SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

For

The FCC ID: A3LSMT561 and A3LSMT561Y have the same PCB design, all the chipset, component including antennas are same.
A3LSMT561 supports GSM 850 and GSM 1900 only.
After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMT561 remains representative of FCC ID: A3LSMT561Y, test data for FCC ID: A3LSMT561Y is being submitted for this application to cover GSM850 and GSM1900 features.

FCC ID: A3LSMT561
Model Name: SM-T561

Report Number: 15K20424-S1
Issue Date: 4/28/2015

Prepared for

SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 443-742, KOREA

Prepared by

UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 443-823, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433

ACCREDITED

TL-637

Revision History

Rev.	Date	Revisions	Revised By
--	4/28/2015	Initial Issue	Justin Park

Table of Contents

1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS.,LTD.		
FCC ID	A3LSMT561		
Model Name	SM-T561		
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013		
SAR Limits (W/Kg)			
Exposure Category	Peak spatial-average(1g of tissue)		
General population / Uncontrolled exposure	1.6		
The Highest Reported SAR (W/kg)			
RF Exposure Conditions	**Equipment Class**		
	Licensed	**DTS**	**DSS (BT)**
Standalone	0.852	1.072	0.037
Simultaneous TX	1.554		
Date Tested	3/10/2015 to 4/27/2015		
Test Results	Pass		

UL Korea, Ltd. 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 Korea, Ltd. 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 Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released By:	Prepared By:
	
JiHo Choi Operations Manager UL Korea, Ltd Suwon Laboratory	Justin Park Engineer UL Korea, Ltd Suwon Laboratory

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 SAR meas for 802.11 v02
- 447498 D01 General RF Exposure Guidance v05r02
- 616217 D04 SAR for laptop and tablets v01r01
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- 865664 D02 RF Exposure Reporting v01r01
- 941225 D01 3G SAR Procedures v03
- 941225 D06 Hotspot Mode v02

3. Facilities and Accreditation

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

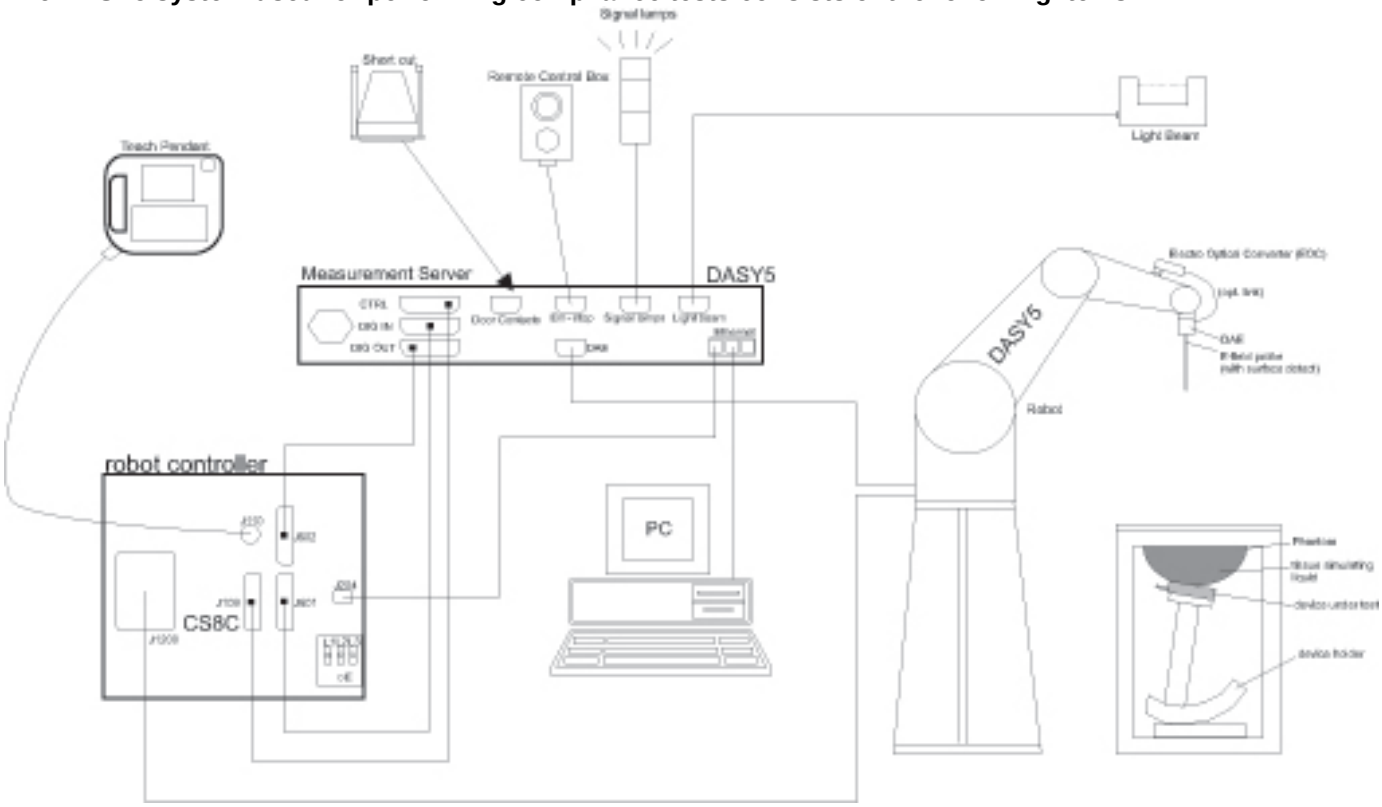
Suwon
SAR 1 Room
SAR 2 Room
SAR 3 Room

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.
The full scope of accreditation can be viewed at http://www.iasonline.org/PDF/TL/TL-637.pdf.

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 Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

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

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

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

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	E5071C	MY46522054	9-23-2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1196	8-5-2015
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	11-13-2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	9-23-2015
Power Sensor	Agilent	U2000A	MY54260010	9-23-2015
Power Sensor	Agilent	U2000A	MY54260007	9-23-2015
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	11-7-2015
Directional Coupler	Agilent	772D	MY52180193	9-22-2015
Directional Coupler	Agilent	778D	MY52180432	9-22-2015
Low Pass Filter	MICROLAB	LA-15N	03943	11-4-2015
Low Pass Filter	FILTRON	L14012FL	1410003S	11-4-2015
Low Pass Filter	MICROLAB	LA-60N	03942	11-5-2015
Attenuator	Agilent	8491B/003	MY39269292	9-22-2015
Attenuator	Agilent	8491B/010	MY39269315	9-22-2015
Attenuator	Agilent	8491B/020	MY39269298	9-22-2015
E-Field Probe (SAR 1)	SPEAG	EX3DV4	7330	2-12-2015
E-Field Probe (SAR 2)	SPEAG	EX3DV4	7313	8-27-2015
E-Field Probe (SAR 3)	SPEAG	EX3DV4	7314	8-27-2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE4	1468	1-12-2016
Data Acquisition Electronics (SAR 2)	SPEAG	DAE4	1447	8-25-2015
Data Acquisition Electronics (SAR 3)	SPEAG	DAE4	1446	8-27-2015
System Validation Dipole	SPEAG	D835V2	4d174	8-13-2015
System Validation Dipole	SPEAG	D1900V2	5d190	8-12-2015
System Validation Dipole	SPEAG	D1900V2	5d199	2-6-2016
System Validation Dipole	SPEAG	D2450V2	939	8-11-2015
Thermometer (SAR 1)	Lutron	MHB-382SD	AH.53049	11-18-2015
Thermometer (SAR 2)	Lutron	MHB-382SD	AH.50215	11-18-2015
Thermometer (SAR 3)	Lutron	MHB-382SD	AH.50213	11-18-2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	8-13-2015
Base Station Simulator	R & S	CMW500	150314	8-13-2015
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	11-17-2015

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 1528-2013 is not required in SAR reports submitted for equipment approval.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 242 mm x 150 mm Overall Diagonal: 276 mm Display Diagonal: 243.5 mm
Back Cover	☒ The rechargeable battery is not user accessible.
Battery Options	☒ The rechargeable battery is not user accessible.
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☐ Mobile Hotspot (Wi-Fi 5 GHz)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☐ Wi-Fi Direct (Wi-Fi 5 GHz)

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK)	GPRS Multi-Slot Class: ☐ Class 8 - One Up ☐ Class 10 - Two Up ☒ Class 12 - Four Up ☐ Class 33 - Four Up	GSM Voice: 12.5% GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)		100%
	Does this device support Band gap channel? ☐ Yes ☒ No			
Bluetooth	2.4 GHz	Version 4.0 LE		N/A

6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1.(3) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

Upper limit (dB): -1.5 ~ 0.5		Max. RF Output Power (dBm)		Reduce RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
GSM850	Voice	32.5	**33.0**	27.0	**27.5**
	GPRS 1 slot	32.5	**33.0**	27.0	**27.5**
	GPRS 2 slots	31.0	**31.5**	25.0	**25.5**
	GPRS 3 slots	29.0	**29.5**	23.0	**23.5**
	GPRS 4 slots	27.0	**27.5**	21.0	**21.5**
GSM1900	Voice	29.0	**29.5**	22.0	**22.5**
	GPRS 1 slot	29.0	**29.5**	22.0	**22.5**
	GPRS 2 slots	26.5	**27.0**	20.0	**20.5**
	GPRS 3 slots	24.5	**25.0**	18.0	**18.5**
	GPRS 4 slots	23.0	**23.5**	17.0	**17.5**

Upper limit (dB): -1.5 ~ 0.5		Max. RF Output Power (dBm)		Reduce RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	15.5	**16.0**	N/A	
	802.11g	14.0	**14.5**	N/A	
	802.11n HT20	13.0	**13.5**	N/A	
Bluetooth		9.5	**10.0**	N/A	
Bluetooth LE		8.0	**8.5**	N/A	

6.4. Power Reduction by Proximity Sensing

Due to the operating configurations and exposure conditions required by tablets, proximity sensors are used in this device to reduce the maximum output power in specific wireless and operating modes to ensure SAR compliance. This device uses a capacitive proximity sensor that is same metallic component as the transmitting antenna to facilitate triggering in typical user interactivity with the device.

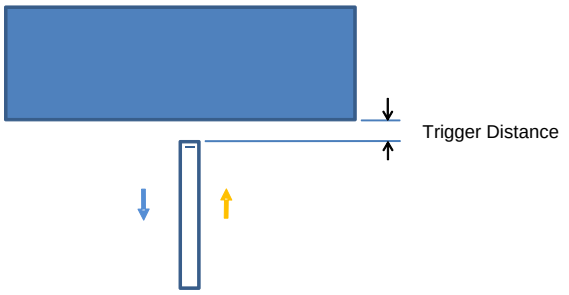
6.4.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

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

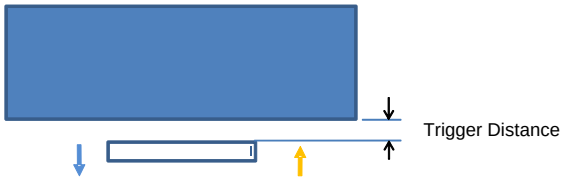
The measurement was then repeated for the surface of Rear.

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

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



Proximity Sensor Trigger Distance Assessment
KDB 616217 §6.2 , **Edge 1**



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

LEGEND

Direction of DUT travel for determination of power reduction triggering point

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

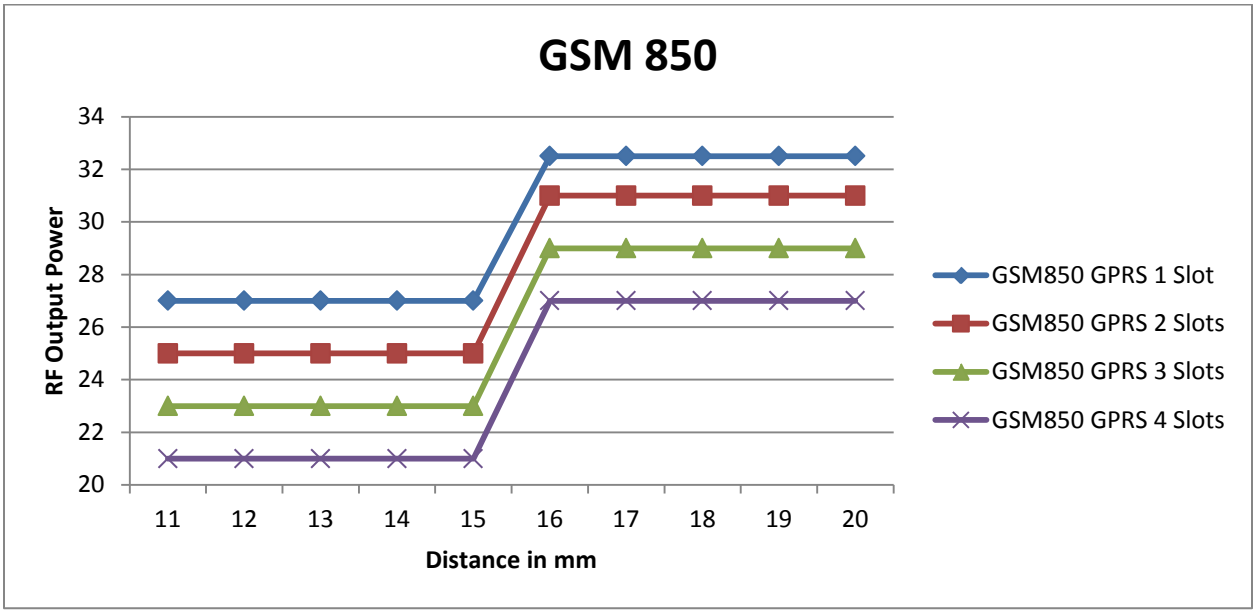
Summary of Trigger Distances for WWAN

Tissue simulating liquid	Trigger distance - Edge 1		Trigger distance - Rear	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
850 muscle	12mm	12mm	15mm	15mm
1900 muscle	12mm	12mm	15mm	15mm

6.4.2. Proximity Sensor Triggering Distance Measurement Results

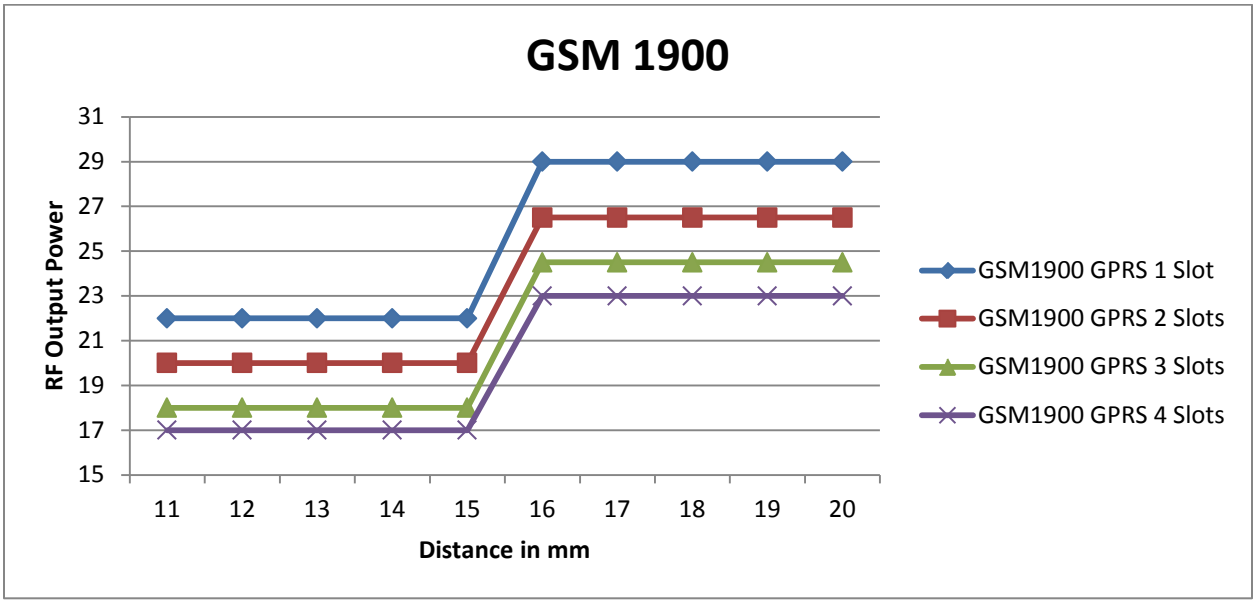
GSM850

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



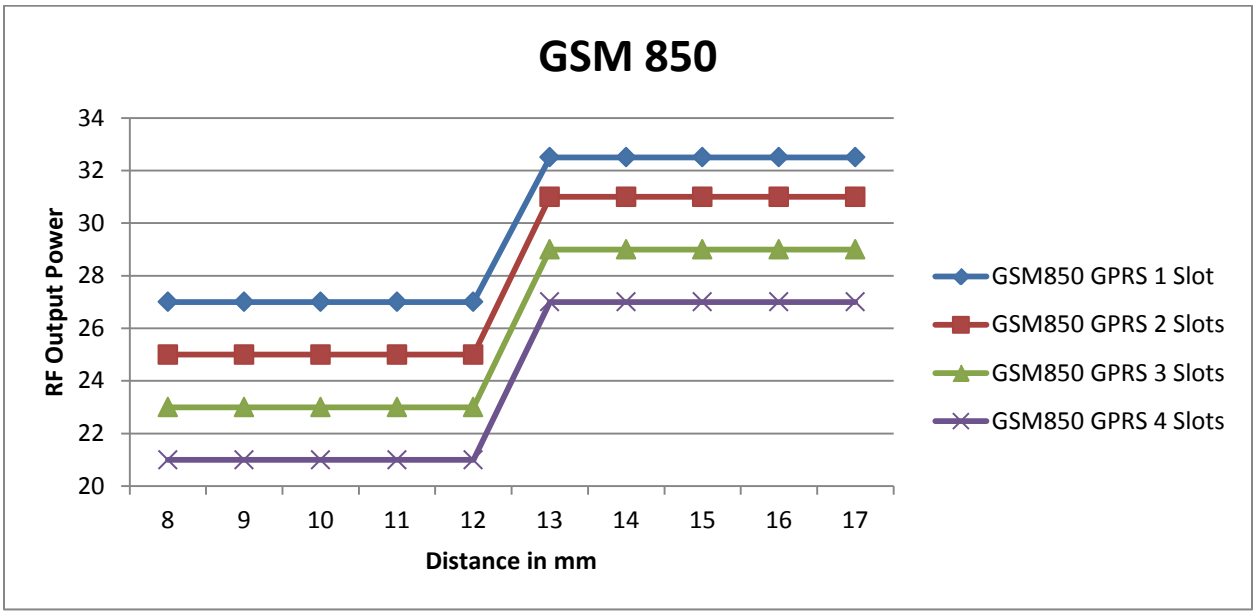
GSM1900

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



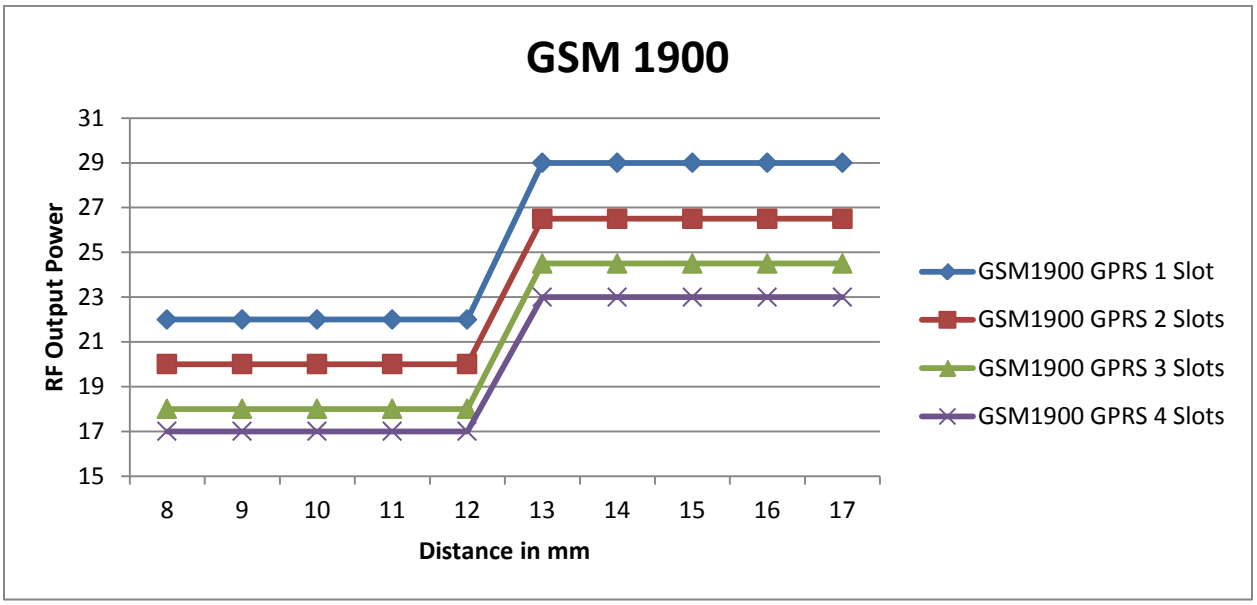
GSM850

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom



GSM1900

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom



6.4.3. Proximity Sensor Coverage (KDB 616217 §6.3)

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

6.4.4. Resulting test positions for SAR measurements

Wireless technologies	Position	§6.2 Triggering Distance	§6.3 Coverage	Worst case distance for SAR
WWAN	Rear	15 mm	N/A	14 mm
	Edge 1	12 mm	N/A	11 mm

7. RF Exposure Conditions (Test Configurations)

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

7.1. Standalone SAR Test Exclusion Considerations

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

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

SAR Test Exclusion Calculations for WWAN

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	GPRS 2 Slots	848.8	31.50	353	1.4	3.5	102	227	12		65 -MEASURE-	65 -MEASURE-	> 50 mm	> 50 mm	27.1 -MEASURE-	
Cellular	GPRS 2 Slots	1909.8	27.00	125	1.4	3.5	102	227	12		34.5 -MEASURE-	34.5 -MEASURE-	> 50 mm	> 50 mm	14.4 -MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 2 Slots	848.8	25.50	89	1.4	3.5	102	227	12		16.4 -MEASURE-	16.4 -MEASURE-	> 50 mm	> 50 mm	6.8 -MEASURE-	
Cellular	GPRS 2 Slots	1909.8	20.50	28	1.4	3.5	102	227	12		7.7 -MEASURE-	7.7 -MEASURE-	> 50 mm	> 50 mm	3.2 -MEASURE-	

Note(s):

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

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	GPRS 2 Slots	848.8	31.50	353	1.4	3.5	102	227	12		< 50 mm	< 50 mm	457.1 mW -EXEMPT-	1164.4 mW -EXEMPT-	< 50 mm	
Cellular	GPRS 2 Slots	1909.8	27.00	125	1.4	3.5	102	227	12		< 50 mm	< 50 mm	628.5 mW -EXEMPT-	1878.5 mW -EXEMPT-	< 50 mm	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 2 Slots	848.8	25.50	89	1.4	3.5	102	227	12		< 50 mm	< 50 mm	457.1 mW -EXEMPT-	1164.4 mW -EXEMPT-	< 50 mm	
Cellular	GPRS 2 Slots	1909.8	20.50	28	1.4	3.5	102	227	12		< 50 mm	< 50 mm	628.5 mW -EXEMPT-	1878.5 mW -EXEMPT-	< 50 mm	

Note(s):

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

SAR Test Exclusion Calculations for WLAN

Antennas < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	16.00	40	1.4	44	6	179.5	140.5		12.6 -MEASURE-	1.4 -EXEMPT-	10.5 -MEASURE-	> 50 mm	> 50 mm	
Bluetooth	2480	10.00	10	1.4	44	6	179.5	140.5		3.1 -MEASURE-	0.4 -EXEMPT-	2.6 -EXEMPT-	> 50 mm	> 50 mm	

Note(s):

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

Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	16.00	40	1.4	44	6	179.5	140.5		< 50 mm	< 50 mm	< 50 mm	1390.6 mW -EXEMPT-	1000.6 mW -EXEMPT-	
Bluetooth	2480	10.00	10	1.4	44	6	179.5	140.5		< 50 mm	< 50 mm	< 50 mm	1390.3 mW -EXEMPT-	1000.3 mW -EXEMPT-	

Note(s):

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

7.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 7.1:

Test Configurations	Rear	Edge 1 (Top Edge)	Edge 2 (Right Edge)	Edge 3 (Bottom Edge)	Edge 4 (Left Edge)
GSM850 Full Power	Yes	Yes	No	No	Yes
GSM850 w / Power Reduction	Yes	Yes	No	No	Yes
GSM1900 Full Power	Yes	Yes	No	No	Yes
GSM1900 w / Power Reduction	Yes	Yes	No	No	Yes
Wi-Fi 2.4 GHz Full Power	Yes	No	Yes	No	No
Bluetooth	Yes	No	No	No	No

Note(s):

1. Yes = Testing is required.
2. No = Testing is not required.

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

SAR 1 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
04-15-2015	Body 2450	e'	50.7500	Relative Permittivity (ϵ_r):	50.75	52.70	-3.70	5
		e"	14.5300	Conductivity (σ):	1.98	1.95	1.51	5
	Body 2410	e'	50.8900	Relative Permittivity (ϵ_r):	50.89	52.76	-3.54	5
		e"	14.3800	Conductivity (σ):	1.93	1.91	1.02	5
	Body 2475	e'	50.6600	Relative Permittivity (ϵ_r):	50.66	52.67	-3.81	5
		e"	14.6400	Conductivity (σ):	2.01	1.99	1.49	5

SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
3-9-2015	Body 835	e'	53.1000	Relative Permittivity (ϵ_r):	53.10	55.20	-3.80	5
		e"	21.2400	Conductivity (σ):	0.99	0.97	1.66	5
	Body 820	e'	53.1900	Relative Permittivity (ϵ_r):	53.19	55.28	-3.78	5
		e"	21.2800	Conductivity (σ):	0.97	0.97	0.18	5
	Body 850	e'	52.9600	Relative Permittivity (ϵ_r):	52.96	55.16	-3.98	5
		e"	21.2200	Conductivity (σ):	1.00	0.99	1.60	5
3-24-2015	Body 835	e'	53.3700	Relative Permittivity (ϵ_r):	53.37	55.20	-3.32	5
		e"	21.6100	Conductivity (σ):	1.00	0.97	3.44	5
	Body 820	e'	53.5200	Relative Permittivity (ϵ_r):	53.52	55.28	-3.18	5
		e"	21.6800	Conductivity (σ):	0.99	0.97	2.07	5
	Body 850	e'	53.2300	Relative Permittivity (ϵ_r):	53.23	55.16	-3.49	5
		e"	21.5400	Conductivity (σ):	1.02	0.99	3.13	5
4-27-2015	Body 2450	e'	51.7600	Relative Permittivity (ϵ_r):	51.76	52.70	-1.78	5
		e"	14.3400	Conductivity (σ):	1.95	1.95	0.18	5
	Body 2410	e'	51.9200	Relative Permittivity (ϵ_r):	51.92	52.76	-1.59	5
		e"	14.1800	Conductivity (σ):	1.90	1.91	-0.38	5
	Body 2475	e'	51.6800	Relative Permittivity (ϵ_r):	51.68	52.67	-1.88	5
		e"	14.4400	Conductivity (σ):	1.99	1.99	0.10	5

SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
3-9-2015	Body 1900	e'	51.2000	Relative Permittivity (ϵ_r):	51.20	53.30	-3.94	5
		e"	14.8100	Conductivity (σ):	1.56	1.52	2.94	5
	Body 1850	e'	51.3700	Relative Permittivity (ϵ_r):	51.37	53.30	-3.62	5
		e"	14.8200	Conductivity (σ):	1.52	1.52	0.29	5
	Body 1910	e'	51.1800	Relative Permittivity (ϵ_r):	51.18	53.30	-3.98	5
		e"	14.8100	Conductivity (σ):	1.57	1.52	3.48	5
4-20-2015	Body 1900	e'	53.2400	Relative Permittivity (ϵ_r):	53.24	53.30	-0.11	5
		e"	14.9700	Conductivity (σ):	1.58	1.52	4.05	5
	Body 1850	e'	53.4100	Relative Permittivity (ϵ_r):	53.41	53.30	0.21	5
		e"	14.9500	Conductivity (σ):	1.54	1.52	1.17	5
	Body 1910	e'	53.2300	Relative Permittivity (ϵ_r):	53.23	53.30	-0.13	5
		e"	14.9800	Conductivity (σ):	1.59	1.52	4.66	5

8.2. 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 re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

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
D835V2	4d174	8-12-2014	835	1g	9.32	9.62
				10g	6.09	6.37
D1900V2	5d190	8-12-2014	1900	1g	40.2	40.4
				10g	21.0	21.3
D1900V2	5d199	2-6-2015	1900	1g	41	40.6
				10g	21.4	21.6
D2450V2	939	8-11-2014	2450	1g	52.1	51.4
				10g	24.2	24

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 1 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4-15-2015	D2450V2	939	Body	1g	5.28	52.80	51.40	2.72	1
				10g	2.40	24.00	24.00	0.00	

SAR 2 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
3-9-2015	D835V2	4d174	Body	1g	0.96	9.57	9.62	-0.52	
				10g	0.63	6.30	6.37	-1.10	
3-24-2015	D835V2	4d174	Body	1g	0.98	9.82	9.62	2.08	2
				10g	0.65	6.45	6.37	1.26	
4-27-2015	D2450V2	939	Body	1g	5.57	55.70	51.40	8.37	
				10g	2.59	25.90	24.00	7.92	

SAR 3 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
3-9-2015	D1900V2	5d190	Body	1g	3.96	39.60	40.40	-1.98	
				10g	2.03	20.30	21.30	-4.69	
4-20-2015	D1900V2	5d199	Body	1g	4.21	42.10	40.6	3.69	3
				10g	2.16	21.60	21.60	0.00	

9. Conducted Output Power Measurements

9.1. GSM

GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Power		with Pwr Back-off	
						Burst Pwr (dBm)	Frame Pwr (dBm)	Burst Pwr (dBm)	Frame Pwr (dBm)
850	GSM (Voice)	CS1	1	128	824.2	32.6	23.5	26.9	17.9
				190	836.6	32.5	23.4	27.0	18.0
				251	848.8	32.5	23.5	27.1	18.1
	GPRS (GMSK)	CS1	1	128	824.2	32.6	23.6	26.9	17.9
				190	836.6	32.5	23.5	27.0	18.0
				251	848.8	32.5	23.5	27.1	18.1
			2	128	824.2	31.0	25.0	24.9	18.9
				190	836.6	31.0	25.0	25.0	19.0
				251	848.8	31.1	25.1	25.1	19.1
			3	128	824.2	28.9	24.7	23.0	18.7
				190	836.6	29.0	24.8	23.1	18.8
				251	848.8	29.1	24.8	23.2	18.9
			4	128	824.2	26.9	23.9	20.9	17.9
				190	836.6	27.0	24.0	21.1	18.1
				251	848.8	27.1	24.1	21.2	18.2

EGPRS(8PSK) is Rx only

Notes:

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

- Standalone: GMSK (GPRS) mode with 2 time slots for Max power and 2 time slots for Reduced power, based on the output power measurements above

GSM1900 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Power		with Pwr Back-off	
						Burst Pwr (dBm)	Frame Pwr (dBm)	Burst Pwr (dBm)	Frame Pwr (dBm)
1900	GSM (Voice)	CS1	1	512	1850.2	29.1	20.0	22.1	13.1
				661	1880.0	29.3	20.3	22.2	13.1
				810	1909.8	29.1	20.1	22.1	13.0
	GPRS (GMSK)	CS1	1	512	1850.2	29.1	20.0	22.1	13.1
				661	1880.0	29.3	20.3	22.1	13.1
				810	1909.8	29.1	20.1	22.1	13.0
			2	512	1850.2	26.8	20.7	20.1	14.1
				661	1880.0	26.8	20.8	20.2	14.2
				810	1909.8	26.7	20.7	20.1	14.1
			3	512	1850.2	24.2	19.9	18.1	13.8
				661	1880.0	24.2	20.0	18.1	13.9
				810	1909.8	24.2	19.9	18.0	13.7
			4	512	1850.2	22.3	19.2	17.1	14.1
				661	1880.0	22.3	19.3	17.1	14.1
				810	1909.8	22.2	19.2	17.1	14.0

EGPRS(8PSK) is Rx only

Notes:

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

- Standalone: GMSK (GPRS) mode with 2 time slots for Max power and 2 time slots for Reduced power, based on the output power measurements above

9.2. Wi-Fi 2.4GHz

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Note(s)
2.4	802.11b	1 Mbps	1	**2412**	**15.5**	16.0	Yes	
			6	2437	15.5			
			11	2462	15.6			
	802.11g	6 Mbps	1	2412	Not Required	14.5	No	1
			6	2437				
			11	2462				
	802.11n (HT20)	6.5 Mbps	1	2412		13.5	No	1
			6	2437				
			11	2462				

Note(s):

1. Output Power and SAR is not required for 802.11g/n HT20 channels when the highest *reported* SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

9.3. Bluetooth

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)	Avg Pwr (mW)
2.4	V3.0 + BDR, GFSK	0	2402	9.1	8.09
		39	2441	8.6	7.29
		78	2480	8.9	7.77
	V3.0 + EDR, π/4 DQPSK	0	2402	5.2	3.33
		39	2441	4.6	2.91
		78	2480	4.8	3.03
	V3.0 + EDR, 8-DPSK	0	2402	5.4	3.45
		39	2441	4.7	2.98
		78	2480	4.9	3.10
	V4.0 LE, GFSK	0	2402	7.8	6.07
		19	2440	7.9	6.13
		39	2480	7.8	6.07

10. 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:

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

KDB 941225 D01 SAR test for 3G devices:
When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

KDB 248227 D01 SAR meas for 802.11 v02:
SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the ***initial test position(s)*** by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The ***initial test position(s)*** is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the ***reported*** SAR for the ***initial test position*** is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the ***initial test position*** to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the ***reported*** SAR is ≤ 0.8 W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the ***initial test position*** and subsequent test positions, when the ***reported*** SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the ***reported*** SAR is ≤ 1.2 W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the ***initial test position***, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the ***initial test position***.

10.1. GSM850

Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
GPRS 2 Slots	ON	0	Rear	190	836.6	25.5	25.0	0.549	0.612	1
			Edge 1	190	836.6	25.5	25.0	0.266	0.296	
			Edge 4	190	836.6	25.5	25.0	0.066	0.073	
GPRS 2 Slots	OFF	14	Rear	190	836.6	31.5	31.0	0.331	0.368	
		11	Edge 1	190	836.6	31.5	31.0	0.200	0.222	
		0	Edge 4	190	836.6	31.5	31.0	0.293	0.326	

10.2. GSM1900

Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
GPRS 2 Slots	ON	0	Rear	661	1880.0	20.5	20.2	0.447	0.482	
			Edge 1	661	1880.0	20.5	20.2	0.448	0.483	
			Edge 4	661	1880.0	20.5	20.2	0.185	0.199	
GPRS 2 Slots	OFF	14	Rear	661	1880.0	27.0	26.8	0.281	0.291	
		11	Edge 1	661	1880.0	27.0	26.8	0.377	0.390	
		0	Edge 4	512	1850.2	27.0	26.8	0.789	0.834	
				661	1880.0	27.0	26.8	0.821	0.850	
				810	1909.8	27.0	26.7	0.802	0.852	2

10.3. Wi-Fi (DTS Band)

Frequency Band	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
							Tune-up limit	Meas.	Meas.	Scaled		
2.4GHz	802.11b 1 Mbps	0	Rear	1	2412.0	1.750	16.0	15.5	0.955	1.072	3	3
				6	2437.0	1.440	16.0	15.5	0.779	0.878		
				11	2462.0	0.980	16.0	15.6	0.622	0.680		
			Edge 2	1	2412.0	0.176	16.0	15.4	0.163	0.187	1	

Note(s):

1. Highest *reported* SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest *reported* SAR is > 0.4 W/kg. Due to the highest *reported* SAR for this test position, other test positions in Head exposure condition were evaluated until a SAR ≤ 0.8 W/kg was *reported*.
3. Testing for a second channel was required because the *reported* SAR for this test position was >0.8 W/kg.
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.

10.4. Bluetooth

Frequency Band	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
2.4 GHz	GFSK	0	Rear	39	2441.0	10.0	8.6	0.037	0.051	4

11. SAR Measurement Variability

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

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

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
850	GSM 850	Standalone	Rear	No	0.549	N/A	N/A
1900	GSM 1900	Standalone	Edge 4	Yes	0.821	0.826	1.01
2400	Wi-Fi 802.11b/g/n	Standalone	Rear	Yes	0.955	0.974	1.02
	Bluetooth	Standalone	Rear	No	0.037	N/A	N/A

Note(s):
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.

12. Simultaneous Transmission SAR Analysis

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

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

Where:

SAR_1 is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest 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 $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

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:

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

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations
Standalone	1	GSM(GPRS/EDGE) + Wi-Fi 2.4GHz
	2	GSM(GPRS/EDGE) + BT

Notes:

1. Only DTS supports Hotspot.
2. GPRS/EDGE support Hotspot.
3. VoIP is supported in GPRS/EDGE
4. Wi-Fi 2.4GHz Radio cannot transmit simultaneously with Bluetooth Radio.

Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

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

Estimated SAR for WWAN

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	GPRS 2 Slots	848.8	31.50	353	1.4	3.5	102	227	12		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Cellular	GPRS 2 Slots	1909.8	27.00	125	1.4	3.5	102	227	12		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 2 Slots	848.8	25.50	89	1.4	3.5	102	227	12		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Cellular	GPRS 2 Slots	1909.8	20.50	28	1.4	3.5	102	227	12		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	

Estimated SAR for WLAN

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi 2.4 GHz	2462	16.00	40	1.4	44	6	179.5	140.5		-MEASURE-	0.190	-MEASURE-	0.400	0.400	
Bluetooth	2480	10.00	10	1.4	44	6	179.5	140.5		-MEASURE-	0.048	0.350	0.400	0.400	

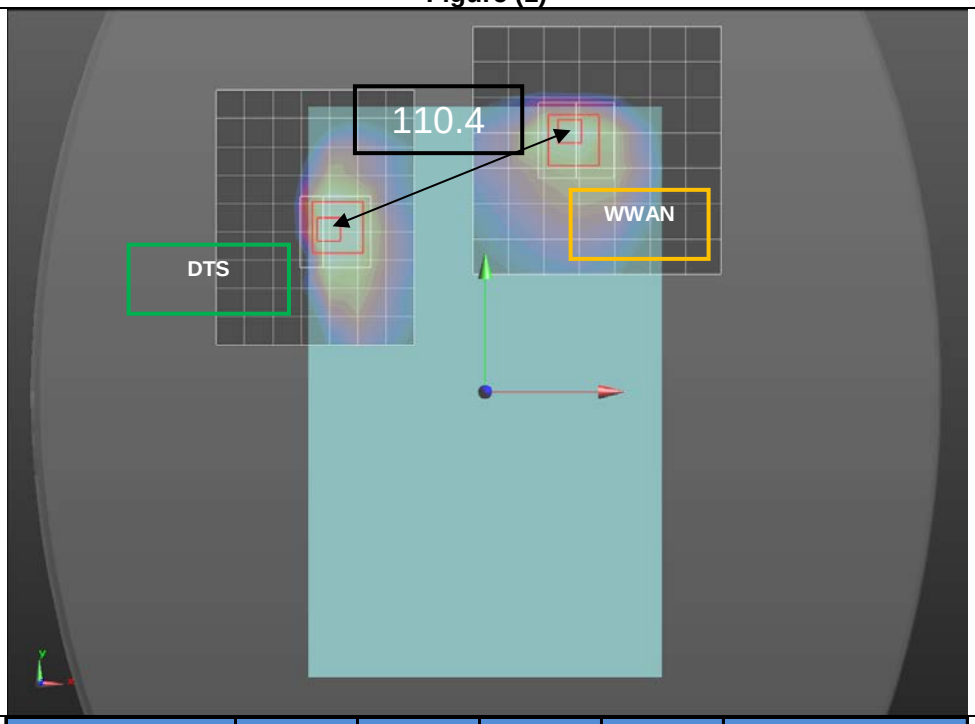
12.1. Sum of the SAR for GSM850 & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Body	Rear	0.612	1.072	0.051	1.684	**Yes**	0.663	No
	Edge 1	0.296	0.190	0.048	0.486	No	0.344	No
	Edge 2	0.400	0.187	0.350	0.587	No	0.750	No
	Edge 3	0.400	0.400	0.400	0.800	No	0.800	No
	Edge 4	0.326	0.400	0.400	0.726	No	0.726	No

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination		∑ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS						
Rear	0.612	1.072	① + ②	1.684	110.4	0.020	No	1

Figure (1)



Mode		Peak SAR mW/g	X m	Y m	Z m	d: Calculated distance (mm)	
WWAN	①	0.799	0.034	0.112	-0.004	① + ②	110.4
DTS	②	1.75	-0.068	0.068	-0.003		

The Peak Location Separation Distance is computed by using the formula below:
SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Body	Rear	0.482	1.072	0.051	1.554	No	0.533	No
	Edge 1	0.483	0.190	0.048	0.673	No	0.531	No
	Edge 2	0.400	0.187	0.350	0.587	No	0.750	No
	Edge 3	0.400	0.400	0.400	0.800	No	0.800	No
	Edge 4	0.852	0.400	0.400	1.252	No	1.252	No

Conclusion:

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

Appendixes

Refer to separated files for the following appendixes.

A_15K20424 SAR Photos & Ant. Locations

B_15K20424 SAR Highest Test Plots

C_15K20424 SAR System Check Plots

D_15K20424 SAR Tissue Ingredients

E_15K20424 SAR Probe Cal. Certificates

F_15K20424 SAR Dipole Cal. Certificates

END OF REPORT