



## **SAR EVALUATION REPORT**

**(Class II Permissive Change)**

**FCC 47 CFR § 2.1093  
IEEE Std 1528-2013**

*For*

**GSM/WCDMA/LTE Phone + Bluetooth, WLAN 2.4GHz b/g/n & NFC**

**Model: SM-G530M  
FCC ID: A3LSMG530M**

**Report Number: 14I19179-S1A  
Issue Date: 10/30/2014**

*Prepared for*

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NVLAP LAB CODE 200065-0

## REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	10/23/2014	Initial Issue	--
A	10/30/2014	Section 1 – modified summary table to clarify sources of test results. Section 7.4 – Expanded test rationale.	Dave Weaver

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### 1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO. LTD.		
Application Purpose	<input type="checkbox"/> Original Grant <input checked="" type="checkbox"/> Class II Permissive Change		
FCC ID	A3LSMG530M		
DUT Description	GSM/WCDMA/LTE Phone + Bluetooth, WLAN 2.4GHz b/g/n & NFC		
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)		
The Highest Reported SAR	RF Exposure Conditions	Equipment Class	
		Licensed	DTS
	Head	0.326 W/kg	NA W/kg
	Body-worn Accessory	0.732 W/kg	NA W/kg
	Wireless Router (Hotspot)		
Wi-Fi Direct	N/A	N/A	
Simultaneous Transmission	Head: 0.452 W/kg Body: 0.875 W/kg		
Note	The proposed CIIPC to add LTE bands is via software and does not affect previously reported values for other modes. The SAR measurement results from the original filing can be found in SAR test report 14118800-S1. This report contains the SAR values for the new LTE bands. The highest SAR Values for the new LTE Bands do not surpass the previously reported highest SAR values in the original test report. Therefore, the highest SAR values remain unaffected by this change. The summary results below are the highest overall values from the original report.		
The Highest Reported SAR from original report - 14118800-S1	RF Exposure Conditions	Equipment Class	
		Licensed	DTS
	Head	0.402 W/kg	0.238 W/kg
	Body-worn Accessory	1.017 W/kg	0.310 W/kg
	Wireless Router (Hotspot)		
Wi-Fi Direct	N/A	N/A	
Simultaneous Transmission	Head: 0.528 W/kg Body: 1.095 W/kg		
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013		
Test Results	Pass		
Date tested	10/20/2014 – 10/21/2014		
<p>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.</p> <p><b>Note:</b> 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.</p>			
Approved & Released By:	Prepared By:		
			
Dave Weaver Program Manager UL Verification Services Inc.	Coltyce Sanders Laboratory Engineer UL Verification Services Inc.		

## 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2003 & 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

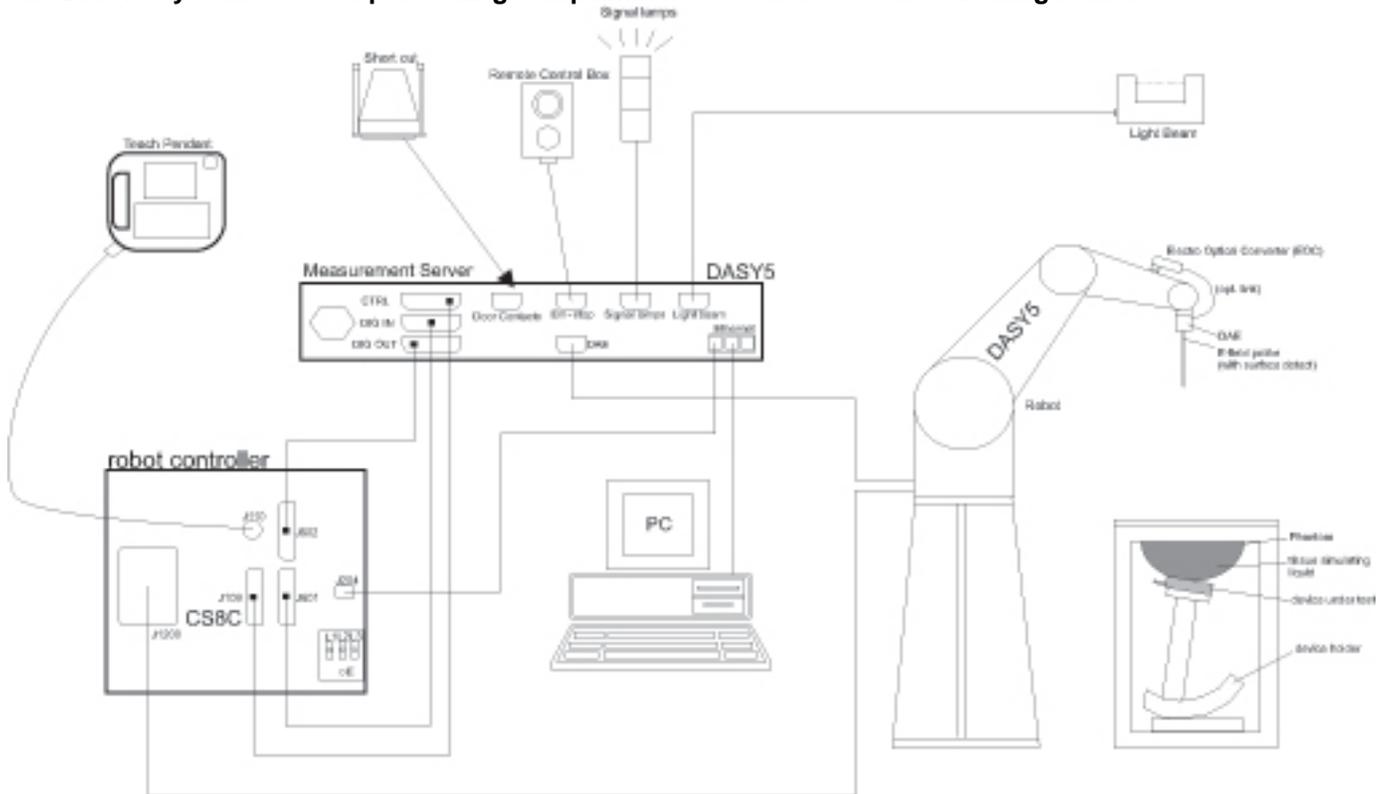
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 4. SAR Measurement System & Test Equipment

### 4.1. SAR Measurement System

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



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

## 4.2. SAR Scan 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

	$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1$ 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: $\Delta x_{Area}$ , $\Delta y_{Area}$	$\leq 2$ GHz: $\leq 15$ mm $2 - 3$ GHz: $\leq 12$ mm	$3 - 4$ GHz: $\leq 12$ mm $4 - 6$ GHz: $\leq 10$ 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

		$\leq 3$ GHz	$> 3$ GHz	
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$		$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm *	3 – 4 GHz: $\leq 5$ mm * 4 – 6 GHz: $\leq 4$ mm *	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$	$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm	
	graded grid	$\Delta z_{\text{Zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ 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	$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm	
Note: $\delta$ 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 <i>1-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ 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.

### 4.3. Test Equipment

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

#### Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E753ES	MY40000980	4/7/2015
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	10/8/2015
Thermometer	EXTECH	445703	CCS-200	3/24/2015

#### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	HP	437B	3125U11347	8/27/2015
Power Meter	HP	437B	3125U16345	6/16/2015
Power Sensor	HP	8481A	1926A16917	10/10/2015
Power Sensor	HP	8481A	2702A60780	6/16/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	Sorensen Ametek	XT20-3	1318A00530	N/A
Synthesized Signal Generator	Agilent	8665B	3438A00633	8/29/2015
Power Meter	Agilent	N191A	MY53060016	8/7/2015
Power Sensor	Agilent	E9323A	MY53070003	5/1/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 2)	SPEAG	EX3DV3	3531	11/21/2014
E-Field Probe (SAR 4)	SPEAG	EX3DV4	3929	5/9/2015
Data Acquisition Electronics (SAR 2)	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics (SAR 4)	SPEAG	DAE4	1377	8/27/2015
System Validation Dipole	SPEAG	D750V3	1071	11/15/2014
System Validation Dipole	SPEAG	D1750V2	1050	4/22/2015
Thermometer (SAR Lab 2)	EXTECH	445703	CCS-203	3/28/2015
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/3/2015

#### Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53040015	7/10/2015
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015
Base Station Simulator	R & S	CMW500	125236-es	5/29/2015
Base Station Simulator	R & S	CMW500	309027305-A2LA	7/14/2015

## 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is  $< 1.5$  W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2003 & 2013 is not required in SAR reports submitted for equipment approval.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

Model: SM-G530M	
Device Dimension	Overall (Length x Width): 144 mm x 72 mm Overall Diagonal: 155 mm Display Diagonal: 128 mm
Battery Back Cover	<input checked="" type="checkbox"/> Normal Battery Cover <input type="checkbox"/> Normal Battery Cover with NFC <input type="checkbox"/> Wireless Charger Battery Cover <input type="checkbox"/> Wireless Charger Battery Cover with NFC.
Battery Options	<input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 3.8Vdc, 9.88Wh <input type="checkbox"/> Extended (large capacity)
Accessory	Headset
Wireless Router (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) <input type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz)
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) <input type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz)
SIM Information	<input checked="" type="checkbox"/> Single SIM <input type="checkbox"/> Dual SIM

### 6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
GSM	850 /1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GSM Voice: 12.5%; GPRS/EGPRS: 1 Slot: 12.5%; 2 Slots: 25%, 3 Slots: 37.5%, 4 Slots: 50%,
	GPRS Multi-Slot Class: <input type="checkbox"/> Class 8 - One Up <input type="checkbox"/> Class 10 - Two Up <input type="checkbox"/> Class 12 - Four Up <input checked="" type="checkbox"/> Class 33 - Four Up DTM (Dual Transfer Mode): Not supported		
W-CDMA (UMTS)	Band V / II	UMTS Rel. 99 (Voice & Data) HSDPA HSUPA DC-HSDPA	100%
LTE (FDD)	Band 2 / 4 / 5 / 17	QPSK, 16QAM	100%
	Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	32.25% (DH1), 66.68% (DH3), 77.52% (DH5)

### 6.3. Nominal and Maximum Output Power

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
LTE Band 4	QPSK	22.5	<b>23.0</b>
LTE Band 17	QPSK	22.0	<b>22.5</b>

## 6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	<ol style="list-style-type: none"> <li>1. GSM 850/1900 Voice + Wi-Fi 2.4GHz</li> <li>2. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4GHz</li> <li>3. WCDMA Band 2/5 + Wi-Fi 2.4GHz</li> <li>4. LTE B2/4/5/17 + Wi-Fi 2.4GHz</li> </ol>
Body-worn Accessory	<ol style="list-style-type: none"> <li>1. GSM 850/1900 Voice + Wi-Fi 2.4GHz</li> <li>2. GSM 850/1900 Voice + BT</li> <li>3. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4GHz</li> <li>4. GSM 850/1900 (GPRS/EDGE) + BT</li> <li>5. WCDMA Band 2/5 + Wi-Fi 2.4GHz</li> <li>6. WCDMA Band 2/5 + BT</li> <li>7. LTE B2/4/5/17 + Wi-Fi 2.4GHz</li> <li>8. LTE B2/4/5/17 + BT</li> </ol>
Wireless Router (Hotspot)	<ol style="list-style-type: none"> <li>1. GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4GHz</li> <li>2. WCDMA Band 2/5 + Wi-Fi 2.4GHz</li> <li>3. LTE B2/4/5/17 + Wi-Fi 2.4GHz</li> </ol>
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. Wi-Fi supports Hotspot and Wi-Fi direct.</li> <li>2. GPRS/EDGE, WCDMA and LTE support Hotspot.</li> <li>3. VoIP is supported in LTE, WCDMA and GPRS.</li> <li>4. Wi-Fi Radio cannot transmit simultaneously with Bluetooth Radio.</li> </ol>	

### 6.5. General LTE SAR Test and Reporting Considerations

Item	Description																																						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 4	Frequency range: 1710 - 1755 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low	20050/ 1720	20025/ 1717.5	20000/ 1715	19975/ 1712.5	19965/ 1711.5	19957/ 1710.7																																
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5																																
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5	20385/ 1753.5	20393/ 1754.3																																
	Band 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 antenna and one (1) Diversity antenna Refer to Appendix 14.1. Photos and Antenna Locations.																																						
Maximum power reduction (MPR)	<p align="center"><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</b></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>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 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>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 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.																																						

## 7. RF Exposure Conditions (Test Configurations)

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

### 7.1. Head

#### 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	

### 7.2. Body-worn Accessory

#### For WWAN and LTE

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

#### For Wi-Fi

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

### 7.3. Wireless Router (Hotspot)

#### For WWAN and LTE

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	125 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)	13 mm	Yes	
Edge 3 (Bottom)	2 mm	Yes	
Edge 4 (Left)	2 mm	Yes	

#### For Wi-Fi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	25 mm	Yes	
Edge 2 (Right)	65 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 3 (Bottom)	105 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 4 (Left)	2 mm	Yes	

## 7.4. Test Rationale

SM-G530M was previously tested for all wireless technologies and bands except LTE Bands 4 and 17. The results for these tests are in SAR report 14I18800-S1. LTE bands 4 and 17 have subsequently been added to SM-G530M through a software change. This report contains test results for LTE bands 4 and 17 only. The Wi-Fi and BT results from 14I18800-S1 have been used in this report for simultaneous transmission analysis.

## 8. Conducted Output Power Measurements

### 8.1. LTE Bands 4 and 17

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 Signaling 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
				> 40	≤ 1
				> 55	≤ 2
NS_09	6.6.3.3.4	21	10, 15		
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 <sup>1</sup>	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 4 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0	0	22.4	22.5	22.6
			1	49	0	0	22.3	22.6	22.7
			1	99	0	0	22.5	22.7	22.5
			50	0	1	1	21.2	21.3	21.5
			50	24	1	1	21.2	21.4	21.5
			50	50	1	1	21.2	21.4	21.4
			100	0	1	1	21.3	21.4	21.5
		16QAM	1	0	1	1	21.5	21.5	21.8
			1	49	1	1	21.5	21.7	21.8
			1	99	1	1	21.5	21.7	21.8
			50	0	2	2	20.3	20.3	20.5
			50	24	2	2	20.3	20.4	20.4
			50	50	2	2	20.2	20.5	20.4
			100	0	2	2	20.3	20.3	20.4
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	0	22.4	22.5	22.6
			1	37	0	0	22.3	22.6	22.6
			1	74	0	0	22.4	22.7	22.4
			36	0	1	1	21.2	21.3	21.5
			36	20	1	1	21.2	21.4	21.5
			36	39	1	1	21.3	21.5	21.5
			75	0	1	1	21.1	21.5	21.4
		16QAM	1	0	1	1	21.6	21.5	21.3
			1	37	1	1	21.5	21.5	21.3
			1	74	1	1	21.6	21.6	21.1
			36	0	2	2	20.3	20.3	20.6
			36	20	2	2	20.3	20.4	20.4
			36	39	2	2	20.3	20.4	20.5
			75	0	2	2	20.2	20.3	20.4
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	0	22.3	22.5	22.6
			1	25	0	0	22.3	22.6	22.5
			1	49	0	0	22.4	22.6	22.5
			25	0	1	1	21.3	21.5	21.5
			25	12	1	1	21.3	21.5	21.6
			25	25	1	1	21.4	21.5	21.5
			50	0	1	1	21.2	21.4	21.5
		16QAM	1	0	1	1	21.0	21.6	21.2
			1	25	1	1	20.9	21.7	21.2
			1	49	1	1	21.0	21.8	21.0
			25	0	2	2	20.3	20.5	20.6
			25	12	2	2	20.4	20.5	20.7
			25	25	2	2	20.4	20.6	20.6
			50	0	2	2	20.4	20.3	20.6

**LTE Band 4 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	0	22.3	22.6	22.6
			1	12	0	0	22.3	22.6	22.5
			1	24	0	0	22.3	22.7	22.5
			12	0	1	1	21.5	21.5	21.6
			12	7	1	1	21.4	21.5	21.6
			12	13	1	1	21.4	21.6	21.6
			25	0	1	1	21.3	21.5	21.6
		16QAM	1	0	1	1	20.9	21.7	21.2
			1	12	1	1	20.8	21.7	21.1
			1	24	1	1	20.8	21.7	21.1
			12	0	2	2	20.4	20.6	20.7
			12	7	2	2	20.4	20.6	20.6
			12	13	2	2	20.4	20.7	20.6
			25	0	2	2	20.3	20.5	20.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	0	22.3	22.6	22.6
			1	8	0	0	22.3	22.7	22.5
			1	14	0	0	22.3	22.7	22.5
			8	0	1	1	21.4	21.6	21.6
			8	4	1	1	21.3	21.6	21.5
			8	7	1	1	21.4	21.6	21.5
			15	0	1	1	21.3	21.6	21.6
		16QAM	1	0	1	1	21.0	21.7	21.2
			1	8	1	1	20.9	21.8	21.1
			1	14	1	1	20.9	21.8	21.0
			8	0	2	2	20.5	20.6	20.6
			8	4	2	2	20.4	20.5	20.5
			8	7	2	2	20.4	20.5	20.6
			15	0	2	2	20.4	20.6	20.5
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	0	22.5	22.6	22.6
			1	3	0	0	22.3	22.5	22.6
			1	5	0	0	22.4	22.6	22.5
			3	0	0	0	22.3	22.6	22.6
			3	1	0	0	22.4	22.6	22.5
			3	3	0	0	22.4	22.6	22.6
			6	0	1	1	21.5	21.6	21.6
		16QAM	1	0	1	1	21.2	21.1	21.5
			1	3	1	1	21.2	21.1	21.4
			1	5	1	1	21.3	21.1	21.4
			3	0	1	1	21.3	21.7	21.5
			3	1	1	1	21.3	21.7	21.5
			3	3	1	1	21.5	21.7	21.5
			6	0	2	2	20.5	20.7	20.6

**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	22.0
			1	25	0	0	22.0
			1	49	0	0	22.0
			25	0	1	1	20.9
			25	12	1	1	21.0
			25	25	1	1	21.1
			50	0	1	1	21.0
		16QAM	1	0	1	2	20.5
			1	25	1	1	20.6
			1	49	1	2	20.5
			25	0	2	2	20.0
			25	12	2	2	20.0
			25	25	2	2	20.1
			50	0	2	2	20.0
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	22.1
			1	12	0	0	22.0
			1	24	0	0	22.0
			12	0	1	1	21.0
			12	6	1	1	21.0
			12	11	1	1	21.0
			25	0	1	1	21.0
		16QAM	1	0	1	2	20.5
			1	12	1	2	20.5
			1	24	1	2	20.5
			12	0	2	2	20.0
			12	6	2	2	20.0
			12	11	2	2	20.0
			25	0	2	2	20.1

**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. Dielectric Property Measurements

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.

### 9.1. Tissue Dielectric Parameters

#### FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

#### IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

## 9.2. Dielectric Property Measurements 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 Lab 2

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit $\pm$ (%)	
10/20/2014	Head 750	e'	40.6700	Relative Permittivity ( $\epsilon_r$ ):	40.67	41.96	-3.08	5
		e"	21.9000	Conductivity ( $\sigma$ ):	0.91	0.89	2.26	5
	Head 700	e'	41.4100	Relative Permittivity ( $\epsilon_r$ ):	41.41	42.22	-1.91	5
		e"	22.3500	Conductivity ( $\sigma$ ):	0.87	0.89	-2.17	5
	Head 725	e'	40.9400	Relative Permittivity ( $\epsilon_r$ ):	40.94	42.09	-2.73	5
		e"	22.0100	Conductivity ( $\sigma$ ):	0.89	0.89	-0.44	5
10/20/2014	Body 750	e'	53.5500	Relative Permittivity ( $\epsilon_r$ ):	53.55	55.55	-3.59	5
		e"	23.2600	Conductivity ( $\sigma$ ):	0.97	0.96	0.72	5
	Body 700	e'	54.1400	Relative Permittivity ( $\epsilon_r$ ):	54.14	55.74	-2.87	5
		e"	23.5700	Conductivity ( $\sigma$ ):	0.92	0.96	-4.36	5
	Body 725	e'	53.8900	Relative Permittivity ( $\epsilon_r$ ):	53.89	55.64	-3.15	5
		e"	23.4100	Conductivity ( $\sigma$ ):	0.94	0.96	-1.81	5

### SAR Lab 4

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit $\pm$ (%)	
10/20/2014	Head 1750	e'	39.4400	Relative Permittivity ( $\epsilon_r$ ):	39.44	40.08	-1.61	5
		e"	14.4600	Conductivity ( $\sigma$ ):	1.41	1.37	2.78	5
	Head 1710	e'	39.5600	Relative Permittivity ( $\epsilon_r$ ):	39.56	40.15	-1.46	5
		e"	14.3600	Conductivity ( $\sigma$ ):	1.37	1.35	1.41	5
	Head 1755	e'	39.4200	Relative Permittivity ( $\epsilon_r$ ):	39.42	40.08	-1.64	5
		e"	14.4700	Conductivity ( $\sigma$ ):	1.41	1.37	2.93	5
10/20/2014	Body 1750	e'	50.9600	Relative Permittivity ( $\epsilon_r$ ):	50.96	53.44	-4.64	5
		e"	15.9100	Conductivity ( $\sigma$ ):	1.55	1.49	4.17	5
	Body 1710	e'	51.0900	Relative Permittivity ( $\epsilon_r$ ):	51.09	53.54	-4.58	5
		e"	15.8000	Conductivity ( $\sigma$ ):	1.50	1.46	2.79	5
	Body 1755	e'	50.9300	Relative Permittivity ( $\epsilon_r$ ):	50.93	53.43	-4.68	5
		e"	15.9100	Conductivity ( $\sigma$ ):	1.55	1.49	4.25	5

## 10. System Check

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

### 10.1. Reference Target SAR Values

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 (W/kg)		
				1g/10g	Head	Body
D750V3	1071	11/15/2013	750	1g	8.46	8.64
				10g	5.51	5.72
D1750V2	1050	4/22/2014	1750	1g	36.6	37.2
				10g	19.4	20.0

### 10.2. System Check Results

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

#### SAR Lab 2

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.
	Type	Serial #		Zoom Scan	Normalize to 1 W			
10/20/2014	D750V3	1071	Head	1g	0.829	8.3	8.46	-2.01
				10g	0.565	5.7	5.51	2.54
10/20/2014	D750V3	1071	Body	1g	0.835	8.4	8.64	-3.36
				10g	0.581	5.8	5.72	1.57

#### SAR Lab 4

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.
	Type	Serial #		Zoom Scan	Normalize to 1 W			
10/20/2014	D1750V2	1050	Head	1g	3.78	37.8	36.60	3.28
				10g	2.00	20.0	19.40	3.09
10/20/2014	D1750V2	1050	Body	1g	4.01	40.1	37.20	7.80
				10g	2.13	21.3	20.00	6.50

## 11. Measured and Reported (Scaled) SAR 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:

- $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
- $\leq 0.6$  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
- $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  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):**

Each channel should be tested at the lowest data rate in each a-b/g mode or 4.9 GHz channel BW configuration.

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

### 11.1. LTE Band 4 (20MHz 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	20175	1732.5	1	99	23.0	22.7	0.304	<b>0.326</b>	1
						50	50	22.0	21.4	0.234	0.269	
			Left Tilt	20175	1732.5	1	99	23.0	22.7	0.077	0.083	
						50	50	22.0	21.4	0.053	0.061	
			Right Touch	20175	1732.5	1	99	23.0	22.7	0.193	0.207	
						50	50	22.0	21.4	0.154	0.177	
Right Tilt	20175	1732.5	1	99	23.0	22.7	0.091	0.098				
			50	50	22.0	21.4	0.072	0.083				
Body-worn & Hotspot	QPSK	10	Rear	20175	1732.5	1	99	23.0	22.7	0.527	0.565	
						50	50	22.0	21.4	0.393	0.451	
			Front	20175	1732.5	1	99	23.0	22.7	0.683	<b>0.732</b>	2
						50	50	22.0	21.4	0.510	0.586	
Hotspot	QPSK	10	Edge 2	20175	1732.5	1	99	23.0	22.7	0.064	0.069	
						50	50	22.0	21.4	0.039	0.045	
			Edge 3	20175	1732.5	1	99	23.0	22.7	0.470	0.504	
						50	50	22.0	21.4	0.347	0.398	
			Edge 4	20175	1732.5	1	99	23.0	22.7	0.223	0.239	
						50	50	22.0	21.4	0.164	0.188	

### 11.2. 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	22.5	22.0	0.119	<b>0.134</b>	3
						25	0	21.5	21.1	0.112	0.123	
			Left Tilt	23790	710.0	1	0	22.5	22.0	0.089	0.100	
						25	0	21.5	21.1	0.082	0.090	
			Right Touch	23790	710.0	1	0	22.5	22.0	0.089	0.100	
						25	0	21.5	21.1	0.080	0.088	
Right Tilt	23790	710.0	1	0	22.5	22.0	0.056	0.063				
			25	0	21.5	21.1	0.053	0.058				
Body-worn & Hotspot	QPSK	10	Rear	23790	710.0	1	0	22.5	22.0	0.308	<b>0.346</b>	4
						25	0	21.5	21.1	0.269	0.295	
			Front	23790	710.0	1	0	22.5	22.0	0.220	0.247	
						25	0	21.5	21.1	0.198	0.217	
Hotspot	QPSK	10	Edge 2	23790	710.0	1	0	22.5	22.0	0.145	0.163	
						25	0	21.5	21.1	0.140	0.154	
			Edge 3	23790	710.0	1	0	22.5	22.0	0.069	0.077	
						25	0	21.5	21.1	0.067	0.073	
			Edge 4	23790	710.0	1	0	22.5	22.0	0.316	0.355	5
						25	0	21.5	21.1	0.273	0.299	

## 12. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. 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  $\geq 0.80$  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  $\geq 1.45$  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  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

### 12.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn Accessory (W/kg)	Wireless Router (Hotspot) (W/kg)	Repeated SAR (Yes/No)
750	LTE Band 17		0.683		No
1750	LTE Band 4			0.316	No

### 12.2. Repeated Measurement Results

#### Conclusion:

Repeated measurement not required since no measured SAR values were greater than 0.8W/kg.

### 13. Simultaneous Transmission SAR Analysis

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 4	② Wi-Fi(DTS)	③ Bluetooth		
Head	Left Touch	① + ②	0.326	0.126		<b>0.452</b>	No
	Left Tilt	① + ②	0.083	0.117		0.200	No
	Right Touch	① + ②	0.207	0.238		0.445	No
	Right Tilt	① + ②	0.098	0.117		0.215	No
Body-w orn Accessory & Hotspot	Rear	① + ②	0.565	0.310		<b>0.875</b>	No
		① + ③	0.565		0.236	0.801	No
	Front	① + ②	0.732	0.079		0.811	No
		① + ③	0.732		0.236	0.968	No
Hotspot	Edge 1	① + ②		0.074		0.074	No
	Edge 2	① + ②	0.069			0.069	No
	Edge 3	① + ②	0.504			0.504	No
	Edge 4	① + ②	0.239	0.218		0.457	No

**Note(s):**

Please refer to SAR Report 14118800-S1 for Standalone Wi-Fi (DTS) and Bluetooth data. Wi-Fi (DTS) and Bluetooth data is used for Simultaneous SAR evaluations.

#### 13.2. 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(DTS)	③ Bluetooth		
Head	Left Touch	① + ②	0.134	0.126		0.260	No
	Left Tilt	① + ②	0.100	0.117		0.217	No
	Right Touch	① + ②	0.100	0.238		0.338	No
	Right Tilt	① + ②	0.063	0.117		0.180	No
Body-w orn Accessory & Hotspot	Rear	① + ②	0.346	0.310		0.656	No
		① + ③	0.346		0.236	0.582	No
	Front	① + ②	0.247	0.079		0.326	No
		① + ③	0.247		0.236	0.483	No
Hotspot	Edge 1	① + ②		0.074		0.074	No
	Edge 2	① + ②	0.163			0.163	No
	Edge 3	① + ②	0.077			0.077	No
	Edge 4	① + ②	0.355	0.218		0.573	No

**Note(s):**

Please refer to SAR Report 14118800-S1 for Standalone Wi-Fi (DTS) and Bluetooth data. Wi-Fi (DTS) and Bluetooth data is used for Simultaneous SAR evaluations.

**Conclusion:**

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

## **14. Appendixes**

**Refer to separated files for the following appendixes.**

- 14.1. Photos and Antenna Locations**
- 14.2. System Performance Check Plots**
- 14.3. Highest SAR Test Plots**
- 14.4. Tissue Material Ingredients**
- 14.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3531**
- 14.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3929**
- 14.7. Calibration Certificate for D750V3 - SN 1071**
- 14.8. Calibration Certificate for D1750V2- SN 1050**

**END OF REPORT**