Body	1g	0.985	0.985	9.85	9.4	4.79	0.00	13,14
				10g	0.663	0.65	6.50	6.16	5.52		

12. SAR Test Results

12.1. GSM1900

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Left Touch	Voice	0	661	1880.0	30.5	30.4	0.023	0.023	1
	Left Tilt		0	661	1880.0	30.5	30.4	0.014	0.014	
	Right Touch		0	661	1880.0	30.5	30.4	0.036	0.036	
	Righttt Tilt		0	661	1880.0	30.5	30.4	0.005	0.005	
Head VoIP	Left Touch	GPRS 3 Slots	0	661	1880.0	29.5	28.6	0.025	0.031	2
	Left Tilt		0	661	1880.0	29.5	28.6	0.026	0.031	
	Right Touch		0	661	1880.0	29.5	28.6	0.077	0.095	
	Righttt Tilt		0	661	1880.0	29.5	28.6	0.015	0.019	
Body & Hotspot	Rear	Voice	10	661	1880.0	30.5	30.4	0.065	0.066	3
	Front		10	661	1880.0	30.5	30.4	0.042	0.042	
Hotspot	Rear	GPRS 3 Slots	10	661	1880.0	29.5	28.6	0.137	0.168	4
	Front		10	661	1880.0	29.5	28.6	0.084	0.103	
	Edge 2		10	661	1880.0	29.5	28.6	0.071	0.087	
	Edge 3		10	661	1880.0	29.5	28.6	0.064	0.078	
	Edge 4		10	661	1880.0	29.5	28.6	0.010	0.012	

Note(s):

- 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
- With headset attached. According to KDB 648474 Section 2.3, 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.

12.2. W-CDMA Band V

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Left Touch	Rel 99 RMC	0	4183	836.6	23.5	23.5	0.290	0.291	5
	Left Tilt	Rel 99 RMC	0	4183	836.6	23.5	23.5	0.170	0.170	
	Right Touch	Rel 99 RMC	0	4183	836.6	23.5	23.5	0.291	0.292	
	Righttt Tilt	Rel 99 RMC	0	4183	836.6	23.5	23.5	0.194	0.194	
Body & Hotspot	Rear	Rel 99 RMC	10	4183	836.6	23.5	23.5	0.400	0.401	6
	Front	Rel 99 RMC	10	4183	836.6	23.5	23.5	0.367	0.368	
Hotspot	Edge 2	Rel 99 RMC	10	4183	836.6	23.5	23.5	0.294	0.295	
	Edge 3	Rel 99 RMC	10	4183	836.6	23.5	23.5	0.036	0.036	
	Edge 4	Rel 99 RMC	10	4183	836.6	23.5	23.5	0.280	0.281	

Note(s):

- 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
- With headset attached. According to KDB 648474 Section 2.3, 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.

12.3. W-CDMA Band II

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Left Touch	Rel 99 RMC	0	9400	1880.0	23.5	23.5	0.042	0.042	
	Left Tilt	Rel 99 RMC	0	9400	1880.0	23.5	23.5	0.021	0.022	
	Right Touch	Rel 99 RMC	0	9400	1880.0	23.5	23.5	0.076	0.077	7
	Righttt Tilt	Rel 99 RMC	0	9400	1880.0	23.5	23.5	0.017	0.017	
Body & Hotspot	Rear	Rel 99 RMC	10	9400	1880.0	23.5	23.5	0.100	0.101	8
	Front	Rel 99 RMC	10	9400	1880.0	23.5	23.5	0.073	0.074	
Hotspot	Edge 2	Rel 99 RMC	10	9400	1880.0	23.5	23.5	0.059	0.060	
	Edge 3	Rel 99 RMC	10	9400	1880.0	23.5	23.5	0.051	0.051	
	Edge 4	Rel 99 RMC	10	9400	1880.0	23.5	23.5	0.007	0.007	

Note(s):

- 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
- With headset attached. According to KDB 648474 Section 2.3, 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.

12.4. LTE Band 5 (BW=10 MHz)

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	Left Touch	QPSK	0	20525	836.6	1	0	24.0	23.3	0.134	0.159	9
						25	24	23.0	22.3	0.112	0.131	
	Left Tilt	QPSK	0	20525	836.6	1	0	24.0	23.3	0.080	0.095	
						25	24	23.0	22.3	0.076	0.089	
	Right Touch	QPSK	0	20525	836.6	1	0	24.0	23.3	0.133	0.157	
						25	24	23.0	22.3	0.124	0.145	
	Right Tilt	QPSK	0	20525	836.6	1	0	24.0	23.3	0.088	0.104	
						25	24	23.0	22.3	0.083	0.097	
Body & Hotspot	Rear	QPSK	10	20525	836.6	1	0	24.0	23.3	0.253	0.299	10
						25	24	23.0	22.3	0.246	0.288	
	Front	QPSK	10	20525	836.6	1	0	24.0	23.3	0.188	0.222	
						25	24	23.0	22.3	0.170	0.199	
Hotspot	Edge 2	QPSK	10	20525	836.6	1	0	24.0	23.3	0.152	0.180	
						25	24	23.0	22.3	0.146	0.171	
	Edge 3	QPSK	10	20525	836.6	1	0	24.0	23.3	0.021	0.025	
						25	24	23.0	22.3	0.019	0.022	
	Edge 4	QPSK	10	20525	836.6	1	0	24.0	23.3	0.108	0.128	
						25	24	23.0	22.3	0.100	0.117	

Note(s):

- 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
- Per KDB 941225 D05 SAR for LTE Devices, SAR test reduction is applied using the following criteria:
 - Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
 - When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
 - Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
 - Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
 - Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

12.5. LTE Band 17 (BW=10 MHz)

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	Left Touch	QPSK	0	20379	710.0	1	0	24.0	23.3	0.041	0.049	11
						25	0	23.0	22.3	0.029	0.034	
	Left Tilt	QPSK	0	20379	710.0	1	0	24.0	23.3	0.028	0.033	
						25	0	23.0	22.3	0.020	0.023	
	Right Touch	QPSK	0	20379	710.0	1	0	24.0	23.3	0.040	0.047	
						25	0	23.0	22.3	0.032	0.038	
	Right Tilt	QPSK	0	20379	710.0	1	0	24.0	23.3	0.027	0.032	
						25	0	23.0	22.3	0.020	0.024	
Body & Hotspot	Rear	QPSK	10	20379	710.0	1	0	24.0	23.3	0.109	0.129	12
						25	0	23.0	22.3	0.091	0.107	
	Front	QPSK	10	20379	710.0	1	0	24.0	23.3	0.064	0.076	
						25	0	23.0	22.3	0.053	0.062	
Hotspot	Edge 2	QPSK	10	20379	710.0	1	0	24.0	23.3	0.088	0.104	
						25	0	23.0	22.3	0.077	0.091	
	Edge 3	QPSK	10	20379	710.0	1	0	24.0	23.3	0.007	0.008	
						25	0	23.0	22.3	0.006	0.006	
	Edge 4	QPSK	10	20379	710.0	1	0	24.0	23.3	0.074	0.087	
						25	0	23.0	22.3	0.064	0.076	

Note(s):

- 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
- Per KDB 941225 D05 SAR for LTE Devices, SAR test reduction is applied using the following criteria:
 - Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
 - When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
 - Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
 - Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
 - Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

12.6. Wi-Fi (DTS Band)

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Left Touch	802.11b	0	1	2412	16.5	16.4	0.856	0.884	13
				6	2437	16.5	16.5	0.908	0.908	
				11	2462	16.5	16.4	0.866	0.886	
	Left Tilt	802.11b	0	6	2437	16.5	16.5	0.487	0.487	
	Right Touch	802.11b	0	6	2437	16.5	16.5	0.314	0.314	
	Righttt Tilt	802.11b	0	6	2437	16.5	16.5	0.421	0.421	
Body & Hotspot	Rear	802.11b	10	6	2437	16.5	16.5	0.111	0.111	
	Front	802.11b	10	6	2437	16.5	16.5	0.142	0.142	14
Hotspot	Edge 1	802.11b	10	6	2437	16.5	16.5	0.110	0.110	
	Edge 2	802.11b	10	6	2437	16.5	16.5	0.128	0.128	
RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Left Touch	802.11a	0	149	5745	12.5	11.7	0.049	0.059	
Head	Left Tilt	802.11a	0	149	5745	12.5	11.7	0.029	0.035	
Head	Right Touch	802.11a	0	149	5745	12.5	11.7	0.055	0.066	
Head	Right Tilt	802.11a	0	149	5745	12.5	11.7	0.060	0.072	15
Body & Hotspot	Rear	802.11a	10	149	5745	12.5	11.7	0.042	0.050	16
Body & Hotspot	Front	802.11a	10	149	5745	12.5	11.7	0.009	0.011	
Hotspot	Edge 1	802.11a	10	149	5745	12.5	11.7	0.010	0.012	
Hotspot	Edge 2	802.11a	10	149	5745	12.5	11.7	0.020	0.024	

802.11ac Mode

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Righttt Tilt	802.11ac	0	149	5745	10.5	9.7	0.023	0.027	
Body & Hotspot	Rear	802.11ac	10	149	5745	10.5	9.7	0.022	0.027	
Hotspot	Edge 2	802.11ac	10	149	5745	10.5	9.7	0.018	0.022	

Note(s):

- 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
- 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 according to April 2013 TCB Workshop Updates.

12.7. Wi-Fi (UNII Band)

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Left Touch	802.11a	0	36	5180	12.5	12.0	0.016	0.018	
				56	5260	12.5	12.2	0.026	0.028	
				104	5520	12.5	11.7	0.034	0.041	
Head	Left Tilt	802.11a	0	36	5180	12.5	12.0	0.011	0.013	
				56	5260	12.5	12.2	0.017	0.018	
				104	5520	12.5	11.7	0.020	0.024	
Head	Right Touch	802.11a	0	36	5180	12.5	12.0	0.025	0.028	17
				56	5260	12.5	12.2	0.034	0.037	18
				104	5520	12.5	11.7	0.053	0.064	19
Head	Right Tilt	802.11a	0	36	5180	12.5	12.0	0.018	0.020	
				56	5260	12.5	12.2	0.030	0.032	
				104	5520	12.5	11.7	0.049	0.059	
Body	Rear	802.11a	10	36	5180	12.5	12.0	0.017	0.019	20
				56	5260	12.5	12.2	0.021	0.023	21
				104	5520	12.5	11.7	0.025	0.030	22
Body	Front	802.11a	10	36	5180	12.5	12.0	0.000	0.000	
				56	5260	12.5	12.2	0.002	0.003	
				104	5520	12.5	11.7	0.000	0.001	

802.11ac Mode

RF Exposure Conditions	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Right Touch	802.11ac	0	36	5180	10.5	10.0	0.007	0.008	
			0	56	5260	10.5	9.9	0.015	0.017	
			0	104	5520	10.5	9.9	0.017	0.019	
Body	Rear	802.11ac	10	36	5180	10.5	9.8	0.014	0.017	
			10	56	5260	10.5	9.8	0.018	0.022	
			10	104	5520	10.5	9.7	0.024	0.029	

Note(s):

- 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
- 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 according to April 2013 TCB Workshop Updates.

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)			
9.0	8	10	2.480	1.3

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	8	10	2.480	0.168

13. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01r01. 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/WiFi Direct (W/kg)
750	LTE Band 17		0.109	
850	WCDMA Band V		0.400	
	LTE Band 5		0.253	
1900	GSM 1900			0.137
	WCDMA Band II		0.100	
2400	WiFi 802.11b/g/n	0.908		
5200	WiFi 802.11a/n/ac		0.025	
5300	WiFi 802.11a/n/ac		0.034	
5500	WiFi 802.11a/n/ac		0.053	
5800	WiFi 802.11a/n/ac		0.060	

13.2. Repeated Measurement Results

Head Exposure Condition

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
WiFi 2.4 GHz	Left Touch	802.11b	6	2437.0	0.908	0.899	1.01	1

Body-worn Accessory Exposure Condition

Not Applicable.

Hotspot Mode Exposure Conditions

Not Applicable.

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 v05, 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 measured 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 measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2]$

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

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

14.1. Sum of the SAR for GSM1900 & WiFi & BT

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		GSM 1900	WiFi DTS Band	WiFi UNII Band	Bluetooth		
Head	Left Touch	0.031	0.908			0.939	No
		0.031		0.041		0.072	No
	Left Tilt	0.031	0.487			0.518	No
		0.031		0.024		0.055	No
	Right Touch	0.095	0.314			0.409	No
		0.095		0.063		0.158	No
Body-worn Accessory & Hotspot	Rear	0.019	0.421			0.440	No
		0.019		0.059		0.078	No
		0.168	0.111			0.279	No
	Front	0.168		0.030		0.198	No
		0.168			0.168	0.336	No
		0.103	0.142			0.245	No
Hotspot	Edge 1	0.103		0.003		0.106	No
		0.103			0.168	0.271	No
		0.012	0			0.012	No
	Edge 2	0	0.110			0.110	No
Hotspot	Edge 3	0.087	0.128			0.215	No
	Edge 4	0.078	0			0.078	No
	Edge 5	0.012	0			0.012	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 & WiFi & BT

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		WCDMA Band V	WiFi DTS Band	WiFi UNII Band	Bluetooth		
Head	Left Touch	0.291	0.908			1.199	No
		0.291		0.041		0.332	No
	Left Tilt	0.170	0.487			0.657	No
		0.170		0.024		0.194	No
	Right Touch	0.292	0.314			0.606	No
		0.292		0.063		0.355	No
Body-worn Accessory & Hotspot	Rear	0.194	0.421			0.615	No
		0.194		0.059		0.253	No
		0.401	0.111			0.512	No
	Front	0.401		0.030		0.431	No
		0.401			0.168	0.569	No
		0.368	0.142			0.510	No
Hotspot	Edge 1	0.368		0.003		0.371	No
		0.368			0.168	0.536	No
		0	0.110			0.110	No
	Edge 2	0.295	0.128			0.423	No
Hotspot	Edge 3	0.036	0			0.036	No
	Edge 4	0.281	0			0.281	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 & WiFi & BT

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		WCDMA Band II	WiFi DTS Band	WiFi UNII Band	Bluetooth		
Head	Left Touch	0.042	0.908			0.950	No
		0.042		0.041		0.083	No
	Left Tilt	0.022	0.487			0.509	No
		0.022		0.024		0.046	No
	Right Touch	0.077	0.314			0.391	No
		0.077		0.063		0.140	No
	Right Tilt	0.017	0.421			0.438	No
		0.017		0.059		0.076	No
Body-worn Accessory & Hotspot	Rear	0.101	0.111			0.212	No
		0.101		0.030		0.131	No
		0.101			0.168	0.269	No
	Front	0.074	0.142			0.216	No
		0.074		0.003		0.077	No
		0.074			0.168	0.242	No
Hotspot	Edge 1	0	0.110			0.110	No
	Edge 2	0.060	0.128			0.188	No
	Edge 3	0.051	0			0.051	No
	Edge 4	0.007	0			0.007	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 & WiFi & BT

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		LTE Band 5	WiFi DTS Band	WiFi UNII Band	Bluetooth		
Head	Left Touch	0.159	0.908			1.067	No
		0.159		0.041		0.200	No
	Left Tilt	0.095	0.487			0.582	No
		0.095		0.024		0.119	No
	Right Touch	0.157	0.314			0.471	No
		0.157		0.063		0.220	No
	Right Tilt	0.104	0.421			0.525	No
		0.104		0.059		0.163	No
Body-worn Accessory & Hotspot	Rear	0.299	0.111			0.410	No
		0.299		0.030		0.329	No
		0.299			0.168	0.467	No
	Front	0.222	0.142			0.364	No
		0.222		0.003		0.225	No
		0.222			0.168	0.390	No
Hotspot	Edge 1	0	0.110			0.110	No
	Edge 2	0.180	0.128			0.308	No
	Edge 3	0.025	0			0.025	No
	Edge 4	0.128	0			0.128	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 & WiFi & BT

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		LTE Band 17	WiFi DTS Band	WiFi UNII Band	Bluetooth		
Head	Left Touch	0.049	0.908			0.957	No
		0.049		0.041		0.090	No
	Left Tilt	0.033	0.487			0.520	No
		0.033		0.024		0.057	No
	Right Touch	0.047	0.314			0.361	No
		0.047		0.063		0.110	No
	Right Tilt	0.038	0.421			0.459	No
		0.038		0.059		0.097	No
Body-worn Accessory & Hotspot	Rear	0.129	0.111			0.240	No
		0.129		0.030		0.159	No
		0.129			0.168	0.297	No
	Front	0.076	0.142			0.218	No
		0.076		0.003		0.079	No
		0.076			0.168	0.244	No
Hotspot	Edge 1	0	0.110			0.110	No
	Edge 2	0.104	0.128			0.232	No
	Edge 3	0.008	0			0.008	No
	Edge 4	0.087	0			0.087	No

SAR to Peak Location Separation Ratio (SPLSR)

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

15. Appendixes

Refer to separated files for the following appendixes.

- 15.1. Photos and Antenna Locations**
- 15.2. System Performance Check Plots**
- 15.3. Highest SAR Test Plots**
- 15.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3929**
- 15.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3773**
- 15.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3902**
- 15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3936**
- 15.8. Calibration Certificate for D750V3 - SN 1019**
- 15.9. Calibration Certificate for D835V2 - SN 4d117**
- 15.10. Calibration Certificate for D1900V2- SN 5d163**
- 15.11. Calibration Certificate for D2450V2 - SN 748**
- 15.12. Calibration Certificate for D5GHzV2 - SN 1003**

END OF REPORT